United States Department of the Interior
BUREAU OF LAND MANAGEMENT
COOS BAY DISTRICT OFFICE
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1792(OR-120)
EA OR125-05-01
Umpqua River-Sawyer Rapids

January 30, 2008

Dear Citizen:

Enclosed is a copy of the "Umpqua River-Sawyer Rapids Environmental Assessment" (EA OR 125-05-01) and finding of no significant impact (FONSI) for proposed commercial thinning, density management and red alder conversion harvest projects. These projects are designed to implement management objectives described in the BLM Coos Bay District Resource Management Plan and Northwest Forest Plan. The environmental assessment analyzes a no-action alternative and a proposed-action alternative.

The Umpqua Field Office proposes to treat 35-80 year old forest stands consisting primarily of Douglas-fir and red alder. The project would thin approximately 9041 acres of conifer stands and convert 167 acres of red alder stands to conifer. Management actions would occur within the Late-Successional Reserve, General Forest Management Area, and the adjacent Riparian Reserve land use allocations in the following subwatersheds listed in Table 1

Table – 1 Project Area Location by Watershed and Subwatershed

Fifth Field Watershed	Sixth Field Subwatershed	Acres
Elk Creek	Lower Elk Creek	180
Lower Smith River-Lower Umpqua River	Vincent Creek	90
Mill Creek-Lower Umpqua River	Lower Camp Creek	298
Umpqua River-Sawyers Rapids	Little Mill Creek-Weatherly Creek	2,359
Umpqua River-Sawyers Rapids	Lutsinger Creek-Sawyer Creek	3,302
Umpqua River-Sawyers Rapids	Paradise Creek	2,750
Upper Smith River	Big Creek-Lower Umpqua River	198
Upper Smith River	Halfway Creek	18
Upper Umpqua River	Mehl Creek	12
	Total Acres Project Area	**9,208**

The legal descriptions for proposed project can be found in Table 2.

Table 2 Legal Description for all Units

Township	Range	Sections
T. 21 S.	R. 7 W.	19, 20, 29, 30, & 31
T. 21 S.	R. 8 W.	23, 24, 25, 26, 27, 29, 33, & 35
T. 22 S.	R. 8 W.	1, 3, 5, 7, 9, 11, 17, 18, 19, 25, 27, 29, 31, 32, & 33
T. 23 S.	R. 8 W.	5, 6, & 7
T. 21 S.	R. 9 W.	31, 32, & 33,
T. 22 S.	R. 9 W.	3, 4, 9, 10, 15, 25, 25, & 35 W. M.

You are encouraged to read the EA and comment on the appropriateness of the FONSI prior to the end of the 30-day comment period, March 3, 2008. The harvest could be accomplished by contracts sold in FY 2008 through FY 2011. Decision documents will be prepared after public comment for each timber sale.

Comments, including names and street addresses of respondents, will be available for public review at the address above during regular business hours (8:00 a.m. to 4:30 p.m.), Monday through Friday, except holidays, and may be published as part of the EA document or other related documents. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

Questions should be directed to Paul Fontaine at (541) 751-4401. Written comments on the appropriateness of the FONSI may be sent to BLM, 1300 Airport Lane, North Bend, OR 97459-2000, Attn: Paul Fontaine. You may e-mail your comments to OR_CoosBay_Mail@blm.gov ,Attn: Paul Fontaine.

Sincerely,

Paul T. Flanagan

Paul T. Flanagan
Acting Umpqua Field Manager

Attachmens:

(1)Umpqua River Sawyer Rapids FONSI (3 pp)
(2)Umpqua River Sawyer Rapids Environmental Assessment OR-125-05-01 (230 pp)
(3)EA Appendix A – Maps (2)
(4)EA Appendix B – Road Construction and Closure Summary
(5)EA Appendix C Special Status Species
(6)EA Appendix D Geology and Soils
(7)EA Appendix E Snags and Coarse Woody Debris
(8)EA Appendix F Essential Fish Habitat & No Effect Table

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1792(OR-120)
EA-OR125-05-01

FINDING OF NO SIGNIFICANT IMPACT (FONSI) For Umpqua River – Sawyer Rapids EA OR125-05-01

I. Introduction

An Interdisciplinary Team for the Umpqua River – Sawyer Rapids EA within the Umpqua Resource Area, Coos Bay District, Bureau of Land Management, has analyzed two alternatives: a no-action alternative and a proposed-action alternative. Alternative 1 would defer action on these forest stands. Alternative 2 proposes to manage tree densities on about 9,041 acres, convert about 167 acres of alder, construct 21.77 miles of new road, renovate or improve 143.11 miles of road, decommission 34.56 miles of road, and create 7,096 snags and 1,078 coarse woody debris logs. The locations for the project area/units are described Table 1.

Table 1 Legal Description for all Units

Township	Range	Sections
T. 21 S.	R. 7 W.	19, 20, 29, 30, & 31
T. 21 S.	R. 8 W.	23, 24, 25, 26, 27, 29, 33, & 35
T. 22 S.	R. 8 W.	1, 3, 5, 7, 9, 11, 17, 18, 19, 25, 27, 29, 31, 32, & 33
T. 23 S.	R. 8 W.	5, 6, & 7
T. 21 S.	R. 9 W.	31, 32, & 33,
T. 22 S.	R. 9 W.	3, 4, 9, 10, 15, 25, 25, & 35 W. M.

II. Background

The Coos Bay District (CBD) of the Bureau of Land Management (BLM) is under the direction of the Final Coos Bay District Proposed Resource Management Plan Final Environmental Impact Statement (USDI-BLM 1994) and it's Record of Decision (USDI-BLM 1995), and the Final Supplemental Environmental Impact Statement on Management of Habitat for Late Successional and Old Growth Forest Related Species Within the Range of the Northern Spotted Owl (FSEIS), commonly referred to as the "Northwest Forest Plan" [NFP] (USDA-FS; USDI-BLM 1994a) and its Record of Decision (USDA-FS; USDI-BLM 1994b) as supplemented and amended by:

- Management of Port-Orford-cedar in Southwest Oregon Final Supplemental Environmental Impact Statement (USDA-FS; USDI-BLM 2004), and its Record of Decision (USDI-BLM 2004).

- The Final Supplement to The 2004 Environmental Impact Statement to Remove or Modify The Survey and Manage Mitigation Measure Standards and Guidelines (USDA-FS; USDI-BLM 2007) and its Record of Decision (USDI-BLM 2007).

This EA is also tiered to and in conformance with the Coos Bay Integrated Noxious Weed Program (EA OR 120-97-11).

Through these documents, the BLM, in conjunction with other Federal land agencies, is directed to conduct watershed analysis (WA), and to implement restoration projects to aid in the recovery of water quality and aquatic, riparian, and terrestrial habitats.

As stated in the ROD for the NFP, the Aquatic Conservation Strategy (ACS) was developed to maintain the ecological health of watersheds and aquatic ecosystems on public lands within the range of Pacific Ocean anadromy. The Environmental Consequences section of the EA describes the consistency of the proposed alternative with the ACS.

All Federal agencies are charged with managing programs to enhance the recovery of Federally listed endangered and threatened species and their habitats (Section 7(a) (1) of the Endangered Species Act). Implementing the proposed actions are expected to benefit numerous threatened, endangered and candidate species.

III. Finding of No Significant Impact

A careful review of the EA, which I herein adopt, indicates that there would not be a significant impact on the quality of the human environment from the implementation of any of the alternatives. I agree with this finding and determined that an Environmental Impact Statement (EIS) will not be prepared. This determination is based on consideration of the following factors:

1. The proposed activities are not national or regional in scope. The Umpqua River – Sawyer Rapids EA Project Area comprises 9,208 project acres. Table 2 summarizes the project area/units by watershed/subwatershed.

Table 2- Project Area Location by Watershed and Subwatershed

Fifth Field Watershed	Sixth Field Subwatershed	Acres
Elk Creek	Lower Elk Creek	180
Lower Smith River-Lower Umpqua River	Vincent Creek	90
Mill Creek-Lower Umpqua River	Lower Camp Creek	298
Umpqua River-Sawyers Rapids	Little Mill Creek-Weatherly Creek	2,359
Umpqua River-Sawyers Rapids	Lutsinger Creek-Sawyer Creek	3,302
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Upper Smith River	Big Creek-Lower Umpqua River	198
Upper Smith River	Halfway Creek	18
Upper Umpqua River	Mehl Creek	12
	Total Acres Project Area	**9,208**

2. The proposed activities have no impact on critical elements of the human environment such as park lands, prime farmlands, wild and scenic rivers, or ecologically critical areas. The individual project areas within the Umpqua River – Sawyer Rapids EA are located at previously disturbed sites, and the silvicultural prescriptions would help restore the natural physical environment.

3. The effects on the quality of the human environment of the proposed activities are not highly controversial.

4. The possible effects of the proposed activities on the quality of the human environment are not highly uncertain and do not involve unique or unknown risk.

5. The proposed projects do not establish a precedent for future actions or represent a decision in principle about future actions with potentially significant effects.

6. There are no significant cumulative effects identified by this assessment. Although there would be removal of vegetation within the Riparian Reserves, potential adverse impacts to the aquatic environment are eliminated or substantially avoided by the implementation of no-harvest buffers along streams.

7. The proposed activities would not affect cultural resources listed in, or potentially eligible for listing in the National Register of Historic Places.

8. The proposed projects would fully comply with the Endangered Species Act (ESA) of 1973, as amended.

- Proposed activities that may affect listed wildlife species within the project area were submitted for consultation with the U.S. Fish and Wildlife Service in accordance with Section 7(A)(2) of the Endangered Species Act of 1973 (16 U.S.C. 1536(A)(2) and (A)(4) as amended). A letter of concurrence was received from the U.S. Fish and Wildlife Service, dated June 29, 2007, in which they concur that the proposed actions are not likely to adversely affect the northern spotted owl, the marbled murrelet, or the bald eagle.

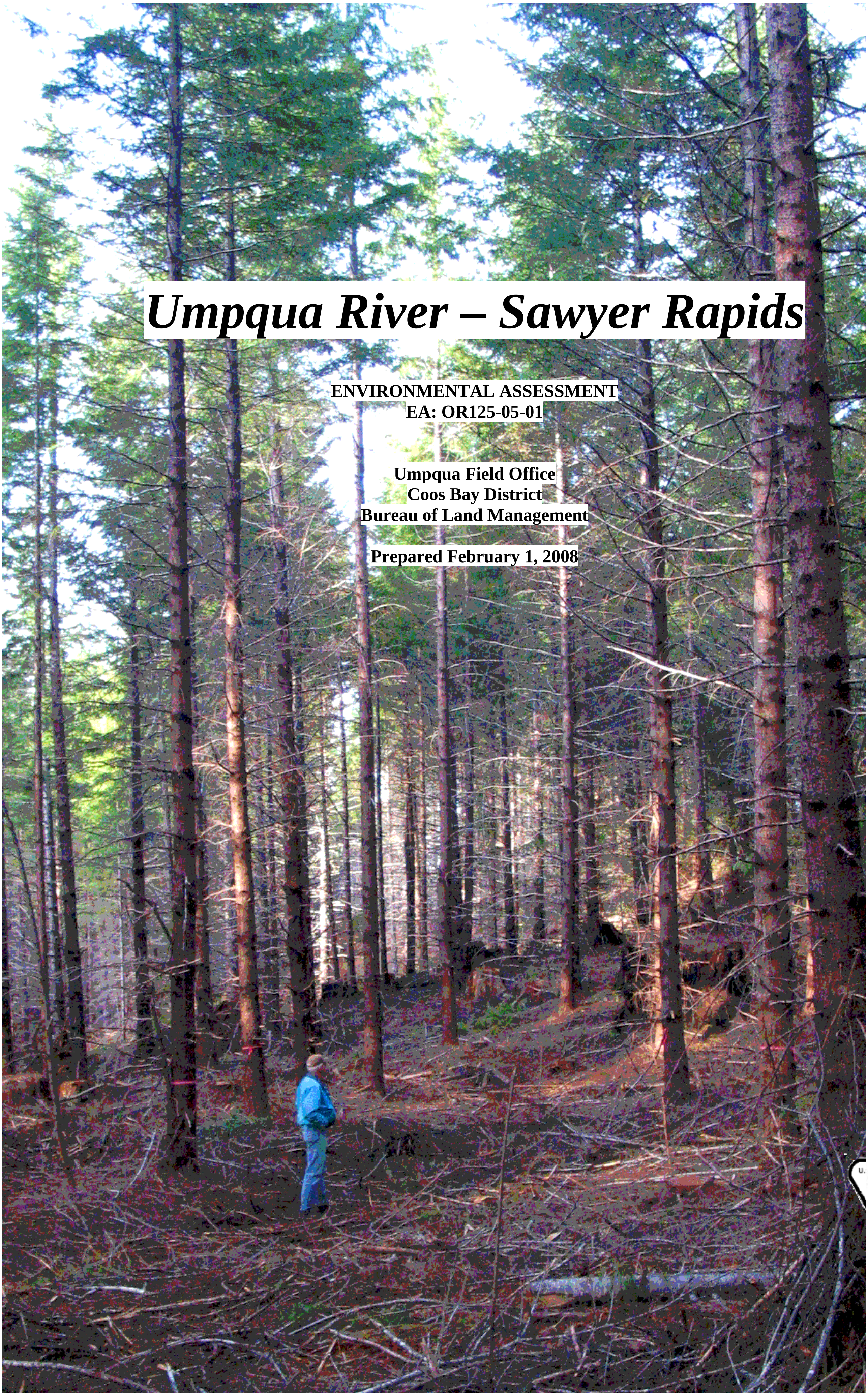
- There are no ESA listed fish species in the Umpqua River – Sawyer Rapids EA Project Area. Based on analysis by the Fisheries Biologist, we find that the proposed action will not adversely affect Essential Fish Habitat (EFH). Therefore, consultation with the National Marine Fisheries Service is not warranted. This conclusion further supports a finding of no significant impact.

9. There are no irreversible or irretrievable resource commitments identified by this assessment, except for a minor consumption of fossil fuels for project operations.

10. The proposed activities would not violate Federal, State, or local laws imposed for the protection of the environment.

___Paul T. Flanagan_________________________ Date: ___01/30/2008________

Paul T. Flanagan
Acting Umpqua Field Manager



Umpqua River – Sawyer Rapids

ENVIRONMENTAL ASSESSMENT
EA: OR125-05-01

Umpqua Field Office
Coos Bay District
Bureau of Land Management

Prepared February 1, 2008

BLM
Coos Bay District

Prepared February 1, 2008 by:

Paul Fontaine	Forester – Team Lead
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Scott Knowles	Environmental Justice Coordinator

The cover image shows a stand shortly after thinning. The stand is located on the Umpqua Resource Area, Coos Bay District.

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CHAPTER I.: PURPOSE OF AND NEED FOR ACTION

BACKGROUND

An interdisciplinary team within the Umpqua Field Office of the Coos Bay District Office was given the task to develop a project proposal in the Umpqua River – Sawyer Rapids Watershed. The watershed includes the Late-Successional Reserve (LSR), numbers 263, 265, and 266, General Forest Management Area (GFMA), and the Riparian Reserve land use allocations. The interdisciplinary team proposes a project to implement conifer-thinning, alder thinning, alder conversion, site preparation, fuel hazard reduction, road construction, road renovation/improvement, road decommissioning, and riparian restoration projects.

The Northwest Forest Plan allocated the uses of lands for different primary purposes. Late-Successional Reserves are to be managed to protect and enhance conditions of late-successional and old-growth forest ecosystems. These lands are to serve as habitat for late-successional and old-growth associated species including the northern spotted owl. Much of the forestland designated as Late-Successional Reserve within the southern Oregon Coast Range consists of forest stands less than 80 years of age. Silvicultural treatments in managed stands up to 80 years of age offer the opportunity to reduce tree density, convert alder stands to conifer stands, increase tree species diversity, improve forest structural characteristics, and to create downed logs and snags. Such treatments are likely to result in forest stands that more closely approximate the structure of a late-successional forest. Silvicultural treatments can accelerate the development of young stands into multi-layered stands with large trees and diverse plant species, and provide habitat structures that may in turn restore species diversity. As these treated stands age, secondary structural characteristics such as understory canopy development and large trees are likely to develop sooner than if no treatments are made. Tappeiner et al. (1997) observed old-growth trees averaged 20 inches in diameter at age 50 years and often were 40 inches at age 100 years. This individual tree growth rate is higher than observed in similar aged plantations. Hence, for many forest stands within the Late-Successional Reserves of the Oregon Coast Range, treatments such as thinning, snag creation, and downed log creation can accelerate the attainment of late-successional forest conditions across the landscape.

"Under the Aquatic Conservation Strategy, Riparian Reserves are used to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed. The Riparian Reserves will also serve as connectivity corridors among the LSRs" (USDA-FS; USDI-BLM 1994b, pg. B-13).

The GFMA, designated as the "matrix" land use allocation in the Northwest Forest Plan, is Federal land outside of designated Riparian Reserves, Late-Successional Reserves and special management areas, and that are available for timber harvest at varying levels.

In May of 1998, an interagency team of specialists from the Bureau of Land Management, U.S. Forest Service, and U.S. Fish and Wildlife Service completed the *South Coast - Northern Klamath Late-Successional Reserve Assessment*, also referred to as the Late-Successional Reserve Assessment (USDI-BLM; USDA-FS 1998). This document provides criteria for determining which forest stand conditions will warrant silvicultural treatment and what types of treatments will be appropriate to achieve desired forest stand conditions. The Proposed Action Alternative and all alternatives described in this environmental assessment are designed to be consistent with the guidance outlined in the Late-Successional Reserve Assessment.

The Late-Successional Reserve Assessment lists LSR #263 as a high priority area for management actions based on its large size, key links to the Late-Successional Reserve network, and land ownership pattern that provide greater opportunities to increase/develop contiguous stands of interior habitat. LSR # 266 is a medium priority for management activities because it has considerable amounts of treatable stands to augment existing interior habitat. LSR # 265 was a low priority for treatments but has good potential to treat edge stands augmenting further the large existing interior blocks. The analysis area has one Tier 1 key watershed, Paradise Creek.

The project is primarily within the Umpqua River-Sawyer Rapids Fifth Field Watershed. The edges of the project area overlap into Vincent Creek, Big Creek-Lower Umpqua, Lower Elk Creek, and Lower Camp Creek subwatersheds. The Coos Bay District completed revision 2.1 of the 2nd iteration watershed analysis in September 30, 2005 under the name of *Middle Umpqua River Watershed Analysis*, now referred to as Umpqua River-Sawyer Rapids (USDI-BLM 2004).

The interdisciplinary team prioritized areas within the Umpqua River–Sawyer Rapids Watershed that will benefit from treatments and contribute to the recovery of Late-Successional Reserve conditions across the landscape. Evaluation of stand conditions within the project area was completed to develop the appropriate prescriptions for each stand based on historic fire regimes, topography, and stand exam data. The proposed projects described herein, are intended to implement specific management opportunities some of which were identified within the *Middle Umpqua River Watershed Analysis* [now known as the Umpqua River-Sawyer Rapids] (USDI-BLM, 1995) and the Late-Successional Reserve Assessment (USDI-BLM; USDA-FS 1998) in a manner consistent with the standards and guidelines outlined in existing planning documents described below.

CONFORMANCE WITH EXISTING LAND USE PLANS

This EA is tiered to and in conformance with the *Final Coos Bay District Proposed Resource Management Plan Final Environmental Impact Statement* (USDI-BLM 1994) and it's Record of Decision (USDI-BLM 1995), and the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late Successional and Old Growth Forest Related Species Within the Range of the Northern Spotted Owl* (FSEIS), commonly referred to as the "Northwest Forest Plan" [NFP] (USDA-FS; USDI-BLM 1994a) and its Record of Decision (USDA-FS; USDI-BLM 1994b) as supplemented and amended by:

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- *The Final Supplement to The 2004 Environmental Impact Statement to Remove or Modify The Survey and Manage Mitigation Measure Standards and Guidelines* (USDA-FS; USDI-BLM 2007) and its Record of Decision (USDI-BLM 2007).

This EA is also tiered to and in conformance with the Coos Bay Integrated Noxious Weed Program (EA OR 120-97-11).

DESCRIPTION OF THE PROJECT

The Umpqua Field Office proposes to treat 31 to 80-year-old stands of primarily Douglas-fir stands within LSR 263, 265 and 266, the GFMA, and the adjacent Riparian Reserve. Stand ages are from stand exam data and Forest Operations Inventory records. The project would thin approximately 9,041 acres of primarily conifer stands and convert about 167 alder-dominated acres to conifer-dominated stands. The total proposed treatment area is 9,208 acres.

About 6,307 acres are in need of density management thinning in the Riparian Reserve and the Late-Successional Reserve to enhance the growth and vigor of the residual trees, and by that, put those areas on a trajectory to develop large diameter trees, and future large diameter snags and down wood debris. Thinning different stands to different target densities would impart a higher level of diversity at the landscape scale. At the stand level, gap creation and low density thinning would encourage understory stand development. Employing different density prescriptions to different units would also impart a level of landscape scale-variation in the rate and composition of understory stand development.

Approximately 2,734 acres, in the GFMA, will receive a commercial thinning to maintain or increase the growth and vigor of the residual trees. Dense stands will be thinned from below to leave approximately 50 to120 stems per acre. Primarily suppressed, intermediate, and smaller co-dominant conifers will be cut to increase the available growing space for the dominant and larger co-dominant conifers retained in the stands. This intermediate harvest will capture much of the growth that would otherwise be lost through mortality before the end of the rotation, and provide economic benefits identified in the Coos Bay District Resource Management Plan. Red alder is a very small component in these stands, but depending on the condition, size, and stand prescription of the alder units, individual alder trees, and small patches, will be either left uncut, or thinned, or cut to facilitate understory conifer regeneration, or converted to conifer.

The project will construct temporary new roads, and renovate or improve existing roads to facilitate harvesting. Alder conversion units will receive site preparation for planting back to conifers. Thinning units will receive fuel hazard treatments. Most new roads and some existing drivable roads will be decommissioned.

LOCATION OF THE PROJECT

The proposed project units are located between approximately 20 to 32 miles inland from the Pacific Ocean. Ninety-one percent of the proposed project units are wholly or primarily inside the Umpqua River-Sawyer Rapids Fifth Field Watershed. The remaining units are in nearby portions of adjacent subwatersheds. Table I-1 shows the distribution of project acres by watershed and subwatershed. The elevation of the project units ranges from 500 to 1,600 feet. The steepness varies from gentle to steep, with slopes ranging from flat to 80%.

Table I-1: Project Area Location by Watershed and Subwatershed

Fifth Field Watershed	Sixth Field Subwatershed	Acres
Elk Creek	Lower Elk Creek	180
Lower Smith River-Lower Umpqua River	Vincent Creek	90
Mill Creek-Lower Umpqua River	Lower Camp Creek	298
Umpqua River-Sawyers Rapids	Little Mill Creek-Weatherly Creek	2,359
Umpqua River-Sawyers Rapids	Lutsinger Creek-Sawyer Creek	3,302
Umpqua River-Sawyers Rapids	Paradise Creek	2,750
Upper Smith River	Big Creek-Lower Umpqua River	198
Upper Smith River	Halfway Creek	18
Upper Umpqua River	Mehl Creek	12
	Total Acres Project Area	**9,208**

All proposed units within LSR 265 are in northern Spotted Owl Critical Habitat Unit (CHU) OR55. All units in LSR 266, except units 30-34, are in CHU OR54. All units in LSR 263, except units 71 & 72, are in CHU OR58.

The proposed project is located within Douglas County. Table I-2 lists the sections, by township and range, containing units in the proposed project. Map A, Overview of proposed units, land use allocations, and general vicinity, in Appendix A, displays general unit locations by drainage and land use allocations.

Table I-2: Legal Description for all Units in the Proposed Project (Willamette Meridian, Oregon)

Township	Range	Sections
T. 21 S.	R. 7 W.	19, 20, 29, 30, & 31
T. 21 S.	R. 8 W.	23, 24, 25, 26, 27, 29, 33, & 35
T. 22 S.	R. 8 W.	1, 3, 5, 7, 9, 11, 17, 18, 19, 25, 27, 29, 31, 32, & 33
T. 23 S.	R. 8 W.	5, 6, & 7
T. 21 S.	R. 9 W.	31,32, & 33,
T. 22 S.	R. 9 W.	3, 4, 9, 10, 15, 25,25, & 35

NEED FOR THE PROPOSED PROJECT

The *Final - Coos Bay District Resource Management Plan and Environmental Impact Statement* and its *Record of Decision* responds to two needs: the need for forest habitat, particularly for those species associated with late-successional and old-growth forests, and the need for forest products (USDI-BLM 1995, pg. ROD-1). As explained in the Strategy section of the District Resource Management Plan, BLM lands "will be managed to maintain healthy, functioning ecosystems from which a sustainable production of natural resources can be provided" (USDI-BLM 1995, pg. 5). The proposed action, as described in this EA, would implement the Coos Bay District's Resource Management Plan in the Umpqua River-Sawyer Rapids Watershed. The proposed project will improve stand health and restore desired habitats within the Late-Successional Reserve, the General Forest Management Area, Connectivity, and the Riparian Reserve land use allocations. Other than the "no-action" alternative, in order for an alternative to be considered, it must be designed to satisfy the needs described below.

The Coos Bay District Resource Management Plan declared an Allowable Sale Quantity of 27 MMBF per year, which is to be derived entirely from the GFMA land use allocation. The timber stands identified for commercial thinning in this project are characterized by uniform structure, heavy stocking, slowing growth rate, and declining stand vigor. Treatment of these stands to reduce their density through commercial thinning would provide an immediate supply of timber to the local economy while improving the growth rate of the residual stand and insuring a healthy stand of timber will be available for future needs. Such treatments would further the achievement of the Resource Management Plan objectives. The timber proposed for harvest in the GFMA within this project are on lands allocated to the primary purpose of timber production and are of the age and condition anticipated for commercial thinning under the Resource Management Plan.

The proposed units in the Riparian Reserves are in the same over-stocked condition as the commercial thinning units described above. If left untreated, these stands will not achieve the desired vegetation characteristics envisioned in the Aquatic Conservation Strategy in the Northwest Forest Plan (USDA-FS; USDI-BLM 1994b, pg. B-12 & B-13), which is part of Resource Management Plan. Controlling the stocking and re-establishing conifer species on these sites would put these stands on a trajectory to develop the characteristics necessary to fulfill the intended functions of the Riparian Reserves.

The stands within the Late-Successional Reserve in this project are also in an over-stocked condition and in need of timely treatment. The treatments of the proposed units, inside the Late-Successional Reserves, would put those stands on a trajectory to develop late-successional characteristics and restore the historic landscape-level distribution of stand structure types and species composition.

The road network in the Umpqua River–Sawyer Rapids Watershed is a mixture of public, private, and BLM roads built over the past 70 years. Some roads have not been used for a substantial period. Consequently, a portion of these roads may have eroded and overgrown running surfaces, and deteriorated drainage structures. Those overgrown and/or deteriorated roads, accessing proposed units in the project, would be repaired to a standard that allows efficient access consistent with watershed protection. Road closure or decommissioning would follow to reduce the financial and environmental costs of maintaining seldom-used roads in the transportation network once the project activities are completed.

PURPOSE OF THE PROJECT

The following purposes come from the Resource Management Plan. The selection of an alternative will be based on the judgment as to which alternative best accomplishes these purposes. These purposes may be given different weight, depending on the objectives for the lands on which the action will take under the Resource Management Plan land use allocations. For example, the timber production purposes will be given greater emphasis on that portion of the action located on the matrix land and the ecosystem management purposes will have greater emphasis on the portion of the action within the reserve lands.

1. Improve Late-Successional Reserve stand structure by thinning out excess trees in overstocked stands to enhance the growth and vigor of the residual trees to provide larger and healthier trees for future management objectives while maintaining native species diversity. *"Plan and implement silvicultural treatments inside Late-successional Reserves to be beneficial to the creation of late-successional habitat"* (USDI-BLM 1995, pg. 19).

2. Improve Riparian Reserve stand structure by thinning out excess trees in overstocked stands to enhance the growth and vigor of the residual trees to provide larger and healthier trees for future management objectives while maintaining native species diversity. Re-establish conifers on selected sites, currently occupied by red alder, to provide a long-term streamside supply of large wood, shade, and nutrient input. *"Apply silvicultural practices for Riparian Reserves to control stocking, re-establish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives"* (USDI-BLM 1995, pg. 13).

3. Improve GFMA stand structure by thinning out excess trees in overstocked stands to enhance the growth and vigor of the residual trees to provide larger and healthier trees for future management objectives while maintaining native species diversity. *"Apply silvicultural systems that are planned to produce, over time, forests with desired species composition, structural characteristics, and distribution of seral or age classes"*(USDI-BLM 1995, pg. 53).

4. Re-establish conifer on alder dominated stands within the GFMA to provide a sustainable supply of timber that will contribute to the allowable sale quantity. "*Plan harvest of marketable hardwood stands in the same manner as conifer stands, unless the land is otherwise constrained from timber management. Volume from projected hardwood harvest would be in addition to the allowable sale quantity. Where hardwood stands became established following previous harvest of conifers, plant to re-establish a conifer stand on the site*" (USDI-BLM 1995, pg. 53).

5. Replace red alder dominated stands in the Late-Successional Reserves with conifer on sites that previously supported conifer stands. *"Plan and implement silvicultural treatments inside Late-Successional Reserves to be beneficial to the creation of late-successional habitat"* (USDI-BLM 1995, pg. 19).

6. Within the Late-Successional Reserves, restore structural habitat complexity typically found in late-successional or old-growth forests, such as large green trees, large down logs, and snags. *"Plan and*

implement silvicultural treatments inside Late-successional Reserves to be beneficial to the creation of late-successional habitat" (USDI-BLM 1995, pg. 19).

7. Implement recommendations and management priorities contained in the *South Coast - Northern Klamath Late-Successional Reserve Assessment* to enlarge existing interior late-successional habitat blocks, improve habitat connections between Late-Successional Reserves, and maintain and improve connectivity habitat within Late-Successional Reserves. *"Develop Late-Successional Reserve assessments prior to habitat manipulation"* (USDI-BLM 1995, pg. 18).

8. Work towards the goals in the *Western Oregon Districts Transportation Management Plan* by improving problem roads and decommissioning roads not needed for continued resource management. *"Develop and implement a Road Management Plan or a Transportation Management Plan that will meet the Aquatic Conservation Strategy*" (USDI-BLM 1995, pg. 14).

9. Provide cost effective management that will enable implementation of these management objectives while providing collateral economic benefits to society.

10. Protect and/or restore rare and key habitats (wetlands, cliff habitats, talus habitats, grassy balds, or meadows). *"Using interdisciplinary teams, identify special habitat areas and determine relevant to values for protection or management on a case-by-case basis"* (USDI-BLM 1995, pg. 28).

11. Provide timber sale volume toward the Coos Bay District Allowable Sale Quantity as required in the O&C Act of August 28, 1937. The BLM has a statutory obligation under the Oregon and California Act of 1937 (O&C Act) to manage suitable commercial forest lands revested by the government from the Oregon and California Railroad grant (O&C lands) for permanent forest production in accordance with the sustained yield principle.

Forest stands in the Late-Successional Reserves are not currently on a trajectory to achieve late-successional and old-growth habitat characteristics. Current stocking levels in the streamside stands will retard attainment of Riparian Reserve objectives associated with large trees, and limit those stands' ability to provide habitat and connectivity for late-successional associated species benefited by the Riparian Reserve land use allocation. Increased growing space of individual trees has a direct correlation to stand stability and unstable stands are more subject to windthrow (Wilson and Oliver, 2000). Therefore, reducing stand densities is required in order to maintain a growth trajectory and improve stand stability to meet the Late-Successional Reserve and Riparian Reserve objectives.

No thinning in the Late-Successional Reserve land use allocation was a component of Option 1 considered by FEMAT (1993). The FEMAT scientists did not recommend following Option 1 because they assumed that without restoration silviculture, development of late-successional conditions would be retarded. Although Option 1 had a greater than 80% likelihood of providing for abundance and diversity (86%) and connectivity (92%), it had only a 52% likelihood of providing desirable outcomes with respect to process and function.

Overstocked conifer stands, in the GFMA, are not on a trajectory to achieve optimum growth to produce future forest products. Therefore, reducing stand densities is required to obtain optimum growth and stand vigor.

Within the Riparian Reserve, all trees within a variable-width streamside protection buffers could be reserved as standing trees to maintain streamside shading. Some of the buffer trees will be cut for yarding corridors and in this case will be left on site for coarse woody debris. Harvest could be accomplished with a combination of skyline cable, ground based, and helicopter logging equipment depending on road access, steepness of the terrain, and environmental impacts.

New road construction will consist of construction of temporary, semi-permanent roads, or permanent roads depending on management objectives. Road renovation will consist of brushing, grading, and providing adequate drainage to older existing roads. Road improvement will consist of capital improvements such as placing rock surfacing on existing roads or adding culverts. Roads no longer needed for administrative purposes, deemed unnecessary for forest management purposes in the near future or have a high probability of causing resource damage, will be decommissioned.

SCOPING

The primary purpose of scoping is to identify agency and public concerns relating to a proposed project and helps define the issues and alternatives that are examined in detail in this EA. The scoping process began with an interdisciplinary team identifying potential issues that may result in the development of alternatives to the proposal. The public was notified of the proposed project and EA through publication of the District's semi-annual Planning Update. Additional scoping notices were sent to adjacent landowners, agencies that have requested these documents, and other interested parties on the District National Environmental Policy Act (NEPA) mailing list. The scoping period for the proposed project ran between December 12, 2005, and January 12, 2006.

IDENTIFIED ISSUES

The interdisciplinary team reviewed scoping comments from outside agencies, adjacent landowners, and the public. The scoping comments received were determined to either be beyond the scope of this EA, or are minor issues that could be resolved by modifying individual proposed units or modifying the design features of the project. As such, these issues are integrated into the Purposes of the Project, described above.

POTENTIAL ISSUES IDENTIFIED, AND ELIMINATED FROM FURTHER ANALYSIS

ISSUE 1 - ROADS

“The EA should consider an alternative that will helicopter log instead of building new roads or reconstructing self-decommissioned roads.”

“In any alternative that considers **reconstructing roads**, the BLM should make sure that so-called "existing roads" really do exist *as roads*…”
“In any alternative that considers **building new roads**, consider that even temporary roads have lasting effects.…”
“No new roads or reconstructed roads should be in Riparian Reserves, at least without an alternative that considers helicopter yarding.”

Resolution: A full range of logging alternatives is being considered within the proposed action alternative. This includes 5,701 (62%) acres of cable, 2,198 (24%) acres of ground-based harvesting, and 1,307 (14%) acres of helicopter logging.

ISSUE 2 - PRIORITY FORESTS FOR TREATMENT:

‘The South Coast-Northern Klamath Late Successional Reserve Assessment also recommends priorities for managed plantations:

"... stands ages 15-29 would have the highest priority for selection for a density management treatment. Stands aged 30-48 would be a lower priority for selection, and stands aged 50-80 would have the lowest priority for selection for a density management treatment."
"Older stands that currently exhibit late-successional or old-growth characteristics should be retained without active management..."

Resolution: With rare exception, the average tree sizes in 15- to 29-year-old stands are too small to allow for commercial cutting. We apply density management treatments to these stands using precommercial thinning contracts. The precommercial thinning projects are developed and administered by the District's silviculture staff and paid for using funds specifically designated for managing seedling and sapling-sized stands. The Umpqua Field Office silviculture team has precommercial thinned selected stands regenerated prior to the implementation of the Northwest Forest Plan that were in need of density control. As displayed in Table I-3, 70% of the forest stands in the age class 15-29 were precommercial thinned. The remaining 30% are in the older ages in the 15- to 29-year age class and they either were marginal precommercial thinning candidates or were inaccessible. The drop in regeneration harvest, under the Northwest Forest Plan has caused the number of new acres needing precommercial thinning to drop dramatically. The younger units are precommercial thinned soon after they meet the criteria for treatment.

All 30- to 48-year-old stands in the Umpqua River Sawyer Rapids project Area suited for thinning, which were not dropped from consideration for environmental, habitat or operational reasons, are included in this project.

Table I-3: Stand Treatment within the Umpqua River- Sawyer River Project Area

	No Pre-commercial Thinning				Pre-commercial Thinning				
Age Class	In Unit	Outside	Total		In Unit	Outside	Total		Grand Total
0-14 years old	0	732	732	82%		162	162	18%	894
15-29 years old	48	1,326	1,374	30%	51	3,213	3,264	70%	4,638
30-49 years old	4,586	3,091	7,677	70%	1,553	1,775	3,327	30%	11,005
50-80 years old s	2,539	1,814	4,352	90%	67	438	505	10%	4,858
80+ years old	280	11,516	11,796	100%				0%	11,796
Grand Total	7,533	18,510	26,042	78%	1,670	5,588	7,259	22%	33,301

ISSUE 3 - DEAD WOOD

"The EA should make clear that some of the larger trees, that would otherwise be thinned, will be left and not sold, and that the amount of dead wood left behind will be determined by site specific dead wood surveys."

"The SRA (page 89) requires an assessment of down wood and snag levels to determine the appropriate amount to leave. Page 90 also requires a separate assessment in Riparian Reserves to determine what to leave while thinning. Please complete these required assessment and include them in the project file."

"We would like to see the dead wood created during the timber sale activities…."

Resolution: Most forest stands within the Umpqua River–Sawyer Rapids project area have stand exams data. Coarse woody debris transects are part of the information collected. A summary of those stand data and additional recruitment are included in Appendix E- Snags and Coarse Woody Debris. The Umpqua Field Office has included additional recruitment of coarse woody debris and snags where appropriate in the timber sale contract. Where feasible trees damaged in the logging operations will be left and used for snags or wildlife tree creation.

ISSUE 4 – LATE-SUCCESSIONAL RESERVE ASSESSMENT RECOMMENDATIONS

"Please consider other directions from the South Coast Northern Klamath Late Successional Reserve Assessment for units in the LSRs and Riparian Reserves. If you do not follow these directions, the EA should document why."

"**Protect existing snags**: The LSRA gives direction to protect existing snags. "Areas of unthinned trees around the 'remnant' snags could facilitate their retention and reduce the safety concerns." The EA should clearly direct that the marking crews protect any significant snags with unthinned areas."

"**Upper Diameter Limit**: The EA should designate a general upper diameter limit of the size of trees that would be cut. The LSRA recommends 20 inches DBH (page 82)."

"**Created Openings**: The LSRA says "Three to 10 percent of the stand would be in heavily thinned patches of less than 50 trees per acres, or in openings up to 0.25 acre in size to maximize individual tree development and initiate structural diversity..." Please don't exceed this LSRA direction."

Resolution: Timber sale contracts reserve existing dead trees unless they pose a safety hazard. In general, trees greater than 20-inches dbh are reserved from cutting. The Regional Ecosystem Office recently issued guidance clarifying the cutting of larger trees in the Late-successional Reserve.

We will be thinning some stands down to less than 50 trees per acre (TPA). These areas historically supported low-density stands with open grown trees. We will also be creating gaps that are within the Late Successional Reserve Assessment guidelines.

ISSUE 5 - ALDER CONVERSION

"If the BLM is going to propose Alder Conversion, the EA should document beyond doubt that the proposed regeneration harvest was formerly a conifer stand. If there are no conifer stumps, it suggests this is an area of chronic disturbance where Alder Conversion is not appropriate. Any Alder Conversion regeneration harvest units should be small, under 10 acres, so that large watershed disturbances do not occur. Great care should be taken to protect every conifer within the Alder Conversion units…."

"…The BLM does not have enough scientific data to support these types of large clearcuts in the reserves, especially when the acres of clearcuts in the reserves cumulatively are in the hundreds. The EA should also consider that some alder stands are a natural diversity in the LSR."

"…The EA should analyze the site-specific conditions of the alder stands to make sure mistakes are not being made."

"After the alder conversion, it makes no sense to replant the LSR in 9x9 spacing. A wider spacing should be considered so that future thinning entries will not have to degrade the area with more compacted soils, roads, and other negative effects of repeated."

Resolution: A search of the photo archives has shown that all areas considered for alder conversions were in fact conifer stands prior to logging. Most of the proposed alder conversions are not pure alder stands but rather have inclusions of scattered conifers. Scattered conifer will be left, and inclusions of overstocked conifer patches will be thinned.

ISSUE 6 - PILEATED WOODPECKERS

"The BLM must consider new information on pileated woodpeckers that live on the west side of the cascades. They need more and larger roosting trees than nesting trees and these needs are not recognized in current management requirements. Determining pileated woodpeckers population potential based on nesting sites is inadequate. The EA must address this new scientific information. See Science Findings Issue 57 (October 2003) *Coming home to roost: the pileated woodpecker as ecosystem engineer*, by Keith Aubry, and Catherine Raley."

Resolution: Because of their diameter distributions, few of the proposed units in the Umpqua River-Sawyer Rapids project area currently support green trees or hard snags that could meet the minimum size requirement for pileated woodpecker cavity habitat. In addition, of the few green trees and snags that are large enough to meet the diameter requirement for roosting habitat, very few are old enough for heart rot fungi to have hollowed out the bole sufficiently to provide a cavity suitable for roosting habitat. The proposal to thin from below and to retain remnant trees would reserve the older larger trees that are more likely to harbor the rot columns needed to provide pileated woodpecker nesting and roosting habitats. Observations elsewhere in the Oregon Coast Range indicate pileated woodpecker roost and nest only in stands older than 70 years (Mellen et al. 1992). Consequently, the proposed project would have little immediate effect on existing pileated woodpecker nesting and roosting habitats.

Before a tree or snag is suitable for providing nesting habitat, decay fungi must break down the bole wood to a point that would allow excavation. For a tree or snag to provide roosting habitat, decay fungi must hollow out the bole while leaving a rind of solid wood. The trees that are old enough for fungi to have hollowed the bole sufficiently to provide roosting habitat either are reserved from cutting or will be posted out of the treatment areas. Tree age is important attribute for providing roosting habitat for two reasons. First, for heart rot to establish, the precursor and causal fungi must overcome the trees defenses before establishing. Thus, heart rot is rare in young vigorous trees and more likely observed in older trees. Second, heart rot fungi require a long time to develop a substantial rot column. The slow colonization may be due to limited aeration within the heartwood part of the bole. However, being able to survive and spread under low oxygen levels may be an advantage for certain heart rot fungi that cannot otherwise successfully compete with other microorganisms in a more open wound. Thus, trees with extensive heart rot are either very old, with a long-standing infection beginning at a single branch stub, or were infected through multiple branch stubs at several points along the bole. Indian paint fungus, which is responsible for creating the hollow grand firs used as roost trees in northeast Oregon and one of the fungi responsible for hollow western hemlocks on the Olympic Peninsula, is rare in the southern Oregon Coast Range. The rarity of Indian paint fungus potentially may be due to many of the western hemlocks and grand firs in this area being less than 150 years old, thus more disease resistant. The general youthfulness of hemlocks and grand firs is not limited to managed stands but also is characteristic of unmanaged stands where these species comprise most of the understory tree layer.

Long-term, reducing stocking levels in the proposed thinning units would result in attainment of 25-inch and larger diameter trees sooner than if the stands were left unthinned. If the stands were not thinned, suppression mortality would recruit snags. However, in most all cases, snags recruited through suppression would not meet the minimum size requirement for pileated nesting or roosting habitat. Also otherwise healthy trees that die due to suppression mortality decay from the outside in. This pattern of decay will not produce the cavity condition necessary for the roosting habitat. Mechanical injury, such as severe weather induced snap-out, fire, or root rot are the more typical recruitment agents of large snags suitable for nesting habitat (Peet and Christensen 1987). Thus, thinning would in time increase the pool of larger trees available for snag recruitment by these naturally occurring disturbances. In addition, the greater the diameter of a tree at the time an injury and infection, the larger will be the diameter of the resulting future rot column (Shigo and Marx 1977).

ISSUE 7 - TIMING OF PROJECTS

"This a very large number of acres and units, too large for the public to adequate consider during a 30-day comment period. To compensate, the Coos Bay BLM should consider giving the public a greater notice on the timber sale decisions…."

Resolution: While the Umpqua River–Sawyer Rapids project area is large, the project area will be broken up into 10-15 sales, each with an individual timber sale decision.

ISSUE 8 - OLD GROWTH

Avoid commercial timber harvest, roads, and mining in late-seral forests.

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 LSRs, 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 needed.

Resolution: No timber harvest, road construction, or mining, in stands with birth dates prior to 1920 are proposed as part of the project.

A thorough analysis of spotted owl dispersal habitat, spotted owl prey species, including red tree vole, federally listed species, and critical habitat, within the analysis area, is included in the Biological Assessment associated with this project (BA 07-02, submitted to Fish and Wildlife Service.) BLM received a Letter of Concurrence, No. 13420-2007-I-0158, dated June 29.2007).

Special status species that may be present in the analysis area, and snag creation as part of the proposed action, are addressed in this EA.

ISSUE 9 - 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."

Resolution: Surveys are conducted prior to timber sale development.

ISSUE 10 - 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.

Resolution: The EA includes a
Consistency with Aquatic Conservation Strategy Objectives section.

The Coos Bay District Record of Decision and Resource Management Plan does not preclude commercial harvest activities and road construction in key watersheds and municipal watersheds (USDI-BLM 1995, pg. 7, 8, D-2). Management Direction includes, "Apply silvicultural treatments to restore large conifers in Riparian Reserves (USDI-BLM 1995 pg.8), and further directs that a "non-interchangeable component of the allowable sale quantity" comes from Key Watersheds (USDI-BLM 1995, pg. 7). Paradise Creek is the lone Tier 1 Key Watershed within the project area. The closest public water system in the Umpqua subbasin is the City of Elkton (No. 4100276) (ODEQ 2007a). Elkton, Oregon obtains its water from the Umpqua River pumped from a source upstream from the project area.

CHAPTER II.: ALTERNATIVES

NO-ACTION ALTERNATIVE

Under this alternative, the project area will not receive the treatments described in this document in the foreseeable future. There will be no thinning to reduce densities in overstocked stands. Restoration of conifers on sites currently occupied by red alder stands would not occur. Proposed road construction, improvement, renovation, road decommissioning, or culvert replacement would not occur. Ongoing activities necessary to comply with laws, regulations, and projects covered by earlier records of decision, will continue. These include but are not limited to compliance with Oregon fire control regulations, construction of roads across BLM land under existing right-of-way agreements, routine road maintenance, control of noxious weeds, and silvicultural activities in young stands.

PROPOSED ACTION ALTERNATIVE 1 – COMMERCIAL THINNING/DENSITY MANAGEMENT/RED ALDER CONVERSIONS

PROJECT TREATMENT ACRES, LAND USE ALLOCATIONS

Table II-1: Acres by Land Use Allocation

Project Area	Land Use Allocation				
	LSR*	**RR**	**GFMA**	**Conn**	**Total**
	4,401	2036	2182	589	9,208

The Proposed Action Alternative is to treat approximately 9,208 acres. Table II-1: Acres by Land Use Allocation summarizes the treatment acres by land use allocation. Approximately 70% of the proposed project is inside the Late-Successional Reserve and Riparian Reserve land use allocations, and 30% is within the GFMA and Connectivity land use allocations as designated by the *Coos Bay District Resource Management Plan and Record of Decision.*

PROJECT TREATMENT ACRES, PLANNED HARVEST SYSTEM

The Proposed Action Alternative is to harvest the project area utilizing cable, ground, and aerial systems. Table II-2: Estimated Planned Harvest System Acres shows the estimated acres for each unit with the project area by harvest system. Maps D-1, 2, & 3, Yarding methods and road decommissioning, in Appendix A, display the approximate geographical location of the logging systems to be used within each unit.

Table II-2: Estimated Planned Harvest System Acres

Unit #	Harvest System Acres			Unit #	Harvest System Acres			Unit #	Harvest System Acres		
	Cable	Ground	Aerial		Cable	Ground	Aerial		Cable	Ground	Aerial
1A	91.2	177.9		26E	18.2			63	51.3	19.6	13.1
1B	73.0	41.0		26F	34.4			64	35.0		
1C	67.0	16.1		26G			11.7	64A	37.7		
2A	5.5			27	57.3			64B	9.9		
2C		33.2		28	102.2			64C	25.1		
3	95.1	12.2	136.7	29	50.5			65	68.5	38.6	
4A	3.4			30	168.1			66			38.5
4B	5.6			31	114.0	35.9		66A	23.7		
4C	1.2			32	77.5		102.0	66B	25.2		
4D	39.2			33	47.6			67	59.0		
4E	1.2	9.3		34	127.8			68	33.6		
4F	21.4			34A	16.1			69	92.9	236.7	
5	23.4			35	55.0	4.3		70	26.2		
6	20.6		20.7	36	29.3			71	40.7	32.2	
6a	13.1			36		133.1	38.4	72A		35.6	
7	55.7			37			103.6	72B		10.9	
8	18.5			38		25.3	10.3	72C	4.3	12.3	
9A	72.4			39			19.7	73A	8.4		
9B	50.5		126.5	40			36.3	74	35.1	2.2	
10	110.2	19.0		41	24.5			74a		4.6	
11A	81.9	22.8		41A	11.0			75	79.8	11.4	
11B	76.8		85.5	42		18.9		76	46.3		
12	32.7			43	39.0			77	14.3		
13	117.3	45.8		44		14.2		78	35.0		
14	23.4			45	22.2	57.5		79	34.9	8.4	
15	37.3			46	273.2	114.2	15.1	80	23.1		
18	13.6	32.0		47	47.6			81	21.7		
19	66.3			48	66.3	80.2		82	50.2		
19	0.0	46.9		49	17.1	39.5		83	31.3		
21	97.4		220.1	50	73.7	35.7		84	45.6		
22	7.0		7.9	51	29.8	4.4		85	40.7	10.7	
22A			9.7	52	161.2	56.0		86		42.8	
22B			10.3	53	27.6			87	30.2		
22C	8.5			53		92.3		88	22.0	17.7	
22D	2.4		11.2	54	102.8	148.8		89	9.9	29.0	
22E			14.4	55	9.8	39.6		90	38.0		
23	15.5			55a	3.1			91	16.5	21.9	
23				56	302.0	168.8	16.3	92	118.0		
24	47.8	6.7		57	52.6	15.5		92			34.0
24			52.9	58	202.1	45.3		93	22.4		
25	80.1			58A	244.7			94	30.2	4.7	
25			65.1	59	29.9	22.4					
26A	33.1			60	200.4	14.9		Totals	5,704	2,198	1,307
26B			55.7	61	13.3	20.6					
26C			25.4	62A	10.9					**Total all**	**9,209**
26D	26.3			62B		8.1					
26D			25.7	62C	19.2						

PROJECT DESIGN FEATURE - PRESCRIPTIONS

GENERAL DESCRIPTION OF SILVICULTURAL TREATMENTS

The Proposed Action Alternative is to implement timber harvest activity on approximately 9,209 acres of BLM administered lands. This action will include commercial thinning in the General Forest Management Area, and density management thinning in the Late-Successional Reserve and Riparian Reserve. Selected alder stands in all land use allocations will be converted to conifer dominated stands. Alder areas that are not likely to be successfully treated for conversion will be thinned. Within the thinning/density management units primarily Douglas-fir, western hemlock, and grand fir will be thinned. In addition, scattered bigleaf maple, myrtle, and minor species of conifers, such as western redcedar, will be retained. All unmerchantable trees, which are generally less than 6-inches dbh, may be left on site at purchasers' discretion.

Table II-3: Comparison of Stand Data Pre and Post Thinning Using the SPS Growth Model, projects post-harvest stand data as if thinning prescriptions were applied in 2005. For modeling purposes, the prescriptions are based on thinning to a post-harvest density of conifer trees per acre to reach a relative density level at or below self-thinning. The projections are applicable to those parts of the stands away from gaps. Depending on how the stand is marked, the average number of trees per acre, the basal area per acre, and the relative density can be lower in those parts of the stands with gaps. Maps C-1, 2, & 3, Proposed unit locations, prescriptions, and roadwork graphically displays unit prescriptions.

Table II-3: Comparison of Stand Data Pre and Post Thinning Using the SPS Growth Model

EA Unit	Stand Birth Date	Unit Prescription BA = Basal Area, TPA = Trees Per Acre, RD = Relative Density	LUA	Acres	Pre-DBH*	Pre-TPA*	Post-DBH*	Post-TPA*	Comments** BM = Bigleaf maple RA = Red alder CQ = Chinquapin
1A	1953	130 BA, 82tpa	LSR	40.6	11.9	244	17	82	24 tpa BM, 10tpa RA
1A	1958	130 BA, 82 tpa	LSR	228.7					
1B	1953	120 BA, 72 tpa	LSR	114.0	12.6	243	17.4	72	8 tpa RA
1C	1953	130 BA, 85 tpa	LSR	73.8	11.4	331	16.7	85	15 tpa BM
1C	1954	25 X 25, 70 tpa	GFMA	6.1					
1C	1958	130 BA, 85 tpa	LSR	8.4					
2A	1958	Alder Conversion	LSR	5.9	10	387	19.5	18	Leave BM as marked by BLM, leave minor species
2C	1958	Alder Conversion	LSR	32.3	10	387	19.5	18	same as above
3	1958	120 BA, 77 tpa, 1/4-acre gaps	LSR	244.1	10	256	16.9	77	2 tpa CQ, 4tpa RA, 3 gaps south 1/3 north aspect, 5 gaps along main ridge
4A	1957	Alder Conversion	LSR	4.0	9.3	438	15.3	24	Leave BM as marked by BLM, leave minor species
4B	1957	Alder Conversion	LSR	5.6	9.3	438	15.3	24	same as above
4C	1957	Alder Conversion	LSR	1.2	9.3	438	15.3	24	same as above
4D	1957	Alder Conversion	LSR	39.2	9.3	438	15.3	24	same as above
4E	1957	Alder Conversion	LSR	10.6	9.3	438	15.3	24	same as above
4F	1954	Alder Conversion	GFMA	10.4	9.3	438	15.3	24	same as above
4F	1954	Alder Conversion	LSR	4.9	9.3	438	15.3	24	same as above
5	1953	>=11" Diameter Leave	LSR	23.4	7.5	535	13.7	59	34 tpa RA
6	1957	24 X 24 75 tpa,	LSR	41.6	No Stand Exams***				North aspect, mixed stand
6A	1958	Alder Conversion	LSR	13.1	No Stand Exams				Leave BM >10", may cut smaller to 1 stem
7	1957	55 tpa, 100BA	LSR	55.8	12.9	223	17.7	57	5 tpa RA
8	1954	24 X 24 75 tpa,	LSR	18.5	No Stand Exams				Similar to 9A
9A	1954	80 tpa, 135 BA, RD=32	GFMA	72.4	8.8	289	17.6	79	49 tpa BM, 45 tpa RA
9B	1953	120 BA, 80 tpa, RD=29	GFMA	177.1	11.7	228	16.6	79	11 BM, 9 CQ
10	1957	120 BA, 80 tpa, RD=30	GFMA	129.1	12.3	231	16.9	79	
11A	1954	120 BA, 80 tpa, RD=30	GFMA	104.7	11.5	270	16	86	
11B	1959	135 BA, 70 tpa, RD=32	GFMA	162.3	13.4	182	18.9	70	51 tpa BM, 21 tpa CQ, 2 tpa RA
12	1954	23 X 23, 80 tpa	GFMA	32.6	No Stand Exams				Similar to unit 11A
13	1956	125 BA, 75 tpa, RD=30	GFMA	163.1	13.1	175	17.2	77	1 tpa BM, 1 tpa RA
14	1956	Alder Conversion	GFMA	23.4	10.7	94	19.3	19	2 tpa GF, 20 tpa WH, 45 tpa BM Leave BM >10"
15	1960	110 BA, 80 tpa, RD=28	GFMA	37.3	9	401	16	82	95 tpa BM
18	1956	>=16" Diameter Leave X 35'	LSR	45.6	15.7	125	19.9	65	14 tpa BM, spacing override X 35'
19	1956	140 BA, 78 tpa,	LSR	59.1	11.8	278	18.2	70	30 tpa BM West side
19	1966	135 BA, 70tpa,	LSR	54.1	11.8	278	18.8	63	30 tpa BM East side
21	1958	25X25 60-70 tpa	CON	316.7	No Stand Exams			60-70	Similar to unit 26
22	1958	25X25 60-70 tpa	CON	14.8	No Stand Exams			60-70	Similar to unit 26
22A-E	1958	25X25 60-70 tpa	CON	57.1	No Stand Exams			60-70	Similar to unit 26
23	1958	23X23 80 tpa	CON	22.2	No Stand Exams			80	Similar to unit 26

EA Unit	Stand Birth Date	Unit Prescription BA = Basal Area, TPA = Trees Per Acre, RD = Relative Density	LUA	Acres	Pre-DBH*	Pre-TPA*	Post-DBH*	Post-TPA*	Comments** BM = Bigleaf maple RA = Red alder CQ = Chinquapin
24	1958	25X25 60-70 tpa	CON	100.7	No Stand Exams			60-70	Similar to unit 26
25	1958	90 BA, 80 tpa, RD=27	GFMA	145.2	10.4	248	14.2	80	2 tpa BM, 15 tpa RA
26A-B	1959	105 BA, 70 tpa, RD=26	GFMA	88.8	8.1	468	16.6	70	
26C-D	1959	80 BA, 70 tpa, RD=22	GFMA	77.4	8.2	490	14.8	70	
26E-G	1966	80 BA, 70 tpa, RD=22	GFMA	64.3	No Stand Exams			70	Similar to unit 26A-C
27	1971	25X25 60-70 tpa	GFMA	57.3	No Stand Exams			70	Mixed stands. Thin through the Alder
28	1958, 1960	25X25 60-70 tpa	GFMA	102.1	No Stand Exams			70	Mixed stands thin through the Alder
29	1966	105 BA, 80 tpa, RD=27	GFMA	50.5	9.8	281	15.6	80	
30	1958	112 BA, 70 tpa, 1/4-acre gaps	LSR	168.2	12.1	218	17.2	69	Create six 1/4-acre gaps on north aspects
31	1959	140 BA, 70 tpa,	LSR	150.0	14	218	19.7	69	
32	1955	>=12" Diameter Leave X 35'	LSR	179.5	7.1	740	15.3	65	80-90 BA
33	1966	24 X 24 75 tpa,	LSR	47.6	No Stand Exams			75	Similar to unit 29
34	1966	24 X 24 75 tpa,	LSR	127.8	No Stand Exams			75	Similar to unit 32
34A	1970	24 X 24 75 tpa,	LSR	16.1	No Stand Exams			75	Similar to unit 32
35	1953	138 BA, 80 tpa,	LSR	59.3	10.6	396	17.9	79	Area between 35 & 36 out
36	1960	120 BA, 75 tpa,	LSR	16.1	12	216	16.9	75	
36	1967	120 BA, 75 tpa,	LSR	184.7	12	216	16.9	75	
37	1960	24 X 24 75 tpa,	LSR	103.6	No Stand Exams			75	Similar to unit 38
38	1960	100 BA, 80 tpa, linear gaps	LSR	35.6	10.7	270	15	79	4-50'X250' SW linear gaps, underplant WRC
39	1940	>=19" Diameter Leave X 50'	LSR	19.7	17.7	173	24	59	underplant WRC
40	1930	>=19" Diameter Leave X 50'	LSR	36.3	No Stand Exams			75	similar to unit 39, underplant WRC
41& 41A	1961	130 BA, 68 tpa	LSR	35.5	12.7	224	19.4	68	30 TPA GC
42	1962	120 BA, 80 tpa,	LSR	18.9	12.9	211	17	69	
43	1962	125 BA, 70 tpa, 1/4-acre gaps	LSR	39.0	13	203	18.1	69	Create three 1/4-acre gaps on lower slopes north aspect
44	1961	>=19" Diameter Leave	LSR	14.2	17.2	97	22.6	47	
45	1969	80 BA, 50 tpa	LSR	79.7	10.4	285	16.9	50	Scattered larger trees
46	1960	105 BA, 70 tpa,	LSR	298.2	11.7	228	16.6	67	5 tpa BM, 3 tpa RA
46	1960	>=17" Diameter Leave X 50'	LSR	58.1	13.1	181	19.8	40	Open grown, 68 tpa BM
46	1967	120 BA, 90 tpa, RD=30	GFMA	46.2	11.7	228	15.3	90	5 tpa BM, 3 tpa RA
47	1968	105 BA, 71 tpa	LSR	47.6	11.4	242	16.4	71	3 tpa BM
48	1959	140 BA, 80 tpa, RD=33	GFMA	12.6	13.5	181	17.9	79	29 tpa BM, adjacent to Arsenault's land
48	1959	140 BA, 80 tpa, RD=33	GFMA	133.7	13.5	181	17.9	79	29 tpa BM
49	1968	150 BA, 80 tpa, RD=30	GFMA	56.6	12.3	239	16.7	79	
50	1960	145 BA, 75 tpa, RD=33	GFMA	109.5	13.6	204	18.6	76	18 tpa BM, 3 tpa RA
51	1971	24 X 24, 75 tpa	CON	34.1	No Stand Exams				similar to unit 52
52	1967	100 BA, 85 tpa, RD=26	CON	217.2	10.5	248	14.5	85	36 tpa BM, 12 tpa RA
53	1957	135 BA, 75 tpa, RD=32	CON	113.8	13.6	175	17.9	77	6 tpa BM, 3 tpa RA
53	1957	135 BA, 75 tpa, RD=32	GFMA	6.7	13.6	175	17.9	77	6 tpa BM, 3 tpa RA
54	1962	120 BA, 75 tpa, RD=30	GFMA	237.4	10.8	290	16.4	78	1 tpa BM, 16 tpa RA
54	1968	120 BA, 75 tpa, RD=30	CON	13.7	10.8	290	16.4	78	1 tpa BM, 16 tpa RA
55	1959	120 BA, 80 tpa, RD=30	GFMA	49.3	11.4	251	16.8	79	21 tpa RA
55a	1959	Alder Conversion	GFMA	3.1	15.7	106	0	0	111 tpa DF 7 & 8" suppressed
56	1953	115 BA, 86tpa, RD=29	GFMA	93.7	11.6	223	15.2	86	5 tpa BM, 20 tpa RA, 3 tpa CQ
56	1959	115 BA, 86tpa, RD=29	GFMA	393.4	11.6	223	15.2	86	5 tpa BM, 20 tpa RA, 3 tpa CQ
57	1920	125 BA, 40 tpa,	GFMA	68.1	18.1	107	24	39	mixed stand
58	1953	120 BA, 75 tpa, RD=31	GFMA	247.4	11.6	271	16.6	75	12 tpa BM, 34 tpa RA
58A	1959	24 X 24, 75 tpa	GFMA	244.7	No Stand Exams			75	similar to unit 58
59	1953	120 BA, 75 tpa, RD=31	GFMA	52.3	11.6	271	16.6	75	12 tpa BM, 34 tpa RA
60	1960	130 BA, 70 tpa, RD=31	GFMA	215.3	13.6	144	16.1	73	8 tpa BM, 2 tpa CQ, 2 tpa MA
61	1960	130 BA, 70 tpa, RD=31	GFMA	34.0	13.6	144	16.1	73	8 tpa BM, 2 tpa CQ, 2 tpa MA
62A-C	1972	23 x 23 80 tpa	GFMA	38.1	No Stand Exams			80	Similar to unit 66
63	1960	140 BA, 66 tpa,	GFMA	64.3	14.8	173	19.5	66	20 tpa MA
63	1977	140 BA, 66 tpa,	GFMA	19.6	14.8	173	19.5	66	20 tpa MA
64	1968	110 BA, 80 tpa, RD=29	GFMA	35.0	11.9	220	15.9	84	
64A-C	1975	23 x 23 80 tpa	GFMA	72.7	No Stand Exams			80	Similar to unit 71
65	1968	130 BA, 70 tpa, RD=30	LSR	26.2	11.8	318	18.6	68	
65	1969	130 BA, 70 tpa, RD=30	GFMA	80.9	11.8	318	18.6	68	
66	1970	100 BA, 100 tpa,	LSR	38.5	9	375	13.4	103	51 tpa RA

EA Unit	Stand Birth Date	Unit Prescription BA = Basal Area, TPA = Trees Per Acre, RD = Relative Density	LUA	Acres	Pre-DBH*	Pre-TPA*	Post-DBH*	Post-TPA*	Comments** BM = Bigleaf maple RA = Red alder CQ = Chinquapin
66A	1976	27 X 27 60 tpa, 1/4-acre gaps	LSR	23.7	No Stand Exams			70	Create three 1/4-acre gaps
66B	1970	27 X 27 60 tpa, 1/4-acre gaps	LSR	25.2	No Stand Exams			70	Create four 1/4-acre gaps
67	1969	>=14" Diameter Leave X 50'	LSR	59.0	12.1	207	16.3	65	8 tpa RA
68	1950	120 BA, 65 tpa,	LSR	33.6	13.5	178	18.1	66	7 tpa GC, 17 tpa RA
69	1950	25 X 25, 70 tpa	LSR	325.4					
69	1960	25 X 25, 70 tpa	LSR	4.2					
70	1971	23 X 23 80 tpa	LSR	26.2	No Stand Exams			80	Similar to unit 66
71	1971	120 BA, 80 tpa, 1/4-acre gaps	LSR	72.9	10.8	332	16.4	83	11 tpa BM, Create five 1/4-acre gaps on north aspects
72A	1973	23 X 23 80 tpa	GFMA	35.6	No Stand Exams			80	Similar to unit 71
72B	1950	160 BA, 65 tpa,	GFMA	10.9	16.3	194	20.9	67	
72C	1973	23 X 23 80 tpa	GFMA	16.6					Similar to unit 71
73a	1957	Alder Conversion	LSR	8.4	14.5	168	16.3	19	26tpa BM
74	1957	150BA, 55+ tpa,	LSR	37.4	13.2	154	18.2	47	47 tpa RA,
74a	1957	Alder Conversion	LSR	4.6	No Stand Exams				similar to 73a
75	1965	120 BA, 75 tpa,	LSR	91.2	13.7	213	17.4	73	41 tpa RA
76	1973	110 BA, 80 tpa,	LSR	46.3	11	205	15.5	79	
77	1971	25 x 25 70 tpa,	LSR	14.3	No Stand Exams			70	similar to unit 76 in age and composition
78	1976	23 X 23 80 tpa	LSR	35.0	No Stand Exams				similar to unit 83 in age and composition
79	1976	80 BA, 120 tpa,	LSR	43.3	7.8	424	11	120	
80	1976	80 BA, 120 tpa,	LSR	23.1	No Stand Exams				similar to unit 79
81	1978	80 BA, 120 tpa,	LSR	21.7	No Stand Exams				Same as above
82	1969	120 BA, 75 tpa, 1/4-acre gaps	LSR	50.2	13.3	181	17.2	74	drop south mixed stand, Create two 1/4-acre gaps
83	1976	80 BA, 80 tpa,	LSR	31.3	9.3	343	13.7	79	drop lower 1/3rd
84	1972	110 BA, 75 tpa, 1/4-acre gaps	LSR	45.5	9.7	300	16.5	74	Create three 1/4-acre gaps north aspects
85	1972	127BA, 80 tpa,	LSR	51.5	13.1	200	16.7	83	
86	1972	100 BA, 60 tpa,	LSR	42.8	12.2	203	17.7	59	
87	1977	19 X 19, 120 tpa	LSR	30.2	No Stand Exams			120	similar to unit 79
88	1978	23 X 23, 80 tpa	LSR	39.6	No Stand Exams				similar to unit 86
89	1976	90 BA, 80 tpa,	LSR	38.9	8.4	294	14.4	84	
90	1976	75 BA, 60 tpa	LSR	38.0	8.4	317	15.2	59	
91	1979	60 BA, 60 tpa,	LSR	38.3	8.5	481	12.9	59	
92	1911	Wildlife Rx	LSR	152.0	Snag & CWD				
93	1929	>=20" Diameter Leave X 50'	LSR	22.4	20.9	111	24.5	71	
94	1975	23 X 23, 80 tpa	GFMA	35.0	No Stand Exams				Similar to unit 79
		Total Acres		**9,209**					

*All pre-data represent the predominant species composition, conifer in Density Management & Commercial Thinning areas, and alder in Alder Conversions. All post-data represent the conifer species post harvest.
** Hardwood composition, if any, in conifer stands.
*** Due to similarities to existing units No Stand Exams were conducted

DBH = Diameter Breast Height
BA = Basal Area (cross-sectional area of the tree stem at breast height[1] and includes the bark)
RD = Relative Density
TPA = Trees per acre

BASAL AREA THINNING

The basal area of a tree is the cross sectional area of the bole measured at breast height. Stand basal area is the sum of the basal areas of all merchantable trees in the stand divided by the stand area. In the United States, stand basal area is measured in square feet per acre. Stand basal area can be determined by directly measuring the tree diameters on fixed plots, or by using specialized tools such as the Spiegel-Relaskop, or specially calibrated prisms or angle gauges.

[1] Breast height is the point on the tree bole that is 4.5 feet above the ground on the up-hill side of the tree.

In a basal area thinning prescription, the stand will be marked to leave a target square footage of basal area per acre. Using a basal area target rather than a spacing target will obtain a greater variation in spacing and a more natural appearing relation between the tree sizes and spacing. In the resulting stand, small trees will be closer spaced and large trees will be spaced farther apart than would have been obtained using a spacing based on trees per acre target prescriptions. When thinning from below to a basal area target where the trees to be selected as leave tree are small, more trees per acre will be retained than in those parts of the stand where the potential leave trees are large in order to attain the same basal area per acre in both locations. The effect is that where the suitable leave trees are small, trees will be spaced more closely together; where leave trees are large, the trees will be more widely spaced. Where gaps in the canopy occur when using a basal area prescription, additional trees will be left next to a gap to partially compensate for the lack of trees in the gap to help attain the target basal area per acre averaged across the unit. The effect will be that trees will be spaced closer together adjacent to gaps than in those areas away from gaps.

COMMERCIAL THINNING PRESCRIPTION

Commercial thinning is a harvest practice applied to conifer stands intended to redistribute the growth of a stand on individually selected trees. In a commercial thinning, surplus trees are removed from the site and are used for commercial wood products. The standing trees left on the site can then take advantage of the increased growing space resulting in a concentration of wood production on those remaining trees (Smith 1962 pg 29). In commercial thinning, the decisions of when and how much to thin, and which thinning technique will be used are based on stand development objectives and market conditions at the time of the thinning. The conifer volume, but not the hardwood volume, cut from the GFMA counts toward meeting the Allowable Sale Quantity as described in the Resource Management Plan.

The thinning technique that will be applied to the stands on GFMA land in this project is commonly called "thinning from below" and will be implemented using a basal area marking prescription to obtain the desired relative density. Other names for this technique include low thinning, ordinary thinning, and German thinning (Smith 1962 pg 64, 65). The GFMA stands will be thinned by cutting the overtopped, intermediate, and the smaller co-dominant Douglas-fir and red alder. Other species of conifer and hardwood may be retained to provide species, spatial, and structural diversity. All alder trees will be cut in areas where there are releasable conifers that are now or will attain merchantable size within 20 years. The Douglas-fir and red alder that will be left are the dominant trees and larger co-dominant trees. These trees will be distributed across the site to rapidly capture the growing space made available by the thinning. The leave trees will be those trees with the largest crowns and stem diameters relative to the other trees in the immediate area of each leave tree. An average of 50 to 120 trees/acre, depending on the particular prescription for each unit, will be left in the overstory. These prescriptions will vary depending on pre-treatment average stand diameter and stocking level.

The prescribed trees per acre and tree spacing will coincide with a Relative Density[2] between 25 and 35. This post-treatment relative density will leave stands having stocking levels between the stage of competition onset and 75% of full site occupancy. The post-treatment stand average canopy closure will be greater than 60%. Pacific yew, western redcedar, and most of the large scattered hardwood tree species, would be reserved to maintain species diversity. The proposal to leave similar numbers of trees in the Riparian Reserves as in the GFMA is a conservative prescription that foregoes the most rapid attainment of large trees in favor of maintaining maximum connectivity function. This conservative approach may necessitate a second density management thinning entry in the future to keep the Riparian Reserve stands on a trajectory to develop large trees that will contribute to aquatic resources.

[2] Relative density is a function of the trees per acre and the average volume per tree. Average tree volume correlates with dbh, and so average stand dbh is often substituted for average tree volume. The maximum stand RD is 100. In the case of a Douglas-fir, a stand that averages 10 inches dbh and 595 trees per acre has a relative density of 100. A Douglas-fir stand that averaged 10 inches dbh but has 330 trees per acre would have a RD of 55.

Table II-4: Relative Density

Relative Density	Stand Condition
15	Crown Closure
25	On set of competition
35	75% of full stand occupancy
40	Transition from low tree competition to high tree competition.
55	Lower limit of self-thinning, transition into the zone of imminent mortality. Live crown ratio approximately 35-40%. Trees with small crowns will have a delayed response to thinning
100	Theoretical maximum density

Relative density is the stocking level of a stand expressed as a fraction of the theoretical maximum density. Table II-4 shows the relative density associated with benchmark stand conditions. Relative density increases for a given number of trees per acres as stem diameters increase. Relative density decreases for a given stem diameter if the number of trees per acre decrease. Stands with a relative density of 55 are at the lower threshold of imminent competition mortality and have small live crowns that cover only the upper 35% to 40% of the stem (Drew and Flewelling 1979). The correlation between relative density and stand condition is not exact with some of the variation attributable to light levels as influenced by topographic shading, average annual number of cloudy days, and distance from the equator (Lonsdale and Watkinson 1982). This may partly explain why other researchers place the lower limit of imminent mortality at relative density 65 or 60 (Long 1981; Long and Shaw 2005). A relative density of 35 is considered full site occupancy from an operational perspective. A stand with an relative density of 35 is producing approximately 75% of the gross volume periodic annual increment of what that stand would produce if had sufficient stocking to be at the lower limit of self-thinning (Long 1981). As depicted in Table II-3, all stands in the project area exceed this density. A stand with a relative density of 25 to 35 is considered less than fully occupied and capable of understory development (Hayes et al. 1997). Stands with a relative density of 15 are just at the threshold of crown closure and have live crowns extending from the top of the tree to the ground. The stands considered for commercial thinning are overstocked and are in or are approaching the stem exclusion phase of stand development.

DENSITY MANAGEMENT PRESCRIPTION

Density management thinning prescription applied to immature Late-Successional Reserve and Riparian Reserve stands to redistribute the growth on to selected trees. Density management thinning differs fundamentally from conventional commercial thinning in that the intent of treatment is to redirect the stand development trajectory to provide desired stand structural conditions. Whereas commercial thinning prescriptions temper production of larger trees be seeking to maintain high stand-level volume production, density management prescriptions focus on producing future large structure while sacrificing total stand volume production potential. Stands will be thinned from below by cutting and removing the overtopped, intermediate, and the smaller co-dominant Douglas-firs to obtain the desired relative density. Red alder will also be thinned from below, except where they are competing with releasable conifers. In that case, the competing alder will also be cut and removed. Other conifers and hardwoods species will be retained to provide species, spatial, and structural diversity. The Douglas-fir, and in some units red alder, that will be left are the dominant trees and the larger co-dominant trees distributed across the site so as to rapidly capture the growing space made available by the thinning. The leave trees will be those trees with the largest crowns and the largest diameters relative to the other trees in the immediate area of each leave tree. A variety of techniques will be used to provide near term and future canopy gaps that will add to overstory and understory diversity. These include cutting quarter-acre gaps and leaving small patches of red alder, which when they breakup at approximately stand-age 100 years, will create additional gaps. Conifer trees greater than 20 inches in diameter will generally be reserved from harvest. However, in some cases, overcrowded patches of trees composed of 20-inch and larger trees will be thinned. Such conditions may occur, for instance, in the 50- to 60-year-old stands on highly productive growing sites.

Moderate and heavy thinning is proposed to obtain rapid sustained diameter growth. Tappeiner and coauthors (1997) observed that old-growth trees often averaged 20 inches dbh at age 50 and 40 inches dbh at age 100 years. This individual growth rate is higher than what they observed in young plantations. By running stand development simulations, Tappeiner found 31 to 46 TPA at age 20 years resulted in the better-fit-to observations made in old-growth stands with respect to the estimates of total densities and densities of the larger diameter classes. Franklin and Hemstrom (1981) noted that old-growth stands can be in an open grown condition during their first 40 years and be sufficiently open to allow successful establishment of shade intolerant trees for 100 years. This suggests that old-growth stands developed with low density, regenerated over time, and had little inter-tree competition. The implications are that well-stocked plantations and young well-stocked wild stands are not on the same stand development trajectory followed by the old-growth stands currently on the landscape.

Setting these young stands on a trajectory to develop into old growth will require a disturbance of sufficient intensity to increase growing space to allow attainment of large diameter trees that, in turn, can eventually become large diameter snags and down wood. Ideally, the trees that will compose the future old-growth stand will be about 20 inches dbh by stand age 50 years and many will be 40 inches dbh by stand age 100 years. The disturbance will also need to provide gaps between overstory trees to allow establishment of a younger understory stand of tolerant tree species and to facilitate development of deep multi-layered canopies. The rarity of Coast Range old growth with close-spaced annual rings lain down during the first 50 to 100 years suggests either extensive repeated fires reduced the seed sources; (Franklin and Hemstrom 1981) or, well-stocked to overstocked conditions early in the life of a stand may not be conducive to long life and development of old-growth conditions. While the reasons are not known, it is possible that well-stocked 20-year-old stands rarely survive to become old growth because they are at greater risk of blowdown during extreme storms (Oliver and Larson 1990, pg. 83) or their high canopy continuity facilitates the spread of crown fires compared with stands that were understocked at a young age. Young Douglas-fir stands are particularly susceptible to fire during their first 75 to 100 years. Alternately, partial burns could account for the low stocking condition and age ranges observed by counting and measuring old-growth tree rings (Franklin and Hemstrom 1981).

The stands in the density management portion of the proposed project will be thinned down to 80 to 130 square feet basal area per acre as shown in Table II-3 above. The basal area target will be met in those parts of the stands away from the existing gaps; however, the number of the gaps left by the snow and wind damage in the winter of 2004 means the average basal area for the stands as a whole will be lower. This is intentional and desirable, and in those areas with large or clustered natural gaps, unavoidable. The lower retained basal areas associated with the gaps will result in locally more rapid tree growth and more vigorous understory vegetation. The relative density targets are chosen to insure sufficient trees are retained to produce a fully stocked old-growth stand and have a sufficient number of trees for mid-term and long-term recruitment of large snags and down wood.

The density management prescription for Late-Successional Reserve units, to restore landscape-scale diversity and more closely match the descriptions above, includes:

- Thin north facing slopes to a level as low as 60 TPA compared to a higher level on the south facing slopes of up to about 85 TPA. This will result in the trees on the north-facing slopes having larger crowns than trees on the south slopes. Also, observation shows thinning to a wide spacing, combined with normal post treatment random mortality, tends to create a more coarse-textured canopy than thinning to more a conservative spacing.
- Retain alder on north slopes where they occur in small patches and thin through alder where they compete with conifer in order to release the conifer. Alder are more common on the north facing slopes and near draws and less common on the south facing slopes and ridges. When these alder eventually die, they will leave canopy gaps increasing the canopy texture roughness on the north aspects and lower slopes.
- Leaving streamside protection strips, to meet hydrologic and aquatic objectives, will result in retention of alder with the highest probability of providing litter fall to streams and will contribute to landscape-level diversity.
- Convert alder stands to conifer that are approximately 1-acre or larger and economically feasible for site preparation and reforestation treatments. Reestablishing conifers will allow the eventual restoration of habitats used by late-successional and old-growth associated species.

RED ALDER STAND CONVERSION PRESCRIPTION

Red alder stands in the Late-Successional Reserve, GFMA, and Riparian Reserves would be harvested either in conjunction with the thinning operations, or as separate regeneration harvest units. Removal of the red alder is necessary to re-establish conifer in order to provide adequate sunlight for conifer regeneration. Within red alder stands, scattered individual healthy conifers that are dominant or can respond to release would be reserved. Small dense clumps of conifer occurring within some of the red alder stands would be thinned to improve growth and vigor of dominant trees.

Minor conifer, western red cedar and Pacific Yew, and minor hardwood species will be retained. Most bigleaf maple clump stems greater than 10 inches average diameter, and bigleaf maples exhibiting a strong single-stem growth form, will be left as is. Bigleaf maple clump stems less than 10 inches may be cut or reduced down to 1 or 2 stems per clump depending upon location. Regeneration harvest areas would receive site preparation treatment and would be planted with a mix of conifers native to the site. The predominant regeneration species would be Douglas-fir, but would include a mix of other species such as western hemlock, western red-cedar, and grand fir. The alder conversion areas in the Riparian Reserve will be planted at a wider spacing than is conventionally applied to matrix land exhibiting similar site characteristics. The planting spacing used will be based on an assessment of the risk of mortality from light competition and animal browse damage. The assessment of light competition will take into consideration the percent cover and composition of vegetation on the units following site preparation. The assessment of animal damage potential will take into consideration animal signs and sightings, and habitat condition.

PROJECT DESIGN FEATURE - HARVEST METHODS

1. Areas with road access, but otherwise unsuitable for ground-based systems, generally slopes greater than 35%, will be harvested with a skyline cable logging system. In cable yarding areas, a skyline cable system with 75 feet lateral yarding capability and ability to obtain one-end log suspension will be required.

2. A helicopter will be required to aerially yard logs in those areas where road access is not economically feasible, or where other protection needs preclude the use of cable logging systems. At the option of the purchaser, helicopter yarding would be allowed in areas specified as cable or ground based yarding.

3. A crawler tractor/skidder may be used in conjunction with road construction to skid logs within the road construction right-of-way.

4. A cut-to-length harvester and forwarder or a low ground pressure track hoe will be permitted when soil moisture content is within the range outline in Table II-10 below. Based on review of plastic limits of the soils within these units, a maximum operational allowable moisture content will be 25% as measured by the Authorized Officer using a “Speedy” moisture meter or an equivalent method. Soil moisture above 25% will require the discontinuation or limitation of ground-based operations in order to prevent excessive compaction to the soils and/or destruction of the soil column. Ground based operations with a cut-to length harvester/forwarder will require placement of slash under the operating equipment so as not to expose mineral soil. Repeated passes over lateral trails will be kept at a minimum. Existing compacted skid roads will be used to the extent practical. Ground-based harvest will typically be restricted to slopes less than 35%. Ground–based harvest equipment would not be permitted to travel through or within steam channels. Project Area Map D- 1, 2, & 3, in Appendix A, depicts the approximate location of the harvest systems to be used in the project area. Smaller areas, not depicted on the map, that meet the slope and moisture criteria could be harvested using ground based equipment.

5. Trees in skyline cable yarding corridors will be cut to facilitate yarding operations. Skyline corridors will be required to be no wider than 12 feet. The location, number, and width of cable yarding corridors will be specified prior to yarding, with natural openings used as much as possible.

6. Where feasible, the distance between skyline corridors will be required to be at least 150 feet apart at the far unit edge opposite from the landing.

7. Where corridors cross a stream, the corridors will be kept as perpendicular to the stream as possible to minimize adverse effects.

8. Trees will be directionally felled to the lead of cable yarding corridors. Trees will be directionally felled away from all project area boundaries, mainline roads or roads not planned for closure or decommissioning, and property lines.

9. Trees in the thinning units will cut into log lengths not exceeding 40 feet prior to yarding.

10. Falling and yarding may be restricted between March 31 and July 1 to minimize bark damage during periods of high sap flow.

11. Within safety standards, harvest trees will be directionally felled away from roads, posted boundaries, orange painted reserve trees, riparian areas, and snags.

12. Where feasible, the skyline corridors will be spaced parallel to each other to avoid creating small clearings that will occur from multiple corridors extending out radially from landings.

13. Lift trees and/or intermediate supports may be required to attain desired log suspension.

14. Hauling on dirt-surfaced roads will only be allowed between June 1 and October 15 unless dry conditions extend the hauling season.

15. Bare mineral soil areas created from yarding will be covered with slash within 50 feet of any active stream channel to trap sediment and prevent erosion from entering stream channels.

16. Seasonal and daily timing restrictions for areas of suitable marbled murrelet and northern spotted owl habitat would be applied to equipment operations as explained in Table II-9: Seasonal Restrictions.

17. Implementation monitoring will be accomplished in the form of road construction and renovation inspections, logging inspections, slash disposal and noxious weed monitoring. Monitoring would also consist of silvicultural inspections of planting and stand maintenance following regeneration harvest and site preparation until the trees are free to grow.

18. A standard special provision is included in timber sale contracts to require compliance with applicable Oregon State Fire Laws. Disposal of slash through various burning methods requires compliance with the Oregon Smoke Management Plan.

19. Timber sale contracts contain appropriate provisions for the appropriate disposal of wastes and handling of hazardous materials. State of Oregon Department of Environmental Quality regulations for spill prevention and containment would apply to any sale contracts resulting from this EA. Site monitoring for solid and hazardous waste would be performed in conjunction with normal contract administration. Any spills or hazardous releases resulting from operations would be subject to the District spill plan.

20. If sensitive, threatened, or endangered plants or animals are found in the sale units, management guidelines for the species would be implemented. Timber sale contracts include a special provision that includes management guidelines for Threatened & Endangered species, occupied marbled murrelet sites, active raptor nests, federal proposed, federal candidate, Bureau sensitive or State listed species protected under BLM Manual 6840.

21. If planned activities are found to affect adversely listed species, formal consultation with the U.S. Fish and Wildlife Service and/or the NOAA Fisheries Services would be required before award of any timber sale or implementation of the activity. Where appropriate, mandatory terms and conditions would be implemented.

22. Native American Grave Protection and Repatriation Act (43 CFR Part 10; IM OR-97-052) Notification Requirements would be followed. If any important cultural materials are encountered during the project activities, all work in the vicinity would stop and the District Archaeologist would be immediately notified.

PROJECT DESIGN FEATURE - SITE PREPARATION AND FUELS TREATMENT

ROAD AND LANDING AREAS

1. Landing Pullback: Require landing pullback from around all cable landings prior to the removal of equipment. Material will be placed on top of the existing landing. Pull back any material that may result from sweeping material off the landing.

2. Landing and Roadside Hazard Reduction:
   a. If a ground-based processor is used, ensure that the operator falls trees away from roads to the extent feasible to reduce amount of roadside slash.
   b. Hand or machine pile all slash ½" to 4" in diameter within 20 feet each side of those roads within harvest areas that will remain open to traffic after harvest. Cover piles of slash with black plastic and burn during late fall and winter months.
   c. Landing piles resulting from logging operations would be burned. Locate piles away from leave trees to minimize scorching when burning. Cover with black plastic and burn during late fall and winter months.
   d. Hazard reduction measures would be done on all landings and along roads within the project area that are not identified for closure or decommissioning after harvest operations.
   e. Post-harvest fuel loadings on landings and along primary and secondary forest roads would require fuels treatment for hazard reduction.

ALDER CONVERSION PROJECT AREAS

1. Site Preparation: Anticipated post-harvest fuel loadings [Series 3-RA-PRE-01, 02, 03 or 05 (Ottmar and Hardy 1989)] in regeneration harvest units would require some form of fuels treatment to prepare the sites for planting. Multiple site preparation options exist based upon anticipated post-harvest site conditions. The most appropriate and effective method or combination of methods would be used to (1) prepare the site for planting (2) reduce the amount of or retard the re-establishment of competing vegetation, and to (3) reduce hazardous activity related fuels as outlined in Table II-5.

Table II-5: Alder Conversion Units

Unit No.	Unit Acres	Recommended Treatments
2A	5.9	broadcast/machine/hand pile/burn
2C	32.3	broadcast/machine/hand pile/burn
4A	4	hand pile/burn
4B	5.6	hand pile/burn
4C	1.2	broadcast/machine/hand pile/burn
4D	39.2	hand pile/burn
4E	10.6	broadcast/machine/hand pile/burn
4F	15.3	broadcast/machine/hand pile/burn
6A	13.1	broadcast/hand pile/burn
14	23.4	hand pile/burn
55a	3.1	hand pile/burn
73a	8.4	broadcast or hand pile/burn
74a	4.6	broadcast or hand pile/burn
Total	**166.7**	

2. Hand and Machine Piling and Burning: Slash existing undesired vegetation during or after harvest, then hand or machine pile all slash ½" to 4" in diameter. Cover piled slash with black plastic and burn during fall or early winter months. Machine piling will be an acceptable option on units where slope and soil conditions meet the criteria for ground-based operations. Jackpot/swamper burning will be an allowable substitute for hand piling where fuels are unevenly distributed in spotty but heavy concentrations. Jackpot/swamper burning involves covering heavy fuel concentrations with plastic and then burning those areas during the fall or early winter months. Swampers will attend to the burning and create additional planting spots as needed by throwing additional slash from the surrounding area into the burning slash concentrations. Additional saw work would be done as needed to facilitate swamping. Some piles may be designated for retention and left unburned for small mammal habitat.

3. Broadcast Burning: Broadcast burning will be done under spring-like conditions by hand or aerial ignition. Construct hand fire lines to mineral soil with water bars on the exterior of unit boundaries. One hundred percent mop up of burned areas will be required.

4. Slash, Lop and Scatter: This site preparation method is suitable for units with relatively light slash loads. Slash, lop, and scatter involves slashing logging debris, unwanted brush and trees, lopping off limbs and tops and scattering the slash to an acceptable depth and density that will allow for reforestation. On its own, this method does the least to reduce hazardous activity fuel loads. However, when combined with jackpot/swamper burning it can be an effective combined method of site preparation and activity fuel reduction.

5. Fire Defense Structures - Heliponds - Improvements to the existing man made pond located in T21S, R8W, Section 19, in the form of tree removal, road renovation and improvement, culvert repair or replacement, brush control, deepening and relining would be made. The improvements would enhance safety clearances for the ingress and egress of emergency fire suppression helicopters, increase the volume of water available for emergency suppression operations, and improve the road access for fire engines and water tenders. The helipond improvement would involve the cutting and removal of merchantable conifer and hardwood trees from areas around the pond. Unmerchantable trees and brush located in the area to be cleared around the helipond would be either cut, piled, covered with plastic and burned at a suitable time, or may be cut and broadcast burned and then seeded with grass to reduce the natural regeneration and encroachment of brush and trees. Renovation and improvement of access roads 21-9-19.0 and 21-9-19.3 would consist of brushing, grading, application of surface rock and ditch line maintenance. Deepening of the pond would occur along with pond re-lining project. Concrete is the preferred material for lining heliponds because it is relatively maintenance free and resistant to vandalism. Future maintenance of the site would include periodic road maintenance, brush control, broadcast burning, and re-seeding.

6. Fuel Reduction Zone - Much of the analysis area is designated as wildland urban interface in the Douglas County Community Wildfire Protection Plan. A significant portion of the Elkton/Scottsburg Community Wildfire Protection Plan area and a small portion of the Loon Lake and Ash Valley Community, Wildfire Protection Plan area are contained within the Umpqua River-Sawyer Rapids analysis area. The Federal Register (Vol.66, No. 160 pg. 43384 to 43435) lists Elkton, Scottsburg, including Wells Creek, and Ash Valley as communities at high risk from wildfire. The Community Wildfire Protection Plan Mitigation Action Plan calls for specific types of fuels treatment projects to implement. Those treatments include; mechanical harvest, clearing, thinning, mowing, chipping, cutting, piling and prescribed burning. Fuels treatment projects designed to create defensible zones in strategic locations would be implemented utilizing some of the aforementioned methods but could also include pruning, trail construction and maintenance, meadow creation/restoration, grass seeding and light under burning. Areas selected as Fuel Reduction Zones would as much as possible, be treated in conjunction with planned commercial thinning/density management units. Other related treatments, especially maintenance would be conducted independently of timber sale activities and would rely on other funding sources to pay for treatments. Wherever possible, Fuel Reduction Zone treatments would use existing roads as a base line from which to conduct treatments. In areas where suitable roads are not available from which to conduct fuels treatments, construct trails and fuel breaks by hand work or use machinery where appropriate and effective. These roads and trails would serve as fire breaks within the Fuel Reduction Zone and should be periodically maintained in a vegetation free condition during fire season.

   Unit 1b Fuel Reduction Zone would provide a highly accessible defensive zone for the communities of Scottsburg and Wells Creek as well as providing protection to critical late seral northern spotted owl habitats west of the proposed sale area in the event of an east-wind-driven wildfire. The Fuel Reduction Zone in units 13, 14, & 15 is less accessible but would offer additional protection to Federal timberlands and wildlife habitats from fires that may run up steep slopes on private lands along State highway 38.

PROJECT DESIGN FEATURE – FISHERIES AND AQUATIC RESOURCES

1. In the conifer thinning and conversion units, no trees will be harvested within 30 feet of intermittent streams and shade buffers will extend 50 to 60 feet upslope along perennial streams. Shade buffers may be expanded or reduced on a site specific basis depending on the presence of unstable areas, the amount of topographic and understory shade, tree height, terrain slope, and stream orientation. A 30-foot no-harvest buffer will be maintained on the north side of east-west running perennial streams since stand treatments will not affect shade.

2. Within safety standards, all harvest trees will be directionally felled away from stream channels; however, trees that must be felled within the no-harvest buffer to provide cable yarding corridors will be felled toward or parallel to the stream channel and retained on site to provide bank armoring.

3. When yarding across flowing streams, logs will be fully suspended above the stream banks. Logs yarded over known fish bearing streams will require suspension over streambank trees.

4. Other than timber harvest, ground-disturbing activities that occur within the channel of any stream, including disturbances to stream banks, will be limited to the period between July 1 and September 15. Activities that involve work performed with heavy equipment in a stream channel include culvert replacement, culvert removal, new road construction over stream channels, and road maintenance.

5. Natural surfaced roads used as log haul routes will be upgraded to an all weather surface at perennial and known fish bearing stream crossings. Length of surfacing will be to the extent of the immediate crossing culvert and a minimum of 100 feet of the approaches to the crossing.

PROJECT DESIGN FEATURE - WILDLIFE TREES, SNAGS, DOWN WOOD

1. Snags and large remnant trees will be reserved from cutting. Snags that must be felled to meet safety standards or are accidentally knocked over will be retained on site. Additional snags will be created from live trees in units where adequate numbers of suitable sized trees occur in the smaller two-thirds of the trees in the stand. Snag creation from the trees in the larger one-third of the stand would delay attainment of other late-successional attributes and would select against the trees that are best adapted to the site as outlined in Appendix E Snags and Coarse Woody Debris Appendix Table E–9.

2. All presently existing down logs in Decay Classes 3, 4, and 5 will be reserved from cutting and removal. Additional coarse woody debris will be created by falling trees and leaving them on site in units where adequate numbers of suitable sized trees occur in the smaller two-thirds of the trees in the stand.

PROJECT DESIGN FEATURE - WILDLIFE T&E SPECIES, SPECIAL STATUS SPECIES

1. Avoid potentially disturbing activities 1 March – 30 June within distances listed in Table II-6 of known spotted owl core areas, and suitable nesting habitat for spotted owls where surveys have not been completed within the previous five years. This restriction is applied to avoid disturbance at undiscovered new owl sites, or alternate sites where owl pairs may have moved from the site where they were last located as shown in Table II-9: Seasonal Restrictions

Table II-6: Northern Spotted Owl Restricted Activities

Type of Activity – Northern Spotted Owl	Zone of Restricted Operation
Blast of more than 2 lbs. of explosive	One mile
Blast of 2 lbs. or less of explosive	120 yards
Impact pile driver, jackhammer, rock drill	60 yards
Helicopter or single-engine airplane	120 yards
Chainsaws	65 yards
Heavy equipment	35 yards

2. Units that are near either a marbled murrelet occupied site or un-surveyed suitable habitat will require seasonal restrictions from April 1 through August 5 and daily timing restrictions from August 6 through September 15 as shown in Table II-9: Seasonal Restrictions. Daily timing restrictions allow any potentially disturbing activities to occur only from 2 hours after sunrise to 2 hours before sunset. Table II-7 lists the restriction zones by activity.

Table II-7: Marbled Murrelet Restricted Activities

Type of Activity – Marbled Murrelet	Zone of Restricted Operation
Blast of more than 2 lbs. of explosive	One mile
Blast of 2 lbs. or less of explosive	120 yards
Impact pile driver, jackhammer, rock drill	100 yards
Helicopter or single-engine airplane	120 yards
Chainsaws	100 yards
Heavy equipment	100 yards

3. There are no known bald eagle nests near the project area; however, if nests are found, they will have restrictions as shown in Table II-8. There are currently no known winter roosts used by bald eagles within the project area.

Table II-8: Bald Eagle Restricted Activities

Type of Activity – Bald eagle	Zone of Restricted Operation
Work activities that cause disturbance	Within 400 meters of active nests, roosts, habitual perches, or within 800 meters line of sight of active nests, roosts, perches. Applies to nests and perches from January 1 through August 31. Applies to roosts from November 15 through March 15, if winter roosts occur in the project area in the future.
Helicopter activity	½-mile of active nest sites during nesting season

4. All timber sale contracts will contain a standard provision covering all Special Status Species including Threatened and Endangered Species that may be discovered after the contract is awarded. If Threatened or Endangered plant or animal species are found in the timber sale units, management guidelines for the T&E species will be implemented. Timber sale contracts include a special provision that includes management guidelines for Threatened & Endangered species, occupied marbled murrelet sites, active raptor nests, federal proposed, federal candidate, Bureau sensitive or State listed species protected under BLM Manual 6840.

5. Recommendations listed here represent terms and conditions resulting from completed consultation with the US Fish and Wildlife Service.

   a. Where there is an individual or a small group of up to five potential marbled murrelet remnant habitat trees, BLM biologists may selectively mark habitat modification areas around the known individual potential habitat trees. As an additional measure to assure that all potential habitat trees are protected, contract markers will be instructed to reserve all trees within a 30-foot radius of any tree that is greater than 36 inches in diameter at breast height. A seasonal restriction will be applied, generally within 100 yards of the potential habitat trees, which will restrict potentially disturbing activities from April 1 through August 5. Additionally, from August 6 through September 15, a daily timing restriction will limit potentially disturbing activity to a period between two hours after sunrise and two hours before sunset. When thinning occurs, the individual habitat tree and any tree that may be enhancing habitat quality of the habitat tree must be protected. This would include adjacent trees that may have branches or foliage providing protective cover for a platform on the habitat tree.

   b. Where there is a group of six or more potential marbled murrelet remnant habitat trees within a five-acre moving circle, post out a no-touch ½ site potential tree height reserve buffer around the group of remnant trees. These areas will be removed from the unit, and yarding through the protected area will not be permitted. Additionally, seasonal and daily timing restriction will be applied to the area within a 100-yard radius of the habitat trees. The seasonal and daily timing restrictions will also apply to potentially disturbing activities near suitable habitat along the boundaries of units, and around suitable habitat areas that are within the boundaries, but removed from the units. Blasting activities using two or more pounds of explosives, which will occur within one mile of an occupied marbled murrelet stand or within one mile of unsurveyed suitable marbled murrelet habitat, will also require seasonal restrictions and daily timing restriction.

Table II-9 Seasonal Restrictions summarizes the seasonal restrictions and daily timing restrictions of each unit for tree bark damage, soil damage, northern spotted owl disturbance, and marbled murrelet disturbance. Seasonal operating restrictions for northern spotted owl and marbled murrelet are based on disturbance only, not suitable habitat removal.

Table II-9: Seasonal Restrictions

Activity	Reason for Restriction	Unit or road work affected	Restricted Dates	Dates Restrictions in Effect											
				J	F	M	A	M	J	J	A	S	O	N	D
Road renovation, improvement construction	Erosion Sedimentation	Road work with exposed soil	Rainy season, generally Oct. 15 – June 1	>	>	>	>	31					15	>	>
Conventional tree falling	Tree bark damage	All units	April 1 thru June 30				1	>	30						
Cut-to-length harvester and forwarder	Tree bark damage	All units	April 1 thru June 30				1	>	30						
	Potential soil damage in rainy season	All units	Soil moisture exceeds 25% plastic limit	Primarily rainy season, depending on soil moisture											
Cable yarding	Tree bark damage	All cable units	April 1 thru June 30				1	>	30						
Hauling on dirt roads	Potential road surface damage in rainy season	All units with dirt surface haul roads	Oct. 16 thru June 30	1	>	>	>	>	30				16	>	31
Tree falling, yarding, snag/CWD creation	Northern spotted owl nest or activity center Un-surveyed suitable northern spotted owl habit within 65 yards of project	Units 58 & 67, Portions of units, 1b,1c,4a,4b,5,6,6a,12,25,27,28, 34-38, 42-50,52,54-58a,60-67,69-71,74-77,79-89,91-92, 94 all of units 39-41a, 93	No activity March 1 thru June 30			1	>	>	30						
			Extend thru Sept 30, if late nesting							>	>	30			
	Occupied or unsurveyed suitable marbled murrelet habitat within 100 yards of unit	Portions of units, 1b,1c,4a,4b,5,6,6a,12,25,27,28,34-38, 42-50,52,54-58a,60-67,69-71,74-77,79-89,91-92, 94 all of units 39-41a, 93	No activity April 1 thru Aug. 5, then apply daily timing restriction until Sept. 16				1	>	>	>	5				
Helicopter use (does not include aerial ignition) or Blasting (less than 2 lbs. of explosive)	northern spotted owl nest or activity center within 120 yards of unit or Un-surveyed suitable marbled murrelet habitat		No flights over/near nest stand Mar. 1 thru June 30, at a minimum*			1	>	>	30						
Blasting (more than 2 lbs. of explosive)	Un-surveyed marbled murrelet habitat within 1.0 mile of unit	All units	No activity Apr 1 thru Aug 5, then apply daily timing restriction thru Sept 15				1	>	>	>	5				
	Occupied marbled murrelet habitat within 1.0 mile of unit	All units	No activity April 1 thru Sept. 15				1	>	>	>	>	15			
All potentially disturbing activities	Bald Eagle active nests, roosts or habitual perches within 400m or 800m line-of-sight of unit**	Units 50, 51, 52, & 71	From Jan 1 thru Aug 31 for nests & perches	1	>	>									
							>	>	>	>	31				
			November 15 thru Mar 15, for roosts Currently NA because no known roosts are present	1	>	15								15	>

* Restriction may be extended to September 30 based on site specific conditions

PROJECT DESIGN FEATURE - NOXIOUS WEEDS

1. Roadside brush will be cut prior to harvest or road construction activities to help prevent the spread of existing noxious weeds.

2. To prevent the introduction and spread of noxious weeds during the contract period, machinery and equipment will be washed prior to entering contract areas.

3. To help prevent the introduction or spread of noxious weeds, vehicles and equipment will be required to stay on road and landing surfaces, except equipment specifically designated to operate off roads and landings (e.g. mechanical harvesters).

4. To reduce the chance of noxious weeds becoming established, bare soil areas from landing and road construction will be mulched and seeded with native plant species, if available, and fertilized. If native seed is unavailable, bare road surfaces will be seeded with an appropriate seed mix.

5. Monitor units periodically after treatment, particularly along roadsides of open and decommissioned roads, for encroachment by noxious weeds.

PROJECT DESIGN FEATURE - PLANT T&E SPECIES, SPECIAL STATUS SPECIES

1. Guidelines for management for Special Status Species will be implemented and management recommendations will be used to maintain local persistence of Special Status Species (Brian et al, 2002). Managing known sites is an activity that maintains a species at an occupied site to prevent contributing to the need to list that species as threatened or endangered under the Endangered Species Act.

2. The eastern edge of the rock band in the northeastern corner of Unit 2 will be reserved to protect a legacy of older hardwood shrubbery that provides habitat for old-growth associated cyano-bacteria lichens.

PROJECT DESIGN FEATURE - SOIL AND GEOLOGICAL FEATURES

1. Care must be exercised in road construction to minimize intersections with stratigraphy dip angles inclined with the slope. Failure hazards are greater on the north-facing slopes (USDI-BLM, 1995)

2. Care must be exercised in road construction through landslide topography, observant of recent or on-going slide features such as hummocky topography, “pistol-butt” trees, seeps, and springs.

3. In the use of ground-based harvest equipment, existing skid roads will be used to the extent practical (USDI-BLM, 1995).

4. Ground-based operations will not occur when soil moistures exceeds 25 percent. While soil moistures range between a maximum and minimum in units shown in Table II-10, the operation must ensure the use of low-ground pressure equipment on slash covering of the equipment trail. Operations below the minimum soil moisture may include other forms of ground-based operations provided a qualified specialist reviews the project area.

Table II-10: Units Containing 10% or More of the Following Soils

EA Units	Recommended moisture range for low ground-pressure operations on slash cover	Minimum Moisture Soil
1C, 4C, 4D, 4E, 4F, 7, 41, 41A, 43, 45, 63, 68, 75	10%-25%	Fernhaven
1A, 2A, 2C, 9A, 10, 11A, 18, 19, 26E, 26F, 26G, 30, 31, 35, 36, 40, 46, 47, 58A, 60, 61, 62C, 64, 73A, 74, 74A, 76, 78, 79, 80, 82, 85, 88, 91, 92	15%-25%	Xanadu and Sibold
1B, 3, 4B, 9B, 11B, 12, 26C, 29, 48, 49, 50, 51, 52, 53, 54, 55, 55A, 56, 57, 58, 62A, 62B, 64A 64B, 64C, 65, 66, 66A, 66B, 67, 69, 70, 71, 72A, 72B, 72C, 94	20%-25%	Absaquil, Bohannon, Meda, and Wintley
13, 15, 16E, 16F, 23, 26D, 32, 34, 38, 39, 42, 44, 59, 83, 86, 89, 93, 97E, 99E, 179E, 179F, 195E	25%	Honeygrove, McDuff, Bateman, Orford, and Preacher

5. Cut-to-length or track hoe harvest systems must ensure there is ample slash under the equipment to avoid contact with exposed mineral soil, will minimize passes to the greatest extent, and will use existing compacted skid roads for main pathways.

6. Close and decommission roads according to the Best Management Practices listed in Appendix D of the Resource Management Plan

7. Use partial suspension cable logging or other similar low impact operations in FGR1 and FGR2 classified slopes. Use one-end suspension and full suspension when yarding across stream channels.

8. Place slash on any mineral soil exposed from log yarding that is within 50 feet of an active stream channel.

9. Perform road maintenance such as cross drains, road renovation, and culvert cleaning to remove surface water flow and disperse into forest vegetation. Rotational and transitional failures of the Elkton Formation may cause chronic maintenance concerns.

10. Identify appropriate waste area disposals prior to road construction, renovation, slide removal, or fill removal.

11. Protect any identified wetlands from soil disturbance, consistent with Resource Management Plan direction.

PROJECT DESIGN FEATURE - HAZARDOUS MATERIALS

Activity resulting from the Action Alternative will be subject to State of Oregon Administrative Rule No. 340-108, *Oil and Hazardous Materials Spills and Releases,* that specifies the reporting requirements, cleanup standards, and liability that attaches to a spill, release, or threatened spill or release involving oil or hazardous substances. In addition, the Coos Bay District Hazardous Materials Contingency Plan and Spill Plan for Riparian Operations apply when applicable to operations where a release threatens to reach surface waters or is in excess of reportable quantities.

PROJECT DESIGN FEATURE - ROADS

ROAD RENOVATION/IMPROVEMENT

1. Road renovation and improvement activates requiring soil displacement will be limited to the dry season. Table II-11 below lists the miles of road renovation, improvement, and new construction by surface type.

Road renovation consists of returning existing roads back to their original construction design standards. It may include clearing brush and/or trees along roadsides, cleaning or replacing culverts, restoring proper road surface drainage, grading, surface replacement, or other maintenance. Road improvement consists of a capital investment that raises the condition of a road to a higher construction standard. Improvements may include, but are not limited to, additional culvert installation, surfacing existing dirt roads, or increasing the design depth of rock on existing rocked roads. Roads are selected for improvement, to allow cable logging and hauling during the wet season to reduce sediment delivery from roads, and provide a greater window of operation in those areas subject to summer time seasonal restrictions.

Table II-11: Road Renovation/Improvement and New Construction

Road Construction	Surface Type	Miles
Renovation	Natural	27.76
Renovation	Paved	24.78
Renovation	Rock	75.68
Swing Road -Renovation	Natural	1.43
	Total	**129.65**
Improvement	Natural	**13.46**
New Dirt Roads	Natural	5.28
New Rock Roads	Rock	15.65
New Swing Road	Natural	0.84
	Total	**21.77**

* Appendix B includes a list of roads by unit

NEW ROAD CONSTRUCTION

1. Use “Conservation Practices for Road and Landing Construction” Best Management Practices (USDI-BLM 1995, pg. D3-D4) for road and landing construction. These may include, but are not limited to, construction during the dry season, avoiding fragile or unstable areas, minimizing excavation and height of cuts, end-haul of waste material where appropriate, and provision for adequate road drainage. Roads will incorporate design features to minimize erosion and sediment transport into the channel network appropriate for the seasons when the roads will be used, and proximity to water bodies.

2. New road construction would consist of approximately 21.8 miles of dirt or rocked surface roads to be constructed on or near ridge top locations. New roads would be single lane with turnouts. Landing construction would mainly consist of creating wide spots on existing roads to facilitate safe yarding and loading of logs. Cable and cut-to-length system ground-based landings are typically about quarter-acre in size including the existing roadbed. Approximately 1.3 miles of new roads will be constructed within the Riparian Reserve. The Umpqua Field Office hydrologist will review roads that are not located along ridgetop. Some roadside landings would be constructed on or adjacent to existing roads would be in the upland portion of the Riparian Reserve. All road construction would be completed in the dry season. All new construction will avoid wetlands, late-successional habitat, and fragile sites.

ROAD MAINTENANCE

1. Existing roads will be maintained during the life of the project to minimize road drainage problems and reduce the possibility of road failures. Maintenance may include, but is not limited to, grading to remove ruts, removal of bank slough, placement of silt trapping straw bales or other sediment control devices, and adding gravel lifts where needed such as stream crossings and soft spots in the road surface. Maintenance on BLM controlled asphalt and rock surfaced roads will be performed by the BLM road maintenance crews.

2. Dirt roads and landings will receive annual seasonal preventative maintenance prior to the onset of winter rains prior to the contractor leaving the project area during non-hauling periods. Seasonal preventative maintenance may include, but is not limited to cross-ditching, sediment control devices, removing ruts, mulching, and barricades. Bare soil areas created from landing and road construction would be mulched and seeded with native species, if available, and fertilized. If native seed is not available area would be seeded with an approved District see mix.

3. Maintenance of roadway ditch segments that drain directly into stream channels will be conducted only during the in-stream work period from July 1 to September 15 to prevent sediment roadway run-off water from entering stream channels. Work on these ditch line segments can be conducted outside this period when appropriate protection of water quality and soils are applied to these specific sites.

ROAD CLOSURE/DECOMMISSIONING

1. Following completion of harvest, approximately 11.5 miles of the newly constructed roads and 23.06 miles of renovated or improved rock and dirt surface roads under BLM control will be decommissioned. Water barring, sub-soiling, pulling in-stream culverts, and seeding and mulching will be required as needed to reduce potential erosion and to help restore the natural hydrologic flow. Decommissioned roads will also be barricaded to prevent vehicle passage.

2. BLM road mileages for the Paradise Key Watershed have been evaluated as per Information Bulletin No. OR-2000-134. The Table II-12 below lists the mileages taken from the BLM GIS 2007 road database theme and the projected open road mileages that will remain after the project is implemented.

Table II-12: BLM Controlled Road Mileages in the Paradise Key Watershed

	Surface Type	Baseline 1994	Road Closures**	Current Open Roads***	Proposed New Construction	Post Harvest Fully Decommission	Post Harvest Decommission	Post Harvest Open Roads
Year/period		1994*	1994-2007	2007	2008+	2008+	2008+	2008+
BLM controlled roads on both BLM & Private Land	Natural	16.51	3.16	13.35	1.20	3.46	2.53	14.89
	Paved	5.79	0.00	5.79	0.00	0.00		5.79
	Rock	17.46	1.24	16.22	3.10	3.81	1.38	16.61
	TOTAL	**54.25**	**5.28**	**48.98**	**4.30**	**7.27**	**3.91**	**37.29**

*1994 Baseline All Roads
**Closed Roads 1994-2007
***Open Roads 1994 Baseline minus Road Closures

AREAS EXCLUDED FROM HARVEST:

1. Streamside vegetation buffers will be maintained to prevent sediment delivery, and to protect bank stability, beneficial litter inputs and shade. Along intermittent streams, no trees will be harvested within 30 feet of the stream bank on vertically and laterally confined, entrenched and constrained channels or within 30 feet of the floodplain on unconstrained channels. Along perennial streams, shade buffers will extend 50 to 60 feet upslope from the stream bank or floodplain. Shade buffers may be expanded or reduced on a site specific basis depending on the presence of unstable areas, the amount of topographic and understory shade, tree height, terrain slope, and stream orientation. A 30-foot no-harvest buffer will be maintained on the north side of east-west running perennial streams since stand treatments will not affect shade. The distance from the edge of the water to the top of the stream bank, to the outer edge of the floodplain, or to a pronounced upslope

topographic break can be several feet to tens of feet. As a result, the width of the no treatment area may extend beyond the specified buffers for intermittent and perennial streams.

2. Provide protection for individual and groups of remnant trees which contain platforms suitable for marbled murrelet nesting as follows:

3. Where there is an individual or a small group of up to five potential remnant habitat trees, BLM biologists will selectively mark habitat modification areas around the known individual potential habitat trees. As an additional measure to assure that all potential habitat trees are protected, markers will be instructed to reserve all trees within a 30-foot radius of any tree that are equal to or greater than 36 inches in diameter at breast height. A seasonal restriction would be applied, generally within 100 yards of the potential habitat trees that would restrict potentially disturbing activities from April 1 through August 5 for those units within 20 miles of the coast. Additionally, from August 6 through September 15, a daily timing restriction would limit potentially disturbing activity to the period between 2 hours after sunrise and 2 hours before sunset. When thinning does occur outside of the restricted times, the individual habitat tree and any trees that may be interacting with the habitat tree must be protected as described above.

4. Where there is a group of six or more potential remnant habitat trees within a five-acre moving circle, the group of remnant trees will be posted out of the unit, including a half site potential tree wide buffer around the group of trees. These areas would be removed from the unit, and yarding through the protected area would not be permitted. Additionally, seasonal and daily timing restriction would be applied to the area within a 100-yard radius of the habitat trees. The seasonal and daily timing restrictions would also apply to potentially disturbing activities near suitable habitat along the boundaries of units, and around suitable habitat areas that are within the boundaries, but removed from the units..

5. Table II-13 shows units that were part of the initial project proposal but were dropped during the course of the analysis.

Table II-13: EA Units Dropped from the Project during the Course of Analysis

EA Units	Birth date	Prescription	Acres	LUA	Comments
1B	1952 1958	Alder Conversion	21.4	LSR	mixed stand alder , bigleaf maple
1C	1958	Alder Conversion	0.4	LSR	mixed stand with older cedar
2B	1958	Alder Conversion	4.4	LSR	alder with older cedar, grand fir
2C	1952	Alder Conversion	2.0	LSR	alder with older cedar, grand fir
2D	1770	Alder Conversion	20.3	LSR	alder with older cedar, grand fir
7	1957	Density Management	2.1	LSR	
16	1956	Alder Conversion	5.6	GFMA	
17	1956	Commercial Thinning	12.6	GFMA	mixed stand
19	1966 1956	Density Management	8.9	LSR	
20	1966	Alder Conversion	2.9	LSR	
35	1953	Density Management	0.8	LSR	mixed stand with older cedar
36	1967	Alder Conversion	7.7	LSR	mixed stand in riparian
42	1962	Density Management	4.3	LSR	
44	1961	Density Management	1.5	LSR	
45	1969	Density Management	5.2	LSR	
58A	1880	Commercial Thinning	37.1	GFMA	mixed stand with scattered older trees
73	1940	Alder Conversion	118.7	LSR	mixed stand with scattered older trees
81	1978	Density Management	19.0	LSR	
83	1976	Density Management	3.5	LSR	
		Total	**278.4**		

Based on The Field Office's experience in implementing a similar proposal described in the Tioga Creek Subwatershed Density Management project EA OR125-99-05, up to 20% to 30% of the acres proposed acres may be dropped between sale planning, sale preparation and layout.

TREES EXCLUDED FROM HARVEST:

1. Existing snags would be reserved from cutting except those that must be felled to meet safety standards. Any snags felled or accidentally knocked over would be retained on site.

2. Boundaries, spur roads, landings, and yarding corridors would be designed to avoid and protect large residual trees whenever possible.

3. Existing down logs in Decay Classes 3, 4, and 5 would be reserved.

4. Dominant conifers, bigleaf maples, and western redcedar within the red alder conversion units and thinning areas would be reserved without regard for land use allocation. Bigleaf maple clumps greater than 10 inches average diameter, and bigleaf maples exhibiting a strong single-stem growth form, will be left as is. Bigleaf maple less than 10 inches may be cut to one or two stems depending upon location.

5. When marking and selecting trees for removal, marking crews would be made aware of options beneficial to wildlife that should be considered during tree selection. This would include leaving trees that contain evidence of bird or mammal nests. These may appear as nests or cavities that may be currently in use or have been previously used by birds or mammals. The marker would also be allowed to leave low value trees that have damaged tops or other abnormalities that may provide a valuable wildlife habitat component, while having little effect on the results of the thinning operation. These low value trees would be retained but ignored when determining spacing of leave trees. Fallers would be advised that there is no requirement to fall small or defective live trees that are considered non-merchantable.

CHAPTER III.: AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

This chapter is organized by resources of the environmental components that could be affected by any of the alternatives if implemented and describes the expected impacts as they relate to the alternatives.

This chapter identifies the direct, indirect, and cumulative environmental effects of each alternative described in Chapter 2. Direct effects are caused by the action and occur in the same time and place. Indirect effects are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. A cumulative effect is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable action regardless of what agency or person undertakes such other actions.

In the analysis of cumulative effects of the proposed action, the effects of past and present actions are incorporated into Chapter 3, the Affected Environment. The following list includes the reasonably foreseeable actions that are likely to occur within the project area. Cumulative impacts are not separate from direct or indirect effects of individual actions, rather the scope of analysis is expanded to analyze the impacts in the context of all the actions reasonably known to have occurred or will occur regardless of the source of the action.

1. Other forestland owner timber management to include road construction and timber harvest with an assumed rotation age of 40-50 years consistent with the Oregon Forest Practices.

2. The Partnership for Umpqua Rivers will have a 3-4 mile In-Stream and Habitat Restoration project within the Lutsinger Creek Drainage in 2008 or 2009.

The draft Western Oregon Plan Revision is not a reasonably foreseeable future action that could be analyzed for cumulative effects in relation to this timber sale environmental analysis. The Western Oregon Plan Revision is still in process, subject to change based on an evaluation of comments on the draft, and no final record of decision has been made. Therefore, the draft plan revision provides insufficient information for meaningful consideration at this time (see NAEC v. Kempthorne, 457 F.3d 969, 979-80 (9th Cir. 2006) finding it lawful to consider the cumulative effects in the later broad-scale planning analysis).

It is not the intent of the planning or NEPA processes to recalibrate all analyses of existing plan implementation actions whenever a new planning effort begins consideration of a broad array of management guidelines and alternatives at the programmatic scale. Analyzing the outcome of the plan revision process as a "reasonably foreseeable future action" in every implementing project of the current plan would create a circular analysis process, where the effects of revising the plan would be used to determine whether to supplement the current plan's analysis that is already being revisited in the revision effort. Rather, the plan-level EIS itself will factor in the cumulative program effects and reset the stage for analysis of subsequent plan implementation actions.

The purpose of this current proposal is to implement the existing Resource Management Plan. This EA has been prepared to determine if any significant environmental effects of the proposal are substantially greater than what was analyzed in the existing Resource Management Plan's programmatic EIS.

CUMULATIVE EFFECTS CONSIDERATIONS

The present condition of the land affected by the Proposed Action –Alternative 1 resulted from many natural events and human actions that have taken place over many decades. A list and analysis, comparison, or description of all the individual past actions and their effects that have contributed to the current environmental conditions will be practically impossible to compile and unduly costly to obtain. To separate out and list the effects of each of the individual past actions would be time consuming and expensive, and there is no analytical method that would describe the cumulative effect of past actions better than a description of the existing environment, which, by definition encompasses the cumulative action of every human and natural caused event on the landscape. Such a task will not add any clearer picture of the existing environmental conditions. Instead of incurring these excessive costs, it is possible to implement a more straightforward, more accurate, and less expensive way to obtain the information concerning past actions that is necessary for an analysis of the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions" (Definition of "cumulative impact" in 40 CFR § 1508.7).

A description of the current state of the environment naturally includes the effects of past actions. This will serve as a more accurate and useful starting point for a cumulative effects analysis than attempting to establish such a starting point by accumulating the described effects of individual past natural events and human actions. The importance of past actions is to determine the context for understanding the incremental effects of the proposed action.

This context is determined by combining the present conditions with available information on the expected effects of other present and reasonably foreseeable future actions. Here the description and analysis of the effects of other present and reasonably foreseeable actions relevant to the effects of the proposed action is necessary, and has been described below. By comparing this total effect of the No-Action Alternative to the effects described when adding the proposed action or any other action alternative, we can discern the cumulative impact resulting from adding the "incremental impact" of the proposed action to the current environmental conditions and trends.

The information on individual past actions is merely subjective, and would not be an acceptable scientific method to illuminate or predict the direct or indirect effects of the action alternatives. The basis for predicting the direct and indirect effects of the action alternatives should be based on generally accepted scientific methods such as empirical research. Scoping for this project did not identify any need to exhaustively list individual past actions or analyze, compare, or describe the environmental effects of individual past actions in order to complete an analysis that would be useful for illuminating or predicting the effects of the action alternatives.

VEGETATION

AFFECTED ENVIRONMENT

DISTURBANCE INFLUENCE ON VEGETATION

Native American burning created large areas of fire prairie along the Umpqua River from Elkton to Wells Creek. Nineteenth century survey notes document areas of oak savannah and prairie. Aerial photos, from 1939 and 1952, showed remnant prairies increasing in numbers and area from west to east, and decreasing with distance from the river (USDI-BLM 2004: Chapter 5 Vegetation). The Weatherly Creek Fire burned through most of the project area north of the Umpqua River in 1951. The effects of this fire were a combination of stand replacement and stand modification. Post-fire salvage sales marked the transition from essentially custodial to active timber production management for the Coos Bay District-BLM.

Wind damage, snow-break, root rots, and associated subsequent bark beetle damage, are ongoing sources of fine-scale disturbance affecting stand structure in both wild and managed stands. Windstorms, causing some level of damage, are annual events. Root rot is an ongoing source of chronic mortality and gap creation. The biggest weather events, within historical record, that modified stand structures were the 1951, and 1962 windstorms. The most recent event of note was the 2004 combination of wind and snow damage.

The Oregon Coast Range Douglas-fir dominated forest is a disturbance-dependent non-equilibrium ecosystem (Sprugel 1991). Fire is the dominant stand replacement disturbance under natural conditions. When stand replacement fires occur, their size is large relative to the area of the Coast Range Provence. Thus, under unmanaged conditions stand age classes across the province were not balanced. Rather they were skewed toward one or a few age cohorts that regenerated following major fire episodes. As a result, it is possible for an area the size of the Umpqua River-Sawyer Rapids Watershed to have been occupied by single age class and still be within the range of natural variability. A range of disturbance patterns will produce conditions conducive to stands developing into Douglas-fir dominated old growth. As such, regional differences in disturbance regimes result regionally distinct late-successional/old-growth stand characteristics (Spies et al. 2002; Rapp 2003). These variations across the Pacific Northwest not only provide large-scale spatial diversity; they also reflect provincial and even subprovincial structural characteristics that are simultaneously the product of and an adaptation to regional disturbance patterns. These regional stand structural adaptations, in essence, are structural configurations that allow the most effective capture of site resources consistent stand structural characteristics suited for avoiding stand replacement under the locally prevailing disturbance regime (Agee 1993 pgs 3-24; 113-150). Thus while numerous developmental paths can lead to old growth, the dominant path in any one location will be informed by local climate and conditions.

The dominant fire regime in the southern Oregon Coast Range consists of stand replacing fires occurring during periods of regional or continental drought. One to several reburns typically follow the initial stand replacement fire during the ensuing decades. When the climate shifts to that of greater moisture availability, the pattern of repeated large high-severity fires gives way to a pattern of somewhat less frequent low and moderate severity fires. This creates a forest consisting of shade intolerant trees in the overstory represented by a few cohorts regenerated during about a 40 to 80-year drought period. The understory consists of shade tolerant even-aged trees with birthdates clustered in the decade or so following the more recent moderate severity fires (USDI-BLM 1997; USDI-BLM 2002).

Early research on tree regeneration following fires in the Pacific Northwest shows rapid and abundant Douglas-fir regeneration following a single fire event. However, Douglas-fir regeneration is sparse and fills in over long periods in reburned areas. In addition, Douglas-fir is the dominant regenerating species following a stand replacement fire; whereas a moderate severity fire that leaves a partial overstory results in western hemlock being the dominate regenerating species (Hofmann 1924, pages 23-27). The patchy mortality caused by moderate severity fires recruits snags, down wood, injures living trees predisposing them to decay, creates growing space allowing surviving trees to maintain or increase growth, allows maintenance or redevelopment of deep crowns, and in a related fashion, diversifies the herb and shrub layers by creating seedbeds and increasing light levels at the forest floor.

Research in the Coast Range and other area in western Oregon shows stands that survived to become old growth grew at low densities when young (Tappeiner *et al.* 1997; Poage 2000). This suggests multiple fires may be the dominant stand reinitializing event for stands that survived to become old growth, and/or a condition of low stocking in young stands is far more conducive for the development of old growth than one of high initial stocking.

Active fire exclusion has eliminated a major process, which formerly effected stand structures and densities leading to the development of the kinds of old-growth stands characteristic of the southern Oregon Coast Range (Weisberg 2004). Fire histories for watersheds south and north of the project area show severe fires followed by reburns are the stand replacement events that lead to the establishment of the old growth found on the landscape today (USDI-BLM 1997; USDI-BLM 2002). The same fire histories also show moderate severity fires created the growing space that allowed shade tolerant trees to establish in the understory below the Douglas-firs. The evidence for this includes western hemlock, regenerated in pulses, forming even-aged understory cohorts with birthdates occurring soon after fires documented by fire scars on older trees.

While the Douglas-fir dominated old-growth forest can develop under a broad range of disturbance regime, there are upper and lower limits of disturbance, which if exceeded will result in a shift to a different stand type/cover condition (Botkin 1980). At the extremes, very little disturbance will shift the cover type to shade-tolerant species and a climax forest condition. Increased disturbance, beyond that which would allow a Douglas-fir old-growth forest to develop, would favor a shift to alder domination, or cause a cover type conversion to savannah or prairie or shrub land, depending on moisture regimes, seed sources, and character of the disturbance regime.

Alder stands are naturally renewed and thus perpetuated on sites subject to frequent stand replacement disturbance. These areas include streamside zones subject to debris torrents, streambank erosion, and channel migration. Red alder also maintains a presence on wet sites where soil moisture levels are too high for most trees but still within a range tolerated by red alder. In addition, alder maintains a presence in chronically disturbed landscapes. This includes areas where clearcutting is practiced in a way that results in creating new areas of bare soil every few years to decades and road construction or renovation that exposes bare soil along right-of-ways (Harrington 2006).

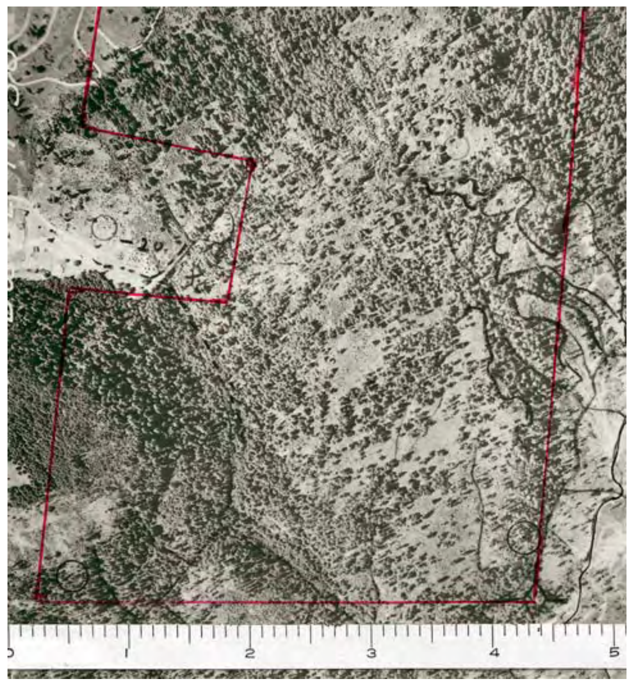

Figure III–1: Aerial photograph of section 11, T.22S., R.8W., in 1952, showing timber scattering. EA unit 48 occupies much of this section. The numbered marks on scale represent approximately 1,000 feet.

Observations in the central Oregon Coast Range suggests that during the period of frequent stand replacement fires and severe reburns from 1845 to the turn of the last century, alder populations can build and spread from moist streamside areas into mesic south facing upland slopes. The frequent disturbance favoring the expansion of alder on the landscape exceeds the level of disturbance compatible with the development of late-successional conifer forests causing a substantial change in species composition, and stand structure and complexity. Red alder reaches sexual maturity at about age six years and produce a light seed that can disperse across long distances (Harrington 1990). Douglas-firs reach sexual maturity about age 30 years, but do not reach peak seed production until age 200 years (Hermann and Lavender 1990). Thus repeated stand replacement disturbances occurring on intervals between 6 and 30 years would favor expansion of alder populations at the expense of Douglas-fir.

Even higher fire frequencies can change the dominant forest cover from closed-canopy alder or Douglas-fir to savannah or prairie. Fires repeating on intervals shorter that six years would not allow alder to reach sexual maturity, and though alder can regenerate from stump sprouts when young, the species loses that capacity with age (Harrington 1990). Review and analysis of land survey notes from the 1850s, and aerial photographs taken in 1952 show oaks and prairie occupying the valley floor and south to west facing valley side slopes in the Paradise Creek area and along the Umpqua River from Elkton to Wells Creek (USDI-BLM 2004). This suggests fire return intervals in those areas were five years or less prior to Euro-American settlement (Reed and Sugihara 1987). Field visits and examination of 1939 aerial photographs, as part of the work in developing this document, revealed additional disjunct patches of remnant oaks and prairies. These smaller oak and prairie occurred on ridges and upper southwest facing slopes in the eastern part of the project area indicating these areas too formerly experienced high fire frequency. Some of these frequent low intensity fires in the oak and prairie areas would have spread into the surrounding forest.

Many of the oak and prairie fire climax areas, and the adjacent stands, would develop into Douglas-fir or grand fir climax stands in the absence of disturbance. Fire regimes are complex on both of these vegetation series. Prior to effective fire exclusion, the high variability in the fire regime in response to local conditions resulted in a wide variation in stand structure. Thus, fire on these sites could increase or decrease wood debris levels, advance or retard succession, and initiate or discourage multi-canopy development (McCain and Diaz, 2001, pages PSME 2, PSME 3, ABGR 2, ABGR 3). For example, while the fire return interval was likely longer than five years, in the forested areas between savannahs and prairies, the frequency was still high enough to influence stand structure and composition. These effects include lower stocking levels creating more open overstory stands composed of fire tolerant Douglas-fir. Under burns would either exclude fire intolerant species, such as western hemlock and grand fir, and those western redcedars that are too young to have developed a fire resistant bark, or confine those species to protected microsites. This would create a mosaic of structurally simple stands on the more frequently burned areas, with pockets of structurally complex stands in the protected microsites. When conditions were right for a locally hot burn, such as in heavy fuel accumulations produced by blowdown, the fires would recruit concentration of dead wood and snags. Deadwood on the ground and snags can be largely absent in other areas subject to repeated light burns. This burn pattern likely created a skewed distribution of down wood and snags; characterized a rarity of large down wood and snags over many acres punctuated by a few acres with very high deadwood accumulations. Figure III–1 shows the mosaic of remnant prairie and low-stock conifer stands Paradise Creek and Little Paradise Creek area, as they appeared in 1952.

AGE CLASS DIVERSITY

At least some stands included in the proposed action, with birth dates prior to 1951, are naturally seeded stands that regenerated on former prairies subsequent to fire exclusion. Scattered open-grown Douglas-firs and oaks grow on some former prairie sites.

Most stands included in the proposed treatment units regenerated following timber cutting. The oldest of these are stands regenerated following salvage of timber burned by the 1951 Weatherly Creek Fire. Because of the fire mortality, and a shift from seed tree cutting to clearcutting shortly before 1951, there are few older residual trees in the units in the fire salvage areas of the proposed project. The remaining younger stands in the proposal regenerated following conventional clearcut harvesting in the 1950s, 1960s and into the 1970s. In the 1950s, aerial seeding was the commonly used artificial regeneration method. Planting was used in the 1950s where the initial aerial seeding effort did not result in adequate stocking. Planting replaced aerial seeding as the most commonly used reforestation method by the 1960s. Subsequent natural seeding further boosted stocking levels of these artificially regenerated stands. This natural seeding added a level of species, spatial, and age diversification. Table II-3 above shows the birthdates of all units based the current FOI boundaries. Since the boundaries are from FOI data, they are only approximations of the boundaries for the different age classes and do not reflect inclusions of small areas of different age classes.

SPECIES DIVERSITY

The project area is outside the range of Port-Orford-cedar, Sitka spruce, and of all pines. Douglas-fir is the primary overstory tree and western hemlock is the primary understory conifer in late-successional/old-growth stands in most of the project area. Grand fir occurs in valley side stands in the Elkton, OR, area where it sometimes supplements and occasionally replaces western hemlock as the primary understory conifer species. Douglas- fir is the most shade tolerant conifer that can survive on some of the drier sites, and thus on those sites, Douglas-fir replaces western hemlock and grand fir as the dominant understory conifer. Incense cedars potential could occur in the eastern most units in the proposed project. In addition, Pacific yew potentially could occur in the proposed treatment units; however, neither species were observed during reconnaissance visits. Western redcedar has been observed in eight of the proposed treatment units. Understory hardwoods are bigleaf maple, with some myrtle on lower slopes, and chinquapin and madrone along dry ridges and upper south facing slopes. A disjunct population of tanoak inhabits the Umpqua River-Sawyer Rapids Watershed representing the northern most occurrence of the species within its natural range. On heavily stocked high quality sites, the conifer overstories are shading out understory hardwoods. Red alder is found on disturbed sites such as streamside areas, slide tracks, and areas affected by sidecast or soil compaction. Oregon white oak, most which are weakened by light competition, and oak snags were observed on some units that had supported prairie and savannahs communities prior to fire exclusion. Douglas-fir, western hemlock, bigleaf maple, alder, chinquapin, yew, and madrone are the only trees that occurred in the stand exam plots. Douglas-fir is the most common conifer species in much of the proposed treatment area; however, western hemlock is the most common conifer on a few sites.

Site characteristics effect the potential understory shrub and herb composition. Thus, the herb and shrub assemblages vary across the project area with changes in site conditions. Stands on higher quality sites in the stem exclusion stage of stand development are shading out understory herbs and shrubs, including legacy plants that carry over from previous stands.

STRUCTURAL DIVERSITY

High winds struck the stands in the proposed treatment area in early 2004 at a time when the tree canopies were laden with snow. This resulted in considerable snap-out and some blowdown. Consequently, the stands contain a number of snags, though few of those snags have sufficient diameter to provide cavity habitat for primary excavator species. The 2004 wind and snow damage is generally well distributed, though there are pockets of concentrated damage. The 2004 event is not unique, rather; since it was recent, it is more obvious. Forked topped trees, crooks in the upper boles of trees, and brush-filled small gaps are the legacies of past storms. Most snags and down trees in the units are the products of suppression mortality were recruited from among the smaller trees in the stands. Random events, such as wind damage, and biotic disturbance, such as root rot, are ongoing fine-scale processes that create small gaps, and recruit low numbers of larger snags and down wood across the project area. The trees in the proposed project area are young enough to exhibit rapid lateral branch elongation in response to the added growing space provided by a gap-creating event. Consequently, canopy gaps created by the death of one or a few trees will disappear within a few years following a gap-creating disturbance for as long as the stands remain in the stem exclusion stage of stand development (Peet and Christensen 1987; Oliver and Larson 1990, pg. 146-149).

Prior to the onset of substantial competition, the diameter size distribution of a stand more or less fits a normal distribution. A normal distribution is alternately known as a bell-shaped distribution, in this case a graphical display of diameter distribution. As competition intensifies, a few trees establish dominance. Meanwhile, the growth rate of an increasingly large percentage of the stand falls behind that of the dominant trees. This results in the stand diameter class distribution becoming progressively more skewed with a few dominate trees in the largest diameter classes and numerous trees filling out the smaller diameter classes. When competition begins to cause the smaller trees to die, the diameter classes begin shifting back toward a bell-shaped distribution. By the end of the stem exclusion stage, the diameter class arrangement returns to bell-shaped distribution with few if any small trees left alive (sources summarized by Long and Smith 1984; and by Peet and Christensen 1987).

After a stand emerges from the stem-exclusion stage, density related tree mortality declines, and disturbance or mechanical damage emerges as the dominant cause of mortality. As lateral branch growth rates decline, fine-scale disturbance, such as individual tree and small-patch blowdown, and lightening strikes, can now create gaps that become long-term features in the canopy. These gaps admit enough light to allow understory regeneration to establish where there is a suitable seedbed. In addition, disturbance mortality often occurs in pulses in response to major storm events, moderate severity fires, or through the interaction of extended drought with insects and disease. These damage agents operate at different scales producing a range of gap sizes. Regeneration of understory trees in these disturbance created gaps reverses the trend toward regular spacing and marks transition of the stand from single-aged to multi-aged. This also results in the stand developing increased diversity with respect to size, age classes, and species composition, which contribute to the development of late-successional and old-growth characteristics (Weisberg 2004). The addition of understory trees shifts the diameter distribution of the whole stand from a normal, or a bell-shaped curve, to initially bimodal, and eventually to a reverse J-shaped curve (sources summarized by Peet and Christensen 1987).

Spatial Diversity

Many of the proposed units in the project area were naturally seeded or aerially seeded. Consequently, these areas have natural appearing spatial variation. The combination of vegetation competition, fill-in by natural seeding, and mortality has largely caused the planted areas also to have no clear spatial pattern. This is not to imply that the stocking is clumpy or entirely random. Competition mortality in natural stands causes the spacing between trees to shift from a clumped or patchy distribution to a more random, and then to a regular distribution as the stand grows older (Peet and Christensen 1987). The dominant trees shift even more rapidly to a regular distribution. Irregular sites for germination are responsible for an initial clumped arrangement of trees. The later more regular distribution results from differentiation and partitioning of the growing spacing among the trees that survive competition mortality (numerous sources summarized by Oliver and Larson 1990, pg. 219; Moeur 1997).

Red Alder Stands

The alder stands, shown as alder conversion units in Table II-3, are on sites previously disturbed by past timber removal and road construction. The areas proposed for alder conversion have either evidence of older conifer stumps, have scattered and clumped conifers growing in them; or, as shown by older aerial photographs, have supported conifers or grassy areas prior to timber harvest. The stand exams for the alder stands proposed for conversion show the alder composition in the individual units ranged from 50% to 75%. Prior to harvest activities, red alder was present in the watershed but was associated with bare soil areas created from stream bank scouring, natural slumps and slides, or were on active floodplains. A comparison of recent imagery to older aerial photography shows alder stands to be more common now than in 1939.

The project area is inside the Coast Range portion of the Umpqua subbasin. Wimberly and Ohmann (2004) found the area occupied by hardwoods within the Umpqua subbasin supporting 40-acres in size and larger hardwood stands to be ten times greater in 1996 than in 1936.

The Coos Bay District used the Western Oregon Digital Image Project data, derived from 1997 Landsat Thematic Mapper images, to estimate that 7,047 acres or 7.5 % of the analysis area supports hardwood stands. Of this, 717acres of alder stands are inside of units proposed for treatment. These are further subdivided into 167 acres proposed for conversion back to conifer or mixed stands and 550 acres of alder patches proposed for thinning. Alder thinning areas, being too small to break out as separate units, are embedded within the conifer thinning units. The 717 acres of alder stands constitute 10% of all hardwood acres in the watershed. (Appendix A, Map B-1, 2, & 3 Hardwood stands and proposed units.)

Conifer and other hardwood species, such as bigleaf maple and Oregon myrtle, are present in varying degrees as scattered clumps or as individual trees within some of the alder stands. The clumped or scattered individual conifer trees within the alder stands can vary from dominant overstory to suppressed understory.

No-Action Alternative

Conifer Stand Development Trajectory

The higher stocking levels found in unthinned aerially seeded and planted stands are not dissimilar to stocking levels observed in natural stands that initiated following a single event stand replacement disturbance such as a severe fire. However, stands that survived to become old growth exhibit diameter growth patterns consistent with stand development under conditions of low competition levels at the time those stands were young. The evidence supporting our understanding that old-growth stands developed under low stocking levels, by extension, suggests that, prior to fire exclusion, few stands that developed under high-density conditions survived to become old growth. Thus, under the no-action alternative, the high-density conifer stands in the proposed project would develop along trajectories different from those that lead to the old-growth stands we find today in the Oregon Coast Range.

Under the no-action alternative, as relative densities increase to where the stands enter the zone of eminent mortality, the variability in spacing declines and the distribution of tree sizes becomes skewed. Tree size distribution only returns to a normal distribution following the death of the smaller diameter trees through competition mortality. Forgoing thinning would result in the stands entering the understory reinitiation stage of stand development later than would have occurred under the thinning alternative. This in turn delays the recruitment of the younger understory trees responsible for providing the size, age and species diversification associated with late-successional stands.

Stand density and diameter growth are inversely related, as is the stand density and the amount of light reaching the forest floor. Slow diameter growth delays attainment of habitat features provided by large diameter trees; and, by extension, large diameter snags and down wood. The low light levels at the forest floor would result in the death of legacy understory plants that carry over from the previous stands, and in the death of plants that established during the stand initiation phase of stand development. The low light levels would also limit the establishment and growth of new understory herbs and shrubs for as long as the stands remain in the stem exclusion stage. At the highest overstory densities, little or no chlorophyllic vegetation would survive.

Supporting information and citations provided and in the Disturbance Influence on Vegetation subsection above.

The no-action alternative will put these stands on a development trajectory that will be very different from the pattern followed by the stands that developed into the old growth found in the Coast Range today. Whereas the candidate stands for thinning are well stocked to over stocked, research suggests that the stands that survived to become old growth were under stocked when young (Tappeiner et al. 1997; Poage 2000). The higher stocking levels in the candidate stands for thinning will retard attainment of late-successional forest characteristics in that higher densities slow attainment of large tree diameters and subsequent large snag and down wood diameters. The higher stocking also translates to full site occupancy, and a general lack of the stand openings and gaps. The gaps and stand openings are necessary for recruiting understory trees and associated multi-canopy structural complexity (Hayes et al 1997). Depending on the attribute and initial stand density, stand projection simulations suggest un-thinned stand may not regularly produce large diameter forest structure associated with late-seral forests until the stands are about 200 years old, see Table III-1. Producing old growth is not a stated objective for the Riparian Reserve; however, several functions of the Riparian Reserve depend on having large conifer trees. The rarity of old-growth trees with tightly-spaced rings lain down by when they were young suggests young stands grown at high densities have a lower chance of surviving 250 years or longer compared with young stands grown at wide spacing. Thus, slow growing high-density stands may not be able to survive long enough to produce large structural components desired for aquatic habitat, stream channel, and floodplain functions. Likewise, producing old-growth habitat is not an objective for Matrix lands. However, culturing large trees in the Matrix would enable future managers to select larger wildlife trees, and provide larger snags and down wood at the time of regeneration harvest.

VARIABILITY IN RELATIVE STAND DENSITY, SPACING, AND TREE SIZE

Relative density is a function of trees per unit area and average volume per tree. Microsite conditions and early mortality impart a level of variation in both tree sizes and stocking levels across stands, including planted stands. Following canopy closure, variation in individual tree sizes is also affected by to proximity to other trees. All other things equal, patches with many trees growing close together will enter the stem exclusion stage of development sooner than will patches of scattered trees. The growing space of the higher stocked patches is fully occupied sooner than on less densely stocked areas supporting similar sized trees. Thus, with the finite site resources being divided among many trees, the individual trees will have slower growth rates, and therefore will be smaller than trees growing in the more open areas of a stand (Oliver and Larson 1990, pg. 211-217). This gives rise to the typical spatial pattern in young stands where small trees are more clumped than larger trees. However, an individual tree's risk of competition mortality increases with the proximity and size of neighboring trees. Therefore, during the stem exclusion stage, clumping progressively decreases with increasing size class (Peet and Christensen 1987). Oliver and Larson explain the process as follows:

> *Suppression and mortality occur sooner at narrower spacings, so the surviving trees end up at spacings similar to the initially widely spaced parts of the stand. In this way, spacing between trees becomes more*

uniform with age. A stand's horizontal spatial pattern tends to shift from a clumped, or patchy, distribution to a more random, and then regular distribution as it grows older. Dominating trees shift even more rapidly to the regular distribution. The originally clumped arrangement of trees is caused by the irregular sites for germination or other regeneration mechanisms, while the later more regular distribution results from differentiation and regular mortality. The approach toward spatial regularity is unusual elsewhere in nature but has been observed in forest stands (Multiple sources cited by Oliver and Larson 1990, pg. 219).

Prior to the onset of substantial competition, the diameter size class distribution of a stand more or less fits a normal distribution. A normal distribution is alternately known as a bell-shaped distribution. As competition intensifies, a few trees establish dominance. Meanwhile, the growth rate of an increasing large percentage of the stand falls behind that of the dominant trees. This results in the stand diameter class distribution becoming progressively more skewed with a few dominate trees in the largest diameter classes and numerous trees filling out the smaller diameter classes. When competition begins to cause the smaller trees to die, the diameter classes begin shifting back toward a bell-shaped distribution. By the end of the stem exclusion stage, the diameter class arrangement returns to bell-shaped distribution with few if any small trees left alive (sources summarized by Long and Smith 1984; and by Peet and Christensen 1987).

HEIGHT-TO-DIAMETER RATIOS

At the individual tree scale, increasingly intense competition would continue to reduce resources available for diameter growth, for root and foliage expansion or replacement, and for providing protective systems for resisting insect and disease attacks. As competition intensifies, light availability to the lower crown decreases. When light levels within the lower canopy fall below that which supports net photosynthetic production, the lower tree crowns die reducing the live crown length. Trees with less than 35% of their bole in live crown are at increased risk of blowdown because the volume of live root mass is proportional to live foliar surface area. In addition, trees experiencing intense competition stress allocate less food to diameter growth than to height growth resulting in increased height-to-diameter ratios. Studies cited by Oliver and Larson (1990, pg. 73-78, 83) indicate many tree species become very unstable and prone to blowing over, bending or buckling when the tree diameter drops below 1% of the tree height. Stated in terms of height-to-diameter (feet to feet) ratios, trees become very unstable when height-to-diameter ratios become greater than 100.

In contrast, areas where snow and wind can cause extensive damage, height-to-diameter ratios below 80/1 appear to impart relative stability to evergreen trees whereas deciduous trees were stable at slightly higher height-to-diameter ratios (Wonn and O'Hara 2001). Wilson and Oliver (2000) also cited research indicating height-to-diameter ratios of 80 or less reduced the risk of wind damage in stands subject to storm winds, or growing on saturated soils, or with open canopies, and height-to-diameter ratios of 50 or less may enable trees to resist blowdown during more extreme storms.

UNDERSTORY VEGETATION RECRUITMENT AND DEVELOPMENT

Closed canopy stands allow little light to reach the forest floor. With reduced light, the less shade-tolerant herbs and shrubs die out first. As competition for light in the overstory increases, nearly all the plants in the herb and shrub layer die. This is the stem exclusion stage of stand development (Oliver; Larson 1990, pgs. 146-147). It is the successional stage with the lowest plant species diversity (sources summarized by Spies 1991, pg. 118) and is the stand development stage that provides primary habitat for the least number of wildlife species (sources summarized by Harris 1984, pgs. 59-64 and displayed in figures 5.10- 5.13 of the same). In the project area, no wildlife species is unique to closed-canopy stands with little understory development (Hayes et al. 1997.)

The no-action alternative would forego attainment of wider spacings between overstory trees and gap creation that would facilitate understory vegetation retention, recruitment, and growth. Within fully-stocked stands, understory tree recruitment and herb and shrub layer reinitiation would begin later under the no-action alternative than under the thinning alternate. In those stands that are going deeper into stem exclusion, the steadily increasing density would result in the mortality of remnant shrubs that could be carried over from the previous stands. Under the no-action alternative, the understory reinitiation stage of stand development will begin either in response to a moderate severity disturbance that opens the canopy, or will occur when the tree's live tissue respiration demands reduce photosynthate availability below that needed for lateral growth to occupy gaps created by mortality (sources summarized by Oliver; Larson 1990 pg 253). Understory reinitiation will be delayed longer in stands with a large component of western hemlock than in Douglas-fir dominated stands (Stewart 1986, Wierman and Oliver 1979).

The crowns of even-aged mixed Douglas-fir/western hemlock stands will stratify by species with hemlock moving into the lower canopy positions (Wierman; Oliver 1979). Conifers would eventually shade out alder in those mixed stands where conifers are dominant in both numbers and crown position. The greater vertical and lateral growth potential of the Douglas-firs would, in time, obscure the gaps left by the demise of small patches of red alder. Larger gaps created by the senescence and death of alder could remain unoccupied by trees indefinitely if clonal shrub species are well established in the understory. Where the larger gaps are fully occupied by less competitive plants in the herb and shrub layers, trees may take up to 50 years establish (Spies and Franklin 1989). However, a disturbance that frees growing space would enable trees to establish more quickly. Repeated disturbances associated with unstable areas and along some stream channels would prevent conifer encroachment and maintain an alder presence in those areas.

TREE, SNAG AND DOWN WOOD DIAMETERS

Under the no-action alternative, retaining the higher stocking levels would retard attainment of the three functions of the Riparian Reserve that are contingent on the presence of large diameter trees: large wood delivery to streams, large wood delivery to riparian areas, and wildlife habitats (FEMAT pgs V-26, V-29). The higher stocking levels would retard attainment of wildlife habitats associated with large diameter trees. These include large diameter snags, large diameter down wood, prey substrates provided by large surface areas of coarse deep-fissured bark, deep canopies, large limbs, and large platforms, cavities and other structures found in damaged or injured large trees (Neitro et al. 1985; Weikel and Hayes 1997).

Snags and down wood produced by competition mortality in dense unthinned young stands are from the lower crown classes and/or areas of dense stocking. Both factors result in snag recruitment from among the smaller diameter, short crown-depth trees (Peet and Christensen 1987). Some snags recruited toward the end of the stem exclusion phase may be large enough to serve as nesting habitat for small to medium size cavity dwellers: however, Carey et al. (1999) observed that suppression mortality in conifers does not contribute materially to cavity habitat or canopy gap formation. Small snags usually do not have top rot or cavities and do not stand very long. They do contribute to the wood debris amounts on the forest floor for a relatively short time before decaying.

After the self-thinning phase, most mortality will be due to factors other than competition for growing space. These include windthrow, lightning, disease, and fire (Peet and Christensen 1987). Retaining high stocking levels under the no-action alternative would delay attainment of large dominant and codominant trees that could be converted into snags and down wood via these disturbances.

ALDER

Overview

The proposed alder conversion units have birth dates between 1954 and 1959; (Table II-3). Under the no-action alternative, the alder stands would senesce and breakup around 2060. Alder stands without a surviving conifer component would transition into shrub-dominated communities. Stands with only a scattering of surviving conifers or a scattering of long-lived shade-tolerant hardwoods would transition into an open stand condition structurally more akin to a savanna with a heavy shrub layer than to a closed canopy forest. These savanna-like stands are unable to provide the stand conditions needed to expand the area providing late-successional habitat within the Late-Successional Reserve. The limited numbers of trees reduces the volume of recruitable large down wood. The open canopy condition allows greater solar and wind penetration resulting in more extreme microclimatic swings. The species assemblages associated with savanna-like stand structures are more similar to early seral communities than to late-successional forests. Similarly, the stands in the Riparian Reserve would neither be fully capable of providing the benefits to streams, floodplains, or aquatic organisms attributable to the microclimate moderating effects of a closed-canopy forest, abundance of large diameter trees, nor provide connectivity and habitat benefits for late-successional associated species. Barring disturbance, clonal shrub communities can delay establishment of new trees indefinitely. Communities of less competitive plants can delay establishment of new trees by up to 50 years. This suggests establishment of a replacement stand on those sites could be delayed until about the year 2110. Further, assuming conifer or mixed stands establish in about 2110, those stands would not support 20-inch average diameter conifers until between years 2160 to 2200, depending on stocking levels. Disturbances resulting in sufficient sunlight reaching the forest floor, a suitable seedbed, and enough growing space to allow tree establishment would shorten the time until a replacement stand establishes.

On a watershed scale, alder stands would contribute to landscape scale diversity by providing contrasting conditions to that found in conifer stands. In the absence of human disturbance, and, with the continued exclusion of fire, the acres of red alder would decline. However, landslides, debris torrents, streambank erosion, and channel migration would provide both the intensity and frequency of disturbance needed to maintain core areas of alder on the landscape. In reality, human activities in the watershed would cause ongoing disturbances enabling alder to maintain a shifting presence on the landscape on sites that are in addition to the core alder areas.

The amount and character of organic particulate matter provided by red alder to streams under the no-action alternative would not be meaningfully different from that provided by retaining alder within the 50-foot minimum variable-width buffers on perennial streams. Similarly, there would be no meaningfully different between the amount provided under the no-action alternative and that provided by retaining alder within the 30-foot minimum variable width buffers on intermittent streams under the following conditions. Where the 30-foot width is measured from the top of an inner gorge of the outer edge of a floodplain that is 10 feet wide on a medium quality alder site (SI 55 $_{20\text{-yr.}}$) or, is 20 feet wide on a very high quality alder site (SI 75 $_{20\text{-yr.}}$).

Red alder fixes nitrogen to the soil; however, the nitrogen levels under the alder stands reached equilibrium about stand age 20 years; or, in about 1974 to 1979 in the specific case of the proposed alder conversion units covered by this EA. The additional available nitrogen likely benefited those sites where cat logging severely damaged soils and where road construction exposed subsoil. However, in areas of high quality soils, the available nitrogen fixed by the alder may have acidified the soils thereby reducing the availability of calcium, magnesium, and phosphorus.

Supporting information and citations provided below.

Alder and stand development

Under the no-action alternative, red alder stands will continue to persist until about age 90 years followed by a rapid decline shortly there after. Few live alder will remain by stand age 130 years (Newton and Cole 1994). Conifers will be present, provided either that conifers established before the alder or if conifers established in sizeable gaps between alder (Newton et al. 1968). In the absence of disturbance, additional conifers are unlikely to become established under a fully stocked alder stand. The understory conifers are at risk of competition related mortality until they emerge above the alder. Conceptually, the conifers could emerge after stand age 40 years when the alder grows to near their maximum height (Newton and Cole 1987). However, conifers that reach up into the alder canopy will have difficulty growing past the red alder into a free-to-grow position because storm winds cause the stiff lateral alder branches to whip the adjacent conifers, thus damaging and breaking off the terminal buds or damaging the leaders of the understory conifers. This keeps many conifers from emerging above the alder even after the alder has reached its potential height (Kelty 1986; Wierman and Oliver 1979). In some locations, and particularly at higher elevations, ice glazing and early wet snows break alder crowns (Harrington 1990, 2006). These disturbances release understory conifers that otherwise would be stunted by leader whipping or would die from light competition. In cold pockets and cold air drains, red alder suffers cold damage weakening their ability to out compete and kill conifer cohorts.

Understory vegetation will respond to changes in the overstory condition. As the stand ages, random mortality, and crown abrasion will create canopy gaps. These gaps will allow the existing understory vegetation to increase in vigor. As the alder component of the stand breaks up, more light reaches the forest floor allowing the shrub layer to become very vigorous (Oliver; Larson 1990, pgs 252-259).

Successful conifer establishment following the break-up of an alder stand depends on the presence of a suitable seedbed and the absence of effective competition from other already established plants (Oliver and Larson 1990, pgs 34-39, 144-146). This means there has to be some form of disturbance killing at least some understory plants and exposing mineral soil, following the demise of the overstory alder. In the case of highly competitive understory shrub species, the disturbance might have to be of such intensity as to be a stand-replacing event for the adjacent forested areas. On seeing how effectively salmonberry can hold a site, Hemstrom and Logan (1986 pgs. 24-26) proposed the theory that salmonberry stands are the probable climax communities where the seral community is an alder stand with a salmonberry understory without a releasable conifer component. Later authors concur with Hemstrom and Logan's observations (Emmingham and Hibbs 1997; Newton and Cole 1994). In addition, some authors further propose other highly competitive clonal species, such as vine maple and salal, can also form climax communities in the absence of disturbance following the demise of an alder stand (sources summarized by Harrington 2006).

Salmonberry is frequently present as the likely inheritor of an alder-dominated site because alder is often associated with salmonberry, and salmonberry is an effective competitor. On sites where salmonberry exhibits 10% or greater cover prior to an overstory disturbance, the species can respond aggressively to capture growing space following an overstory removal by disturbance (Hemstrom and Logan 1986). Salmonberry can asexually reproduce by layering, basal sprouting, and rhizomes. Salmonberry seed can remain dormant in the soil for many years, perhaps decades, creating a large seed bank (Jensen et al. 1995). On a square meter of ground, two years following disturbance to the stand, salmonberry can produce 1.0 to 2.5 meters of new rhizomes per year and 25 to 50 new aerial stems. Salmonberry clones are larger under alder than under conifers or in riparian areas. A clone is an interconnected network of rhizomes and associated aerial branches. The larger salmonberry clone size associated with alder stands may be due to the lower basal area and greater amount of light reaching the forest floor under alder when compared to conifer stands (Tappeiner et al 1991).

Salmonberry brush fields are unable to contribute coarse wood to streams, or to provide late-successional forest habitat. The maximum height potential for salmonberry is about 12 feet (Jensen et al. 1995). Consequently, salmonberry would provide deep shade above narrow streams but will be unable to provide shade above wider streams. Salmonberry will contribute organic litter to streams, but will also limit or exclude other vascular species from streamside areas, and by that limiting the diversity of organic matter that could enter the aquatic system.

These sites, that had previously supported a late-successional conifer and mixed stands, are currently not on a trajectory to develop late-successional forest attributes. This will result in not attaining wildlife habitats associated with conifer or mixed stand late-successional forests habitats on the affected acres within the Late-Successional Reserve. This will also result in the non-attainment of habitat and connectivity benefits that the Riparian Reserve was intended to provide for certain terrestrial late-successional forest associated wildlife species (USDA-FS; USDI-BLM 1995, pg B-13). Though less frequently discussed in the literature, the development of vine maple and other clonal species dominated brush fields would have similar effects.

Well-established understory vegetation, which is less competitive than salmonberry or similar clonal species, can also delay establishment of new tree seedlings following the death of an alder patch. Spies and Franklin (1989) observed that stand gaps could remain free of tree saplings for 50 or more years, following a gap creation event, when the disturbance creates a gap in the overstory canopy, but leaves the understory vegetation intact. This is likely due to the lack of suitable seedbeds, and the ongoing light and root competition from herbs and shrubs already present in the new gaps[3].

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[3] In addition to the example of age-related mortality of red alder, this mode of gap creation occurs when insects or root disease, such as bark beetles and laminated root rot kill patches of Douglas-fir. In contrast, fire simultaneously creates gaps in all the vegetation strata, prepares a mineral seedbed, and in the process of killing the aerial portions of some plants causes their roots to die. Consequently, fire frees more resources expanding the growing space to where new tree seedlings can establish. In addition, low to moderate severity burns create mosaic patterns producing a diverse array of microsites (Spies and Franklin (1989).

Following the breakup of the red alder stands, the resulting treeless area would provide benefits for some shrub associated wildlife species. Early seral species that depend on snag and down wood habitats would use the dead and fallen alder; however, since dead alder decays rapidly, those benefits would be transitory. Where one or a few clonal shrub species dominate the resulting treeless areas, competition by those species would result in low species diversity (Jensen et al. 1995).

Alder stands with a dominant conifer component, or shade tolerant conifers that successfully emerged though the alder following a canopy-opening disturbance, would have a somewhat different trajectory. After 130 years, these stands will transition into a low-density conifer stand with large individual trees (Stubblefield; Oliver 1978, Newton; Cole 1987). Without disturbance, a well-established shrub layer under the low-density conifer stand can preclude recruitment of understory trees thus delaying attainment of the structural complexity associated with late-successional forests. An underburn, either natural or prescribed fire, could set back the shrub layer facilitating understory tree recruitment. However, that carries a risk of loss of the overstory trees, because the overstory trees will be predominately fire intolerant hemlock and redcedar with few fire tolerant Douglas-fir (sources summarized by Minore 1979). These sites will develop some attributes associated with late-successional forest but will lack others. Stands with a disproportionate number of western hemlocks will be at higher risk of loss to fire. The low-density conifer stands will have only a limited ability to contribute large wood to the stream channel and forest floor while maintaining some capacity to provide shade to the stream when compared to moderate to well-stocked conifer and mixed stands.

Alder and recruitment of down wood, snag and cavity habitats

Red alder dying during stand breakup would provide some snag habitat; however, when an alder dies, its wood quickly decays. This rapid rate of decay greatly limits the longevity of alder stems as instream structure, snags or down wood (Niemiec et al 1995; Keim et al. 2000). As a live tree, alder is very effective at compartmentalizing decay and thus limiting the extent of heart rot. In one study, decay caused less than 4% loss of merchantable volume (Allen 1993 cited in Harrington 2006). Thus, unlike many other hardwoods in the region, few living alder have heart rots conducive to nest cavity excavation, nor are they likely to develop hollow bole conditions suited for dens and roosts.

Windthrow of red alder is relatively uncommon because of the intermingling of roots and branches and absence of storm wind intercepting leaves during the winter. The resistance to windthrow limits gap formation and limits recruitment of down wood habitat other than from the competition mortality recruited from among the smaller stems in the stand and at the time of stand breakup. This also limits freeing of growing space in the shrub layer via falling trees crushing the understory vegetation. When uprooting occurs, it is commonly associated with streambank erosion and channel migration (Herrington 1990), exposed stand edges along roads or infrequent wet snow and ice storms.

Alder and within stand species diversity

When compared to other stand types growing near streams in the Oregon Coast Range, red alder-dominated hardwood stands consistently have had the fewest understory species. In areas near streams, Hibbs and Bower (2001) found the greatest shrub diversity occurred under pure conifer stands and the greatest herb diversity occurred under conifer-dominated stands.

Alder and litter deposition into streams

Streamside alder patches and alder growing in areas subject to stream channel migration, slope failure, debris torrents, and other disturbances occurring with a frequency of less than 100 years, would be subject to stand replacement before stand breakup due to senescence. Thus, in those areas there would be a continuous source of fine organic matter in the form of leaf litter and small stems from alder except during the period between disturbance and seedling establishment. The amount of organic particulate matter reaching the streams would vary as a function of the heights of the alder, and the crown volume. In streamside areas, sufficiently stable to allow an alder stand to senesce and breakup, and supporting a clonal shrub understory such as salmonberry, vine maple of salal, alder litter contributions would decline with the demise of the alder trees. However, shrub associated organic particulate matter would continue entering the stream until a sufficiently severe disturbance opens growing space allowing the establishment of a new stand.

According to FEMAT (1993, pgs. V-26, V-27), "the effectiveness of floodplain riparian forests to deliver leaf and other particulate organic matter declines at distances greater than approximately one-half a tree height away from the channel." Alder obtains most of its potential height by age 40 years. This is about 80 feet on good sites and 100 feet tall on the best alder sites (Harrington and Curtis 1986). Thus, the zone where alder can contribute organic particulate matter to streams is about 40 to 50 feet measured from the stream edge. Alder located farther away from the stream channel are unlikely to make a meaning contribution of organic particulate matter to the streams.

Alder and nutrient capital

Red alder is well suited to facilitate primary succession on young soils, such as glacial outwash, and rebuilding soils damaged by erosion and repeated hot fires (Bormann et al 1994). Under some conditions during secondary succession, alder can improve growth of associated species. The best-known example is near the Wind River Nursery where off-site alders were interplanted among Douglas-fir on low site quality ground (Miller and Murray 1977). However, on high quality site, the retention of alder in a Douglas-fir the plantation reduces the conifer volumes without changing the total stand volume (Miller et al 1999). The alder will continue to fix nitrogen during the life of the stand; however, Newton and coauthors (1968) reported that nitrogen fixation reaches equilibrium with soil nitrogen when the stand is about 20 years old, and so the additional net contributions of fixed nitrogen to the site are small thereafter. Healthy pure alder stands typically fix 100 to 200 kg ha^{-1} yr^{-1} (Binkley et al 1994) with reported ranges from 24 to 300 kg ha^{-1} yr^{-1} (Miller and Murray 1979).

Recent work suggests that nitrogen inputs by alder stands on sites that are already nitrogen rich can reduce soil calcium and magnesium availability (Compton et al 2003; Perakis et al 2006). In addition to creating a condition of lower cation availability, the high rate of nitrification and soil acidification under alder stands can reduce phosphorus availability for future rotations of both alder and conifer stands (sources summarized by Compton et al 2003). Nitrogen rich conditions can favor some weedy nonnative plants that can establish following site disturbance (Harrington 2006). Perakis (2006) describes the interaction of nitrogen and calcium as follows:

> *"In forest ecosystems, nitrogen (N) is a critical nutrient that regulates plant growth and the cycling of other essential nutrients, such as calcium (Ca). Under conditions of low nitrogen availability, moderate increases in nitrogen supply stimulate tree growth and uptake of calcium. More dramatic increases in nitrogen supply can overcome nitrogen limitation and drive forests toward nitrogen saturation4 . . . When the soil has accumulated more nitrogen than the plants can use, excess nitrate is produced and is lost to groundwater, lakes, and streams in a process known as nitrate leaching. As negatively charged nitrate ions seep away, they carry with them positively charged base cations (a.k.a. calcium and other nutrients) that are vital for continued plant growth. In this way, trees growing in soils with over-abundant nitrogen can be starved of calcium and can develop nutrient imbalances in their roots and leaves.*
>
> *Most often, nutrient imbalances due to excess nitrogen in forests occur where air pollution is a significant problem, such as the eastern US and Europe. Nitrogen inputs from air pollution are not a significant problem across much of the Pacific Northwest. Despite this, comparable changes to the nitrogen cycle may also occur in this region due to biological processes. Red alder can impart a legacy of soil nitrogen enrichment due to biological nitrogen fixation. Fixed nitrogen can contribute to exceptionally high nitrogen levels in soil and can accelerate nitrogen cycling, nitrification, and coupled nitrate-calcium leaching in a manner similar to chronic nitrogen pollution. These factors are even thought to predispose coastal Douglas-fir forests to intensification of Swiss needle cast disease."*

Alder regenerated directly back on site that had previously supported an alder stand will exhibit reduced growth due to the higher soil acidity. This is because one generation of red alder can change the acidity of the underlying forest

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4 Nitrogen saturation occurs when nitrogen inputs overload the retention capacity of a forest ecosystem. Nitrogen saturation could lead to increased nitrate leaching and decreased forest productivity (Perakis 2006).

soils by as much as 50 years of acid rain (research note on page 9 of the April 1991 Journal of Forestry). Bormann and coauthors (1994) noted that

> *"On nitrogen rich sites with deep, highly weathered substrates, a negative feedback may develop to reduce growth of pure alder stands and the potential productivity of subsequent ecosystems. Further additions of organic matter and nitrogen lead to the production of H+ ions that are not countered by plant uptake or weathering. Production of nitrates leaches released cations deep into the profile."*

In other words, on nitrogen rich sites with deep highly weathered soils, the soil acidification associated with alder stands may result in soil nutrients being leached deep into the soil profile out of the reach of plant roots thus degrading site productivity.

Under certain circumstances, the nitrogen enrichment of infertile sites by red alder may lead to reduced biodiversity. A decrease in species diversity with an increase of site productivity is a well-documented pattern in plant ecology (sources cited in Wedin 1992). Elevated nitrogen levels can increase the abundance of common generalist plant species. These generalist plant species can take advantage of the increased fertility by fully occupying the site resulting in a sharp decrease of overall species diversity caused by the loss of plants with specialized survival strategies (Wedin 1992).

PROPOSED ACTION: ALTERNATIVE I - COMMERCIAL THINNING/DENSITY MANAGEMENT THINNING

CONIFER STAND DEVELOPMENT TRAJECTORY

Commercial thinning increases the growing space for the trees left on the site. As the trees increase photosynthetic surface to take advantage of the growing space, more food becomes available for the leave trees to maintain or increase crown length and volume, root mass, diameter growth, and the ability to produce the pitch and protective chemicals used by the trees to ward off insect and disease. The proposed thinning would reduce stocking levels from about 100 to 500 TPA down to between 50 and 120 TPA. Selected patches will also be thinned to lower densities, approximately 30 TPA. Dispersed quarter-acre gaps will be created in some stands.

Trees in the low-density patches, and edge trees next to created gaps, will receive a greater increase in growing space than those areas thinned to 50 to 120. This will result the leave trees retaining branches in the lower crown longer that those trees thinned to 50 or more TPA. The longer retention will result in those branches growing to larger diameters, and by that add to the structural diversity.

The commercial treatments will consist of thinning the Douglas-firs from below with retention of under-represented hardwoods and shade-tolerate conifers that typically occupy lower canopy positions (Smith 1962 pg 64-77). The intent is to leave the trees that have the greatest potential for rapid response with allowances for maintaining species diversity. These trees are most capable of shading the forest floor, deflecting wind, and buffering temperatures within the treated stands. If a cut tree's crown position is in the lower canopy or is completely overtopped then removal of that tree will have little effect on canopy closure. This is due to the overlapping canopy structure where the intermediate and suppressed tree crowns are below the crowns of the codominant and dominant trees. Moderate and heavy thinning from below will remove the smaller codominant trees. The removal of the smaller co-dominant trees increases the light level inside the canopy, allowing for deeper crowns, and increases light at the forest floor allowing understory vegetation establishment and growth.

Tree size and vigor is directly related to photosynthetic surface and is a function of the depth and width of the tree crown. Therefore, the practice of thinning from below retains the trees with the deeper, wider crowns (Smith 1962 pg 30-33, Oliver; Larson 1990 pg 211-215, 224-225). The amount of light reaching the forest floor does not increase in direct proportion to the number of trees cut in a low thinning. For example, in one study 50% of the basal area was removed from a stand leaving 100 TPA. The increase in the light levels reaching the forest floor ranged from 2% to 39%. The amount of light increased to 20% where the treatment was replicated on a second site (Chan et al. 1996).

Table III-1: Projected Age that Stands Will Attain Desired Tree and Snag Diameters Following Commercial Thinning Compared to No-Action for a Range of Representative Sites[5]

Site Index (Kings $_{50}$) Age when data collected, & Thinning age	Post thinning conifer stocking	Post thinning relative density (RD)	Thinning intensity	Age when stand attribute attained, assuming no subsequent treatments or disturbances*			
				Average green tree DBH			Average newly dead tree dbh > 24 inches ***
				>20 inches **	>24 inches ***	32 inches ****	
	Thin to 60 conifer/ac	RD 22 post thin at age 32	Heavy thin	47 yrs	57 yrs	117 yrs	67 yrs
	Thin to 80 conifer/ac	RD 28 post thin at age 32	Moderate thin	47 yrs	67 yrs	157 yrs	77 yrs
SI 107	Thin to 100 conifer/ac	RD 33 post thin at age 32	Moderate thin	57 yrs	77 yrs	197 yrs	97 yrs
27 yrs old	No thin (183 conifer/ac	RD 44 at age 27	No thin	67 yrs	117 yrs	>207 yrs	207 yrs
thin at 32 yrs	183 total trees/ac)	RD 49 at age 32					
	Thin to 60 conifer/ac	RD 22 post thin at age 32	Heavy thin	47 yrs	57 yrs	77 yrs	57 yrs
	Thin to 80 conifer/ac	RD 27 post thin at age 32	Moderate thin	47 yrs	57 yrs	97 yrs	67 yrs
SI 146	Thin to 100 conifer/ac	RD 31 post thin at age 32	Moderate thin	47 yrs	67 yrs	117 yrs	87 yrs
27 yrs old	No thin (168 conifer/ac	RD 35 at age 27	No thin	57 yrs	77 yrs	177 yrs	157 yrs
thin at 32 yrs	168 total trees/ac)	RD 42 at age 32					
	Thin to 60 conifer/ac	RD 18 post thin at age 36	Heavy thin	51 yrs	61 yrs	101 yrs	81 yrs
	Thin to 80 conifer/ac	RD 24 post thin at age 24	Heavy thin	61 yrs	71 yrs	131 yrs	91 yrs
SI 153	Thin to 100 conifer/ac	RD 28 post thin at age 36	Moderate thin	61 yrs	81 yrs	171 yrs	101 yrs
31 yrs old	No thin (221 conifer/ac	RD 59 at age 31	No thin	91 yrs	161 yrs	>201yrs	>201 yrs
thin at 36 yrs	298 total trees/ac)	RD 64 at age 36					
	Thin to 64 conifer/ac	RD 26 post thin at age 37	Moderate thin	42 yrs	52 yrs	92 yrs	62 yrs
	Thin to 84 conifer/ac	RD 31 post thin at age 37	Moderate thin	52 yrs	62 yrs	102 yrs	72 yrs
SI 161	Thin to 104 conifer/ac	RD 35 post thin at age 37	Light thin	52 yrs	72 yrs	131 yrs	92 yrs
32 yrs old	No Thin (233 conifer/ac	RD 58 at age 32	No thin	72 yrs	102 yrs	>202 yrs	171 yrs
thin at 37 yrs	293 total trees/ac)	RD 66 at age 37					

Notes:

* Ages and diameters from Stand Projection System (SPS) projection of stand exam data collected following BLM stand exam protocol (USDI-BLM 1995c)

** 20-inches is the average diameter of trees at age 50 that survived to become old growth (Tappeiner et al 1997).

*** 24-inches is the minimum diameter for:

- A snag suitable for a pileated nesting tree (sources summarized in Neitro et al. 1985).
- In stream wood considered when assessing proper functioning condition using National Marine Fisheries Service's matrix of factors and indicators for the Tyee Sandstone Physiographic Area.
- Minimum diameter piece considered as a key piece by Oregon Department of Fish and Wildlife for aquatic inventory purposes.

**** 32 inches is the minimum diameter Douglas-fir fitting the definition of old growth (Franklin et al 1986).

Table III-1 compares the effects of variable thinning intensities with no treatment, in stands on a range of sites, with respect to attaining large diameter trees, snags, and down wood. As indicated, larger diameters will be obtained sooner on the higher quality sites and with wider spacing. The information in the table is from computer growth projections run on stand exam data. The stands used in this comparison are typical managed stands with precommercial thinning and fertilization.

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5 These data are from units analyzed in the North Coquille Density Management & Commercial Thin - EA OR-125-03-06. These trends apply to other Umpqua Resource Area sites.

The quarter-acre gap creation will result in enough light reaching the forest floor to support understory conifer regeneration. However, increased light levels alone will not assure establishment of understory trees. Understory trees can establish where logging disturbance exposes a suitable seedbed and sets back vegetation competition. Alternately, where advance understory tree regeneration is present in the gap area, the removal of overhead competition will result in increased growth and improved prospects for long-term survival. Where shrubs are present and disturbance is not sufficient to allow tree establishment, the increase in light reaching the forest floor will result in increased growth and vigor of shrubs will not increase understory tree seedling establishment. Spies and Franklin (1989) observed that, if a canopy gap-creating disturbance is not accompanied by a disturbance or conditions that provide a suitable seedbed that frees growing space at the forest floor, then understory tree regeneration could be delayed by as much as 50 years.

Effects of light thinning on the candidate stands

Light thinning will not appreciably increase light level on the forest floor under stands in the stem exclusion stage of stand development. Light thinning will result in a temporary increase in the understory vegetation beneath stands that have entered the understory reinitiation stage of stand development. Light thinning will temporarily increase diameter growth rates and crown depth, resulting in future larger average green tree, snag and down wood diameters. Additional thinning or a moderate to severe disturbance within 15 to 25 years will be necessary to maintain growth, crown depth, and favorable height-to-diameter ratios. Light commercial thinning of precommercial thinned young stands on high sites may enable those stands to attain the average 20-inch dbh at age 50 years benchmark indicating the stand is on a trajectory to develop into old growth. However, subsequent rethinning will be needed to maintain that trajectory.

A light thinning on lower sites or late in the life of a stand may not put those stands on a trajectory to rapidly develop late-successional characteristics. In these cases, rethinning will be needed to attain some late-successional characteristics provided by large trees. However, characteristics such as large limbs, deep crowns, and complex multi-layered stand structure may be delayed compared with moderate or heavy thinning. Repeated thinnings beginning with a light thinning can maintain or somewhat improve height-to-diameter ratios. However, the very low height-to-diameter ratios that enable a tall tree to have high resistance to blowdown may only be attainable with wide spacing early in the life of the stand, either through low initial stocking or early precommercial thinning, or heavy early commercial thinning (Becquey and Riou-Nivert 1987 cited in Wilson and Oliver 2000).

Effects of moderate thinning on candidate stands

Moderate thinning will increase light levels on the forest floor improving the vigor of existing herbs and shrubs, where present, and allow establishment of shade tolerant plants. The additional light will allow some shade tolerant conifers to establish; however, the overstory trees will continue to grow laterally and fill the gaps in the canopy thus limiting the long-term growth of the understory trees. Without additional disturbance, some understory trees will eventually lose epinastic control, becoming flat-topped, and others will die. About 15 to 25 years after treatment, an additional thinning or moderate severity disturbance will be needed to maintain the growth rates for the overstory trees. In general, a moderately thinned stand will progress from the stem exclusion to the understory reinitiation stage of stand development sooner than a lightly thinned or an untreated stand.

Effects of heavy thinning

Heavy thinning will result in trees in the treated stands developing deeper crowns and more favorable height-to-diameter ratios. Heavy thinning in stands 40 years-old and younger will put those stands on a trajectory to develop into old growth as defined by attainment of an average stand dbh of 20-inches by age 50 years. This thinning intensity will shift stands from the stem exclusion stage to the understory reinitiation stage of stand development by allowing sufficient light to reach the forest floor to allow understory tree regeneration and recruitment of a shrub and herb layer. In stand successional terms, the stand will be a step closer to the old-growth stage of stand development.

Increased light levels alone will not guarantee immediate establishment of understory trees. Following heavy thinning, understory tree establishment will most likely occur in those parts of stands where former low light levels excluded understory vegetation and the duff layer is either thin enough to allow seeding establishment or logging operations expose a suitable seedbed. In areas with well-established herb and shrub layers, competition for growing space can be sufficiently intense to prevent establishment of understory without additional disturbance (Spies and Franklin 1989). In some areas with well-established understory vegetation, logging activity will provide sufficient ground level disturbance to free growing space and create a seedbed suitable for understory tree establishment.

Where understory tree regeneration occurs, the stands will develop a shade tolerant understory trees below the more shade intolerant upper canopy resulting in increased species diversity, a multi-canopy condition, and a wider range of tree sizes associated with late-successional and old-growth conditions. Work by Tappeiner and others (1997) suggests that thinning to between 31 and 46 TPA would be sufficient to put the stands on a trajectory to develop into old-growth trees; however, leaving additional trees would allow a future treatment to recruit snags. Computer modeled stand growth projections indicate that 40-year-old stands thinned to 60 TPA would experience a growth slowdown due to competition after 20 years suggesting that competition in the overstory would again affect understory growth rates by reducing the light reaching the forest floor.

If sufficient shade tolerant understory trees regenerate to form a fully stocked understory stand, those understory trees will also reduce the light levels reaching the forest floor causing a decline and even exclusion of understory herbs and shrubs (Deal and Farr 1994). Over time, with the absence of moderate severity disturbance, the two-aged, two-story character will become less distinct as the crowns of the understory hemlock and cedar trees grow into and merge with the lower part of the overstory Douglas-fir canopy. However, the merged overstory-understory will retain species diversity and structural complexity. This will occur when the overstory tree height growth slows and the understory trees grow to where their crowns merge with the lower canopy of the overstory. Further, these stand developmental processes are facilitated by large canopy gaps that allowed continued understory tree growth and retention of deep crowns on the overstory trees.

VARIABILITY IN RELATIVE STAND DENSITY, SPACING, AND TREE SIZE.

The prescription of different densities for different units will contribute to landscape scale diversity. The density prescribed for each unit is a stand average density. However, the variation introduced by differences in how individual people mark trees for a thinning, naturally occurring clustered mortality, and logging-associated mortality will result in within-stand variation in densities. Examination of pretreatment and post treatment data from previous thinnings illustrates the amount of within-stand density variability. Table III-2 is a summary of these data from three stands. The plots are stratified into no between-tree competition (relative density less than 20), low competition (relative density from 21 to 34), high competition (relative density 35 to 55), and high competition transitioning to imminent mortality (relative density greater than 55). As indicted by the data, the relative density of approximately half the plots or patches within a stand will correspond to the average relative density range of the stand as a whole. However, many other plots will have relative densities that are higher or lower than the stand average.

Figure III–2 shows the Mose 15 unit data graphed on a Reineke diagram. The diagram displays the trees per acre on the vertical axis and average tree diameters on the horizontal axis. A diagonal lines show the average tree per acre to average diameter relationship for selected benchmark relative densities. The individual points for each plot, or sampled patch, correspond to the average trees per acre and average tree diameter calculated from the plot data. As shown on both Figure III–2, and Table III-2, the Mose 15 unit had a post treatment average stand relative density of 30. However, several plots had relative densities less than 20, which would allow enough light into the stand to allow establishment of understory trees, provide for herb and shrub growth, allow retention of lower branches on the overstory trees, and maximize individual tree growth. A few post treatment plots had relative densities approaching 55. The amount of light reaching the forest floor under the trees in these plots is not enough to allow survival of any but the most shade-tolerant plants. While thinning increased the amount of light reaching into the canopy, the leave trees will rapidly recapture the growing space resulting in the resumption of the effects of overcrowding in the affected patches.

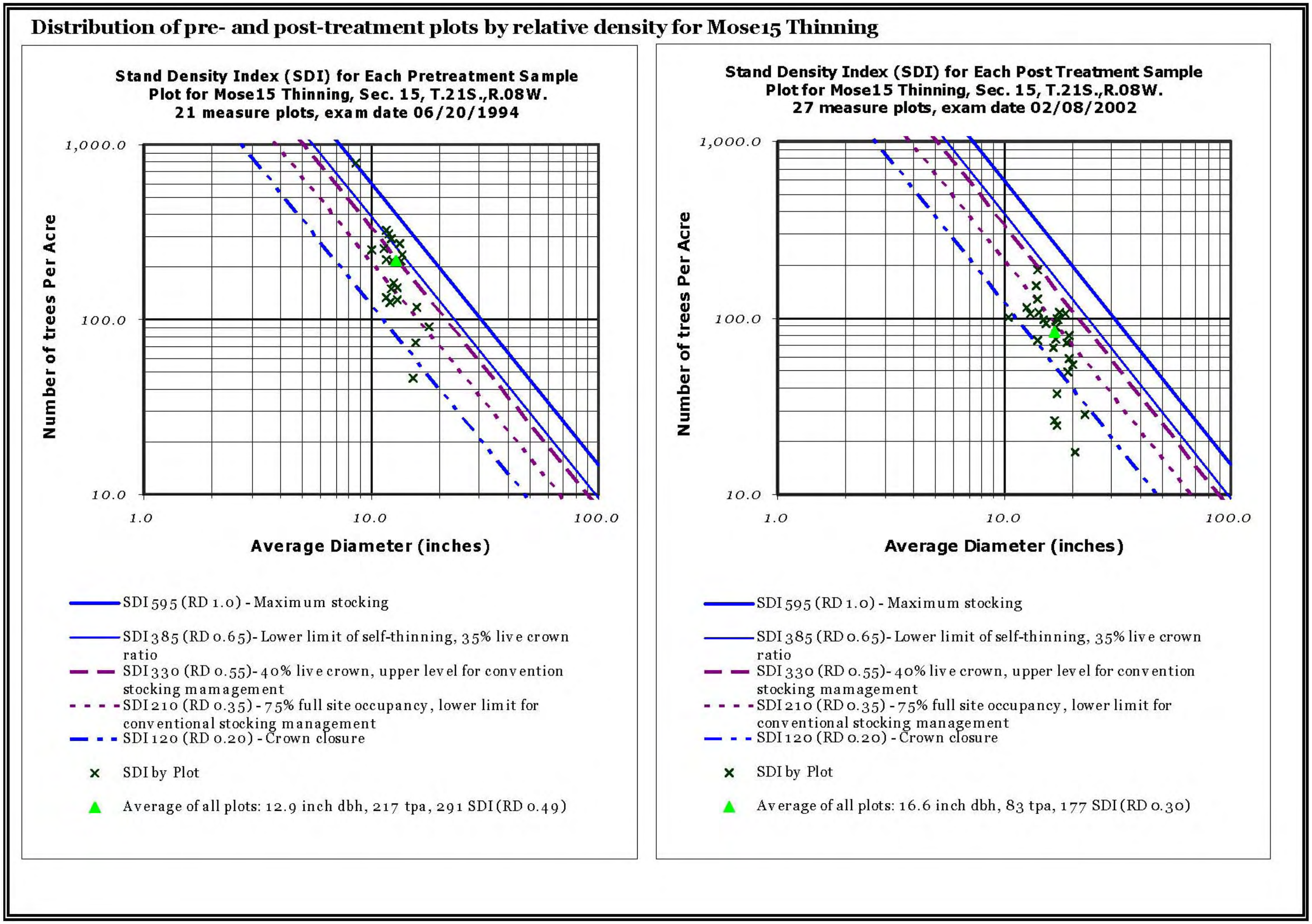

Figure III–2: Distribution of pre- and post-treatment plots by relative density for Mose 15 Thinning

Table III-2: Pre and Post-Thinning Percent of Plots (Patches) by Relative Density Range

	Site name	location	stand exam date	total plots	Whole stand average relative density (RD)	Percent plots by relative density range			
						No competition: RD of 0.20 and less	Low competition: RD of 0.21 to 0.34	High competition: RD of 0.35 to 0.55	High competition transitioning to imminent mortality: RD 0.56 and greater
Pre-treatment	Scare Ridge	Sec. 13, T.21 S., R.09W.	08/13/1991	18	**0.59**	5.6%	16.7%	22.2%	**55.6%**
	Mose 15	Sec. 15, T.21 S., R.08W.	06/20/1994	21	**0.49**	4.8%	23.8%	**38.1%**	33.3%
	Soup Creek	Sec. 19 & 30, T. 23 S., R.09 W.	11/03/1994	11	**0.57**	0.0%	18.2%	18.2%	**63.6%**
	Pretreatment Average					**3.4%**	**19.6%**	**26.2%**	**50.8%**
1st Post-treatment (For units with pre-treatment data)	Scare Ridge	Sec. 13, T.21 S., R.09W.	11/05/1996	46	**0.32**	17.4%	**45.7%**	37.0%	0.0%
	Mose 15	Sec. 15, T.21 S., R.08W.	02/08/2002	27	**0.30**	22.2%	**44.4%**	33.3%	0.0%
	Soup Creek	Sec. 19 & 30, T. 23 S., R. 09 W.	07/23/1998	8	**0.39**	12.5%	25.0%	**50.0%**	12.5%
	Post-treatment Average					**17.4%**	**38.4%**	**40.1%**	**4.2%**

Following commercial thinning, the within-stand density variability changes with the passage of time. Barring stand disturbance, the relative densities of all of the patches inside the stand will increase as the average tree diameters of each patch increases until the density of each patch enters into the range of imminent competition mortality.

Thinning will decrease the time each stand is in the stem exclusion stage thus moving each stand more rapidly into the understory reinitiation stage of stand development. Thinning in stands that have already entered the understory reinitiation stage will promote a more vigorous understory and allow plants with lower shade tolerance to better maintain a presence in the stand. Along with this successional progression is a more rapid attainment of average stand diameters of 20-inches and larger. This corresponds to a shift from secondary habitat to primary habitat conditions for several mammals and attainment of nesting conditions for several birds associated with late-successional forests (sources summarized by Harris 1984, pgs. 59-64 and displayed in figures 5.11- 5.13 of the same).

TREE AND SNAG AND DOWN WOOD DIAMETERS

Growing trees 20 inches and larger will permit recruitment of larger snags that will provide habitat function longer than smaller diameter material (Cline et al.1980, cited in Neitro et al. 1985) as shown in Table III-3 below.

Table III-3: Estimated Age in Years When Douglas-fir Snags Reach Each Deterioration State

Snag size	Decay class 1	Decay class 2	Decay class 3	Decay class 4	Decay class 5
3.6-7.2-inch dbh	0-4 years	5-8 years	9-16 years	17 years	fallen
7.6-18.8-inch dbh	0-5 years	6-13 years	14-29 years	30-60 years	>60 years
>18.8-inch dbh	0-6 years	7-18 years	19-50 years	51-125 years	>125 years

(Adapted from Neitro et al. 1985 pg. 136, which in turn, was adapted from Cline et al. 1980)

Commercial thinning will reduce the numbers of small diameter snags and small down wood material compared with what the stands would have otherwise produced through suppression mortality. Thinned stands, however, will produce larger diameter snags and down wood sooner than if the stands were left unthinned. Further, the larger diameter snags and down wood material will provide habitats for a longer period, as shown in Table III-3, and will meet the habitat requirements for more species than would small diameter material (Kimmey and Furniss 1943, Bartels, et al. 1985, sources summarized in Neitro et al. 1985). Large branches and tops in the thinned stands will continue to provide small diameter standing and down material for those organisms that specialize in using small diameter material.

At the landscape scale, attainment of greater species diversity, multi-canopy structure, larger average tree size and subsequently larger snags and down wood within the treated stands will reduce the contrast between those stands and the adjacent late-successional stands. This will soften the edges between the older and younger stands making boundaries more permeable and expand the total area of suitable interior habitat for late-successional forest associated species in the Late-Successional Reserves (Harris 1984, pgs 128-129). The treated stands in the Riparian Reserves also will contribute to habitat connectivity for certain late-successional forest associated species across the landscape (USDA-FS; USDI-BLM 1994, pg B-13.)

UNDERSTORY VEGETATION RECRUITMENT AND DEVELOPMENT

See ***Effects of heavy thinning*** on page 49.

Moving Riparian Reserve stands into the understory reinitiation stage of stand development will result in development of multi-canopy-layered multi-species condition. This will provide redundant layers of foliage-intercepting light. Stands that are species diverse and structurally complex are more robust in their ability to continue to provide shade following a disturbance, such as blowdown or snow break, than are stands in the stem exclusion stage of stand development. The value of understory vegetation for providing shade to small streams was shown in a study by Levno and Rothacher (1969 cited in Adams and Ringer 1994). They found stream temperature increases limited to 4°F following clearcut logging on a site in the Oregon Cascades. However, stream temperatures increased by 12° to 14°F after broadcast burning and stream cleaning removed the streamside shade formerly provided by the understory vegetation and woody material. Similarly, the multiple vegetation layers and higher species richness in the thinned Riparian Reserve stands also will provide redundant root strength and erosion control mechanisms in the event a disturbance kills the overstory trees.

RED ALDER IN THINNING UNITS

Portions of the units receiving a heavy thinning, where an alder component will be retained, may develop a red alder understory (observations in the Cataract Thinning on the Siuslaw National Forest). This will be a temporary condition because as the overstory conifer canopy expands to reoccupy the site, the red alder, being a shade intolerant species, will die from light competition in all but the largest stand gaps. The understory alder will not likely survive long enough to provide merchantable diameter trees, nor will they provide snags large enough to provide nesting habitat for primary excavator species. The exceptions will be where alder regenerates in gaps on landings and on the surfaces of decommissioned roads where the adjacent trees are comparatively short relative to the width of the road right-of-way. The alder, for the time it is present, will provide vertical and species diversity, and will likely fix about 14 to 52 kg nitrogen per hectare per year (Miller and Murray 1979).

Existing red alder patches, by occupying growing space in the stand, prevent the lateral expansion of the conifer crowns into that space. Since red alder has a shorter life expectancy than the conifer species in the project area, the alder act as placeholders in the stand for future canopy gaps. Those gaps appear upon the death of the alder patches. The patches of alder also shade the lower branches of the adjacent conifers causing those branches to die. This will result in the clear lower boles typical of old-growth Douglas-fir.

Cutting the red alder in the thinning units that are overtopping releasable conifers will allow the released conifers to survive and grow. This will ensure better distribution of conifers or at least a conifer presence in those parts of the units currently occupied by large alder patches.

Thinning the red alder patches will provide more growing space for the red alder left on the site resulting in a growth response where young trees comprise the patches. However, unlike many tree species, red alder height growth is sensitive to rapid changes in stand density. Thus while thinning young alder stands can produce a large increase in basal area growth increment following thinning, this is initially counterbalanced by a decline in height growth resulting in little net change in volume growth (Hibbs et al. 1989). The decline in height growth appears to be of short duration, with the recovery of height growth appearing to be time rather than density related (Hibbs et al. 1995). This in turn, will provide larger expanses of bark substrate for hardwood associated nonvascular plants and for insects, and in time will provide larger hardwood snags. Since alder wood is nondurable, alder produces snags with a very short useful life for cavity using wildlife. However, excavator species that use decay class 4 and 5 conifer snags may also use hardwood snags (Chambers et al 1997). Thinning will have little effect on growth of alder in the older high-density alder patches (Hibbs and DeBell 1994). The primary benefit of thinning older high-density alder patches will be to increase the light penetration though the alder canopy and by that increase the light available for any understory trees, shrubs and herbs that may be present.

Gaps between the alder trees created by thinning would allow some understory conifers, when they occur, to break through the alder canopy into full sunlight. The increased light levels at the forest floor will result in more vigorous growth of the herb and shrub layers. Live red alder are very good at compartmentalizing wounds, and by that, excluding decay fungi. Consequently, minor logging damage to the alder boles will not result in notable heart rot; however, top breakage resulting from damage caused by falling adjacent trees has the potential of introducing decay that may provide some habitat for excavator species.

Alder are near their maximum height at age 40 years (Newton and Cole 1987), whereas conifers will continue to grow, nearly doubling their heights between the ages 40 and 160 years (McArdle et al 1961, pg 12). Thinning around individual dominant red alder and small clumps of red alder would delay the inevitable overtopping of those trees by the conifers.

PROPOSED ACTION: ALTERNATIVE I - ALDER CONVERSIONS

A portion of the alder stands on sites where previous conifer stands were harvested will be regenerated to conifer stands. Where required, site preparation following alder cutting will increase the number of plantable spots. Where existing alder stands also support other hardwood species, this hardwood component will likely develop into mixed stands. Within the reserve land-use allocations, the regenerated conifer stands will eventually supply habitats for species associated with late-successional forest conditions.

Overtopped conifers, which can be released on the project area and survive the logging operations, will go through a period of shock until their shade needles are replaced by sun needles. Conifers which are not capable of releasing will either die of shock or fail to regain epinastic control. Conifers that do release will contribute to the structural diversity of the new stand. The overtopped conifers with the better potential for release from shade competition are those with both a height-to-diameter ratios of 100 or less, and a live-crown to tree height ratio of 30 or greater (Emmingham et al 2000 pg 22). Conifers with height-to-diameter ratios above 100 will be at risk of blowdown until they can take advantage of the increased growing space and develop favorable diameter to height ratios and expanded root systems (Oliver & Larson 1990, pgs. 83-88, 223-224). Of the two conifer species, western hemlock and Douglas-fir, most commonly found in the understory of the alder stands, western hemlock appears to be the best suited for release.

Cutting the alder from the proposed conversion sites will remove that source of nitrogen fixation; however, nitrogen levels under alder stands reach equilibrium before age 20 (Newton et al. 1968). Thus, cutting the older alder stands will have little effect with respect to accumulation of nitrogen in the soil. Fire can reduce the amount of nitrogen in the soil, particularly if the site is poor and the fire is hot. However, early spring prescribed burns or hand-piling, covering, and late-season burning will limit nitrogen volatilization (Tesch and Helms 1992, pg 179). In contrast, a naturally occurring wildfire of sufficient intensity to cause stand replacement in red alder would remove far more nitrogen from the site. The eventual restoration of late-successional conifer stands will restore conditions favorable for nitrogen fixing lichens and asymbiotic nitrogen fixation in dead wood. Both of these mechanisms provide a low but constant input of nitrogen resulting in large amounts of fixed nitrogen over the hundreds of years that a late-successional old-growth forest occupies a site (Hicks and Harmon 2002).

Site index measurements of the thinning/density management units show much of the land in the project area is already highly productive. The removal of the alder component will increase the growing space for the vegetation left on the site, and for newly planted trees. Site preparation will temporally reduce herb and shrub cover and reduce interspecies competition enough to allow successful conifer regeneration and establishment. In combination, these treatments increase the sunlight reaching the forest floor resulting in higher photosynthesis rates for the residual vegetation and conifer regeneration. Following alder cutting and site preparation, the herb and shrub layer plants that survive the disturbance, and species that can regenerate from stump sprouts, root suckers, rhizomes, root crowns or other asexual means, will rapidly recolonize the site. Pioneer plants, with light wind-disseminated seeds, will germinate throughout the treated area; however, only those seedlings that sprouted on open ground away from the highly competitive resprouting plants have a reasonable chance of adding to the species composition of the new stand. Logging debris will provide a pulse of fine and coarse wood debris to the forest floor. In the near term, this debris will add to the fuel loads, will pin down some residual plants capable of vegetative propagation through layering, reduce plantability, provide small mammal habitat, and moderate the microclimate near the ground. In the longer term, the decomposed logging debris will add organic matter to the soil and release nutrients for recycling. The increased sunlight will warm the soil increasing microbial activity. This will result in increased decomposition rates and nutrient cycling, and increased root growth and efficiency of nutrient and water uptake by vascular plants (Kramer and Kozlowski 1979 pg 197.)

Alder conversions across the landscape will increase the area and continuity of conifer cover, and will restore forest type patterns more typical of the late-successional/old-growth dominated landscape prior to intensive management for wood products and wildfires. This will increase the habitat area and connectivity that benefits certain late-successional forest associated species, and will meet one of the intended functions of the Riparian Reserve (USDA-FS; USDI-BLM 1994 pg. B-13). In the short-term, the openings created by cutting the red alder will provide pockets of early seral habitats.

In the long-term, alder conversions will increase the amount of habitat used by the wildlife species associated with late-successional/old-growth conifer and mixed stands, and decrease the amount of habitat used by species associated with the alder dominated disturbed sites. However, conversion efforts will not drop the area in alder below the range of natural variability for late-successional/old-growth dominated landscapes. This is because processes and certain microsite conditions that provide conditions suited for alder establishment and continued presence in the landscape are ongoing. These include landslides, channel migration, debris torrents, streambank erosion, and areas of high water tables. Site-level reestablishment of conifers near small and medium sized stream reaches will, in time, provide those reaches with sources of large durable wood that can provide in-stream structure. Reestablishing streamside conifers that have greater height growth potential than alder will eventually result in more shade above wider channels than streamside alder can provide.

The conversion process curtails the short-term contributions of small nondurable alder wood to the forest floor and to nearby streams, and forgoes attainment of a pulse of large nondurable alder snags and down material that would have been produced when the alder stand breaks up about age 90 to 130 years. The oldest of the proposed alder conversion units would have begun breakup about the year 2060. With successful conversion to a conifer or mixed stand, conversion sites will begin to produce small nondurable conifer wood following canopy closure at age 10 to 15 years. Under a low-density management regime, the first of the conversion units would be capable of producing 20-inch diameter trees about the year 2060. Random mortality will begin recruiting larger diameter snags and down wood, some time between the year 2060 and 2080. This corresponds to the window in which the alder stand breakup would occur under the no-action alternative. The conifer stand will continue to supply large durable snags and woody material until the Douglas-fir component is exhausted 500 to 1,000 years in the future.

HYDROLOGY

AFFECTED ENVIRONMENT

The analysis area for hydrology consists of the three sixth-field subwatersheds in the Umpqua River-Sawyer Rapids fifth-field watershed, and the six surrounding subwatersheds that also contain proposed harvest units. The Little Mill Creek-Weatherly Creek, Paradise Creek, and Lutsinger Creek-Sawyer Creek subwatersheds are inside the

Umpqua River-Sawyer Rapids Watershed. The Vincent Creek, Big Creek-Lower Umpqua River, Halfway Creek, Lower Elk Creek, Mehl Creek, and Lower Camp Creek subwatersheds are hydrologic units in adjacent watersheds.

The term "site-scale," as used in the following analysis, means the stream reach draining a harvest unit.

PRECIPITATION

The hydrologic characteristics of the analysis area are controlled by rain and are typical of the Coast Range. Annual yield, peak and low flows, and ground water levels all depend on the amount, intensity, and distribution of rainfall.

The Oregon Coast Range has a maritime climate characterized by wet and relatively warm winters and dry summers. From 1961 through 1990, the average annual precipitation in the analysis area ranged from 94 inches in the northwest to 50 inches along the eastern boundary (Oregon Climate Service 1995). The Devils Graveyard Remote Automated Weather Station, in the northeast quadrant of the analysis area, recorded 78 inches of rainfall at 1,550 feet elevation during calendar year 2006, the first full year of operation. Average dry season precipitation (May through September) within the analysis area from 1960 to 1980 ranged from 10 inches to 6 inches west to east (McNabb et al. 1982).

Rain-on-snow events occur during cloudy periods when warm winds and rain combine to melt rapidly shallow snowpacks. Rain, combined with rapid snowmelt, can result in higher than normal stream flow potentially causing bed and bank erosion. Although rain-on-snow can occur in the Coast Range, it is more common in the lower and middle elevations of the western Cascades of Washington and Oregon (Harr and Coffin 1992). Rain is the predominant mechanism of peak flow generation in Oregon's Coastal region (Reiter and Beschta 1995, Greenberg and Welch 1998). The entire Umpqua River – Sawyer Rapids analysis area contains just 42 acres of land above 1,800 feet, the approximate lower limit of the transient snow zone on District (Price 2006). Transient snowpacks rarely remain longer than one to two weeks and usually melt in 3 to 4 days during subsequent rainfall (Harr 1983). Only one-tenth of one percent or 12 acres of the proposed harvest area is above 1,800 feet, so post-harvest peak flow augmentation resulting from rain-on-snow events in thinned areas is unlikely and will not be discussed further in this analysis.

STREAM FLOW

Precipitation is rapidly converted into runoff due to coarse textured, well-drained soils, steep topography, and a high drainage density.

No historical year-round gaging information is available for tributaries within the analysis area. The nearest active U.S. Geological Survey (USGS) gaging station is located on the Umpqua at river mile 57, approximately 3.5 miles south of Elkton and eight miles upstream from the mouth of Elk Creek. Station 14321000, active since 1905, measures discharge from a 3,683 square mile drainage upstream of the analysis area.

Annual yield

The Elk Creek stream gage site is near Drain, Oregon, which was approximately 11 miles east of the analysis area. That site documents the stream flow patterns, in response to rainfall, typical for the Oregon Coast Range. This station (14322000) measured discharge from a 104-square mile drainage from 1955 to 1979. Figure III–3 shows that the distribution of monthly runoff in Elk Creek is directly related to the distribution of monthly precipitation[6]. Similar to the analysis area, fall rains recharge soil moisture depleted by summertime evapotranspiration and base flow.

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[6] The Elkton mean monthly precipitation in Figure 1 is from the period 7/1/1948 to 10/31/2006 (Station Elkton 3 SW, Oregon 352633) and the Drain mean monthly precipitation is from the period 12/13/1910 to 10/31/2006 (Station Drain 1 NNE, Oregon 352406). The mean monthly discharge at the gaging station is expressed as a uniform depth of water over the contributing watershed.

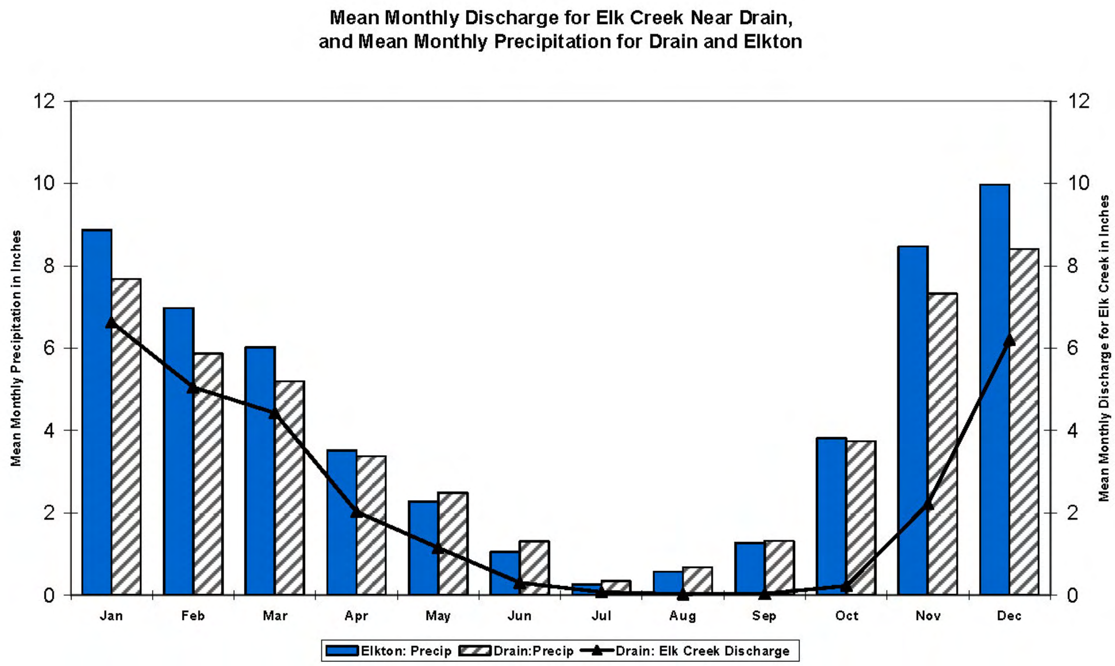

Figure III–3

During the winter, the drainage rapidly translates rainfall into runoff because soils remain wet between frequent storms, evapotranspiration diminishes, and storage capacity, as either groundwater or surface water, is minimal. In the spring, the difference between discharge and rainfall becomes more pronounced as transpiration increases and greater percentages of precipitation are lost to interception. Finally, as summer comes, both precipitation and discharge drop to seasonally low levels.

Low flow

Because rain is infrequent in the summer, tributaries within the analysis area exhibit extremely low base flows, discontinuous pools or they dry entirely. Historical base flow information at the mouth of the ten square mile Paradise Creek subwatershed is available for the years 1934 through 1936. Flows measured in September of these years ranged from a low of 0.3 cubic feet per second (cfs)[7] in 1934 and 1935 to a high of 1.5 cfs in 1936 (USDI-BLM 1995b). Climate records show a period of subnormal rainfall for the entire state of Oregon that started in February 1934 and persisted until December 1936 (Meteorology Committee Pacific Northwest River Basins Commission 1969, Volume 1 Part A, Table II-17, pg. 177).

More recent base flow information at the mouth of Paradise Creek is also available. Discharges of 0.88 cfs and 1.1 cfs were measured in September 1979 and August 1980 respectively at USGS water quality station 14322860. Bureau of Land Management personnel measured a flow of 0.9 cfs in July 1994.

The minimum discharge measured at the Umpqua River gaging station near Elkton for the period 1905 to the present is 640 cfs.

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[7] One cfs is equivalent to approximately 449 gallons per minute.

Peak flow

Peak flow or peak discharge is the instantaneous maximum discharge generated by an individual storm or snowmelt event. Historical records indicate that peak flows are highly variable on larger rivers from water year to water year.[8] For water years 1906 and 1908 through 2006, peak flow ranged from 13,100 cfs to 265,000 cfs on the Umpqua River at station 14321000. There was up to an 824% change in consecutive annual peak flow values. In a watershed as large and diverse as the Umpqua, rain, rain-on-snow, and snow events may operate concurrently to produce peak flows.

Peak flows are also highly variable in smaller watersheds. Between water years 1956 and 1977, the annual peak flow on Elk Creek near Drain ranged from 715 cfs to 19,000 cfs with up to a 500% change in consecutive annual peak flow values. For water years 1971 to 1974 and 1976 to 1981, the annual peak flow from a 0.05 square mile drainage within the Lower Camp Creek subwatershed ranged from one cfs to 47 cfs with up to a 900% change in consecutive annual peak flow values.

CHANNELS AND LARGE WOOD

First and second-order intermittent and perennial non-fish-bearing headwater streams account for approximately 77% of the stream miles in the analysis area and 81% of the stream miles within the proposed harvest units. Table III-4 shows stream miles by stream order[9] for the entire analysis area as well as stream miles by stream order within the proposed harvest units. According to BLM Geographic Information System (GIS) data, the 293 square mile analysis area contains approximately 2,000 miles of streams for a drainage density of 6.8 stream miles per square mile.

Based on 27.1 miles of Oregon Department of Fish and Wildlife stream habitat surveys completed between 1994 and 1996 on mainly 3rd order and larger streams, reaches adjacent to or immediately downstream from the proposed harvest units lack present and future sources of durable large wood.

Table III-4: Miles of Stream by Stream Order

Stream Order	Stream miles in Analysis Area	Stream miles in proposed harvest units	Percentage of stream miles in proposed harvest units
1	1,123	49.55	4%
2	415	19.69	5%
3	195	10.79	6%
4	105	3.88	4%
5	49	0.55	2%
6	16	0	0%
7	55	0	0%
9	42	0	0%
Totals	**2,000**	**84.46**	**4%**

Table III-5 summarizes the survey values for channel geometry, pools, large wood, and shows whether the observed conditions are desirable or undesirable, according to Oregon Department of Fish and Wildlife habitat benchmarks. Key pieces of in-stream large woody debris and larger riparian conifers within 30 meters of the channel are absent or deficient over almost all surveyed reaches. Large, key pieces of wood, resistant to downstream transport during high winter flows, diversify channel form by capturing sediment and organic matter. Large wood also provides cover for fish and substrate for macroinvertebrates.

8 In hydrological studies it is preferable to compute annual statistics based on the water year. The water year, October 1st to September 30th, is defined such that the flood season is not split between consecutive years. Water year 1906, for example, ended on September 30th, 1906.

9 First-order headwater streams have no tributaries. When two first-order channels join they form a second-order stream. When two second-order channels come together they form a third-order stream, and so on. If two streams with different orders join then the higher order is retained. The main stem always has the highest order (Strahler 1957).

Table III-5: Oregon Department of Fish & Wildlife Aquatic Inventories Project Summer Stream Surveys.
Shaded values are desirable and diagonally hatched values are undesirable according to Oregon Department of Fish & Wildlife habitat benchmarks (Foster et al. 2001)

Stream name & survey year	Reach number	Reach length	Width to depth ratio	POOLS		LARGE WOODY DEBRIS		Number of Riparian conifers >20-inch dbh per 1,000 feet of stream
				Pool frequency (channel widths between pools)	Residual pool depth in meters	All pieces (>=3m x 0.15m) per 100 m of stream	Key pieces (>=10m & >60cm) per 100 m of stream	
Little Mill - 1995	2	1,643m	13.7	17.4	0.38	4.8	0.1	30
Vincent - 1995	6	4,167m	8.4	N/A	0.40	10.4	2.1	0
Weatherly - 1994	4	6,267m	17	8.1	0.38	24.1	0.2	0
East Fork Mosetown 1995	3	837m	12.5	N/A	N/A	17.7	4.5	0
Lutsinger - 1994	3	1,601m	24	2.7	0.34	15.9	0.1	0
	4	777m	30.3	5.2	0.32	16.3	0.4	20
	5	1,333m	15	8.2	0.30	32.6	2.3	0
	6	1,178m	21.3	8.3	0.39	23.4	0.2	0
	7	376m	2.5	N/A	N/A	21.8	0.0	0
Lutsinger Trib. #1 1994	1	1,129m	21	6.4	0.32	30.8	1.2	0
Little Camp - 1995	1	3,034m	13.2	5.0	0.49	10.9	1.5	24
Sawyer - 1996	3	2,504m	12.8	10.0	0.43	7.4	0.9	71
Little Paradise - 1994	1	623m	23.3	12.7	0.47	8.0	0.0	0
	2	3,436m	36	6.1	0.49	9.6	0.1	0
	3	2,416m	26.5	10.4	0.38	14.8	0.7	20
	4	1,030m	7.5	N/A	0.36	1.5	0.4	0
Paradise - 1994	5	1,541m	13	4.5	0.36	23.9	1.2	51
	6	950m	15.7	6.1	0.31	19.2	1.2	305
	7	460m	7.5	N/A	N/A	44.5	16.9	122
Paradise Trib. #2 1994	1	1,049m	15	7.8	0.36	19.7	0.5	20
	2	994m	17	17.6	0.39	36.3	0.9	0
	3	601m	5	N/A	N/A	34.4	1.7	0
Little Tom Folley 1996	4	2,240m	12.7	N/A	0.35	46.4	1.4	15
House - 1994	2	1,098m	13	12.4	0.36	24.1	1.3	0
Cedar - 1996	1	2,355m	22	10.2	0.28	22.2	0.8	12

Although they represent the best available data, the Department of Fish and Wildlife surveys done in 1994 through 1996 predate the November 1996 flood and thus do not reflect the positive and negative habitat changes associated with that event. The recurrence interval, or return period, for the November 1996, peak discharges in the Umpqua River Basin ranged from less than 2 years to more than 50 years (USDI-BLM 2004). A 2-year peak discharge has a 50% probability of being equaled or exceeded in any one year and a 50-year flood has a 2% probability of being equaled or exceeded in any one year. Major storms trigger debris torrents of saturated soil, rock, and vegetation that undercut and topple riparian trees. Storm flows create and destroy logjams and carve new stream channels.

The same Oregon Department of Fish and Wildlife surveys also predate the most recent stream enhancement work in the Paradise Creek Key Watershed. During the summer of 2006, approximately 587 pieces of wood, including logs, whole trees and treetops, were placed in Paradise Creek, Paradise Creek Tributary #2, Little Paradise Creek, Cedar Creek, and House Creek. Greater numbers of key pieces and all pieces, as defined by Oregon Department of Fish and Wildlife, would be recorded if the Paradise Creek watershed were resurveyed. Larger riparian conifers, as defined by the Oregon Department of Fish and Wildlife, would likely still be deficient.

WATER TEMPERATURE

Except for Lutsinger Creek, none of the proposed harvest units border streams listed for exceeding Oregon's water quality standards.

The Oregon Department of Environmental Quality (ODEQ) develops water quality standards that protect beneficial uses of rivers, streams, lakes, and estuaries. Section 303(d) of the federal Clean Water Act requires Oregon to develop a list of water bodies that do not meet these water quality standards. This 303(d) list of water quality limited streams provides a way to set treatment priorities of water quality problems. Table III-6 summarizes 303(d) listed streams within the analysis area that are immediately downstream of or adjacent to the proposed harvest units.

Table III-6: Water Quality Limited Streams, 2004-06 303(d) List

Water Body Name	River Mile	Parameter	Season	Beneficial Use	Proposed Harvest Units upstream or adjacent
Halfway Creek	0 to 1.1	Temperature	Year Around	Salmon and trout rearing and migration	36, 76, 77
Halfway Creek Trib.	0 to 1.2	Temperature	Year Around	Core cold water habitat	35
Little Mill Creek	0 to 4.1	Temperature	Year Around	Salmon and trout rearing and migration	73a, 74a, 75
Lutsinger Creek	0 to 5.4	Temperature	Year Around	Salmon and trout rearing and migration	56, 57, 58, 58A, 59, 60, 61, 68, 69
Umpqua River	25.9 to 109.3	*E. coli*	Fall/Winter/Spring	Water contact recreation	All
Umpqua River	25.9 to 109.3	Fecal Coliform	Fall/Winter/Spring	Water contact recreation	All
Umpqua River	11.8 to 25.9	Fecal Coliform	Year Around	Shellfish growing	All
Umpqua River	0 to 100.2	Temperature	Year Around	Salmon and trout rearing and migration	All

Source: ODEQ 2007b

According to Boyd and Sturdevant (1997), the State's temperature standard for protecting salmon and trout rearing and migration is not based on directly lethal temperatures. Rather it is based on temperature associated on sub-lethal effects. These include increased incidence of disease, reduced growth and survival of juveniles, increased competition for limited habitat and food, and reduced ability to compete with other species that are better adapted to higher temperatures.

Elevated stream temperatures are primarily attributable to a lack of stream shading, a high width to depth ratio, and low summer flows (Moore and Miner 1997). A lack of shade allows solar radiation to reach the stream surface. A high width to depth ratio allows more surface area to be warmed by solar radiation per volume of water. Lower flows or volumes contribute to elevated stream temperatures since the change produced by a given amount of heat is inversely proportional to the volume of water heated.

BACTERIA

In addition to exceeding the State's temperature standard, the Umpqua River exceeds the *E. coli* and fecal coliform standards designated to protect water contact recreation and shellfish growing. Because elevated bacteria levels in the Umpqua River derive from sources other than forest management (ODEQ 2006a Chapter 2, pg. 2-10; CH2M HILL 2006) this issue will not be discussed further in this analysis.

SEDIMENTATION

Oregon Department of Environmental Quality has not listed any streams inside the analysis area for sedimentation. Sedimentation, which affects resident fish and aquatic life and salmonid fish spawning and rearing, has a narrative criterion instead of a numeric criterion (ODEQ 2006b). The narrative criterion states that "the formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation, or industry shall not be allowed."

NO-ACTION ALTERNATIVE

STREAM FLOW

Weather, natural disturbance, and plant succession will continue to influence annual yield, peak flows, and low flows with or without implementation of the proposed project. It is expected that stream flow will not differ greatly than described in the Affected Environment section.

CHANNELS AND LARGE WOOD

Reduced tree growth in young overstocked stands in Riparian Reserves will delay delivery of large key pieces of wood to channels. It takes about 50 years to grow an average 20-inch dbh Douglas-fir stand at low stocking levels and 80 to 100 years at more dense stocking levels.

WATER TEMPERATURE

Dense second growth will delay establishment of understory trees and shrubs that could provide redundant layers of shade in the event that some or all of the overstory is lost due to high wind events (Levno and Rothacher 1969). Dense second growth stands will also develop unfavorable height-to-diameter ratios increasing the risk of blowdown (Smith 1962, pg.422).

Reduced base flows and elevated summer water temperatures may occur along stream reaches draining red alder stands. Hicks and others (1991) suggest that increased water use by a red alder dominated riparian zone established after clearcut logging may have been responsible for decreased summer stream flows in the western Oregon Cascades.

PROPOSED ACTION: ALTERNATIVE 1 - COMMERCIAL THINNING/DENSITY MANAGEMENT THINNING

STREAM FLOW

The distribution of vegetative age classes on BLM-administered land in the analysis area indicates hydrologic recovery after a period of active timber harvest, especially 30 to 50 years ago (Table III-7). Reduced interception and reduced evapotranspiration lead to increased water yield after forest cutting (Harr 1983). Stream flow increases following logging generally decrease over time and eventually disappear in about 20 to 30 years in western Oregon as maturing stands begin transpire as much water to the air as the original forest (Adams and Ringer 1994). In a 2005 timber harvest and stream flow memo (Collier 2005), the National Oceanic and Atmospheric Administration Northwest Fisheries Science Center states that peak flow effects seem to diminish over 10 to 20 years following planting of harvested units. In a review of the effects of forest harvesting in the Pacific Northwest, Moore and Wondzell (2005) also found that recovery to pre-harvest peak flow conditions occurs within about 10 to 20 years in some coastal catchments. In the analysis area, nearly 82% of the BLM stands are greater than or equal to 30 years-old and 90% of the BLM stands are greater than or equal to 20 years-old. Another 9% of the stands are 10 to 20 years old, and they have attained or will shortly attain canopy closure making them effective at interception.

The Proposed Action involves thinning hydrologically recovered stands between 31 and 80 years old. The distribution of vegetative age classes across all ownerships in the analysis area indicates ongoing hydrologic recovery after a period of active timber harvest, especially 16 to 30 years ago. Table III-8 summarizes clear cuts and regeneration harvests between 1974 and 2004, but does not account for roads, water bodies, and other open areas such as farm fields.

Table III-7: Forest Operations Inventory Age Classes and Proposed Thinning Acres

Subwatershed	Acres by Current Age Class									Totals	Acres of Proposed thinning
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80+		
Lutsinger Creek-Sawyer Creek	116	1,273	599	1,246	1,624	575	71	0	1,601	7,105	3,276
Paradise Creek	2	482	773	876	1,859	212	143	48	2,621	7,016	2,750
Little Mill Creek-Weatherly Creek	92	1,077	175	44	1,814	694	0	140	4,808	8,844	2,258
Lower Camp Creek	0	408	896	1,137	662	397	129	0	2,154	5,783	298
Big Creek-Lower Umpqua River	82	994	487	9,379	4,006	425	629	0	2,027	18,029	198
Lower Elk Creek	38	589	373	945	292	596	159	0	1,395	4,387	180
Vincent Creek	0	634	667	1,336	1,857	103	163	0	950	5,710	51
Halfway Creek	0	1,209	1,757	4,668	3,017	474	99	49	6,627	17,900	18
Mehl Creek	18	1,070	1,343	1,040	524	58	26	14	3,464	7,557	12
Totals	**348**	**7,736**	**7,070**	**20,671**	**15,655**	**3,534**	**1,419**	**251**	**25,647**	**82,331**	**9,041**

Past harvest of entire small tributary basins on private and federal land, with little or no buffer protection, undoubtedly led to elevated stream temperatures and greater annual water yields. Before the 1970s, clearcutting down to the stream edge was a common practice on all streams. During the 1970s, the BLM left hardwood buffers and hardwood-cedar-hemlock buffers next to certain streams flowing through clearcut units (USDI-BLM 2005). According to the Timber Management Final Environmental Impact Statement (USDI-BLM 1975, pg. IV-13), "All perennial streams, all intermittent streams with fisheries values, and other important streams are to have buffer strips." The South Coast Management Framework Plan governing District operations in the 1980s established buffers on third order and larger streams but specified no buffering of 1st and 2nd order channels unless they supplied domestic water or had verified fish use (USDI-BLM 1982). The Management Framework Plan buffers were 80 feet and wider on either side of the stream. According to the figures in Table III-8, nearly three times as many acres were harvested prior to adopting more stringent Northwest Forest Plan and Forest Practices Act buffers in 1994.

Table III-8: Forest Change Data across All Ownerships through 2004,

Subwatershed	Stand Age in 2007							Total subwatershed acres	% of subwatershed <19 years-old	% of subwatershed <30 years-old
	3-5	5-7	7-12	12-16	16-19	19-23	23-30			
Lutsinger Creek-Sawyer Creek	467	309	682	337	834	1,152	708	24,154	11%	19%
Paradise Creek	82	91	30	82	255	326	519	12,622	4%	11%
Little Mill Creek-Weatherly Creek	1,114	668	510	469	1,089	2,368	902	26,732	14%	27%
Lower Camp Creek	351	133	888	475	920	1,363	1,178	13,483	20%	39%
Big Creek-Lower Umpqua River	517	217	168	128	375	669	295	30,145	5%%	8%
Lower Elk Creek	442	198	238	196	501	522	181	12,584	12%	18%
Vincent Creek	190	229	101	23	288	781	931	9,794	8%	26%
Halfway Creek	282	609	371	325	361	868	1,042	27,332	7%	14%
Mehl Creek	34	290	276	517	357	1,058	2,467	31,125	5%	16%
Total	**3,479**	**2,744**	**3,264**	**2,552**	**4,980**	**9,107**	**8,223**	**187,971**	**9%**	**18%**

Sources: Lennartz 2005; Moeur et al. 2005

The Northwest Forest Plan and the revised Forest Practices Act require wider and more extensive buffers for the long-term maintenance of stream habitat. Forested buffers provide root strength, shade, nutrients, and ultimately large wood to the stream system. Earlier buffers, although not as effective, provided some of these same functions.

Areas harvested prior to the buffer requirements enacted in the mid 1990s have recovered or will soon recover with respect to discharge. Half of the 34,000 harvest acres in Table III-8 are 19 to 30 years old and another 22% are between 12 and 19 years old. Today's wider buffers, in effect when approximately 28% of the acres in Table III-8 were harvested, lessen the effect of harvest-related flow increases by intercepting precipitation and transpiring water creating a difference in soil water content between cut and uncut areas.

Based on the following literature review, partial harvest of conifers in hydrologically recovered stands may lead to relatively short-lived site-scale flow increases; however, any cumulative increase is expected to be morphologically inconsequential and undetectable at larger spatial scales.

Annual yield

Reduced interception and reduced evapotranspiration following thinning operations make site-scale annual yield increases possible; however, any increases will likely be relatively small and short-lived. Reiter and Beschta (1995) state that "where individual trees or small groups of trees are harvested, the remaining trees will generally use any increased soil moisture that becomes available following harvest. Because of such 'edge effects,' partial cuts, light shelterwood cuts, and thinnings are expected to have little effect, if any, on annual water yields." Similarly, in a summary of water yield response to forest cutting outside the snow zone, Satterlund and Adams (1992, pg. 253) found that "lesser or nonsignificant responses occur… where partial cutting systems remove only a small portion of the cover at any one time."

Regional research shows patch-cutting and harvest of individual trees produce considerably less increase in annual yield compared to clearcutting. Annual yield is defined as the total volume of surface flow computed for a water year expressed as a uniform depth of water over the contributing watershed. In western Oregon, patch-cutting 25% of a 250-acre drainage (H.J. Andrews Experimental Forest, western Oregon Cascades) produced an annual yield increase approximately one-half the size of that produced by clearcutting a 237-acre drainage (Harr 1976). Annual yield was increased 15 inches from predicted after 100% clearcutting, and increases averaged about 7.1 inches for the first five years following patch-cutting. Patch-cutting 30% of a 169-acre drainage (Coyote Creek Experimental Watersheds, western Oregon Cascades) produced an annual yield increase approximately one-third the size of that produced by clearcutting a 123-acre drainage (Harr et al. 1979). Annual yield during the first five years after clearcutting averaged 11.4 inches, streamflow deviation from predicted, while annual yield following patch-cutting averaged 3.5 inches. By comparison, harvest of individual trees making up about 50% of the total basal area in a 171-acre Coyote Creek watershed produced an average annual yield increase of only 2.4 inches. In the Alsea Watershed Study in coastal Oregon, three patch-cuts, totaling 25% of a 750-acre drainage, with 50- to 100-foot buffers, produced an average annual yield increase one-seventh the size, 2.8 inches versus 19.3 inches, of that produced by a severely burned, extensively clearcut 175 acre catchment without riparian buffers (Harr 1976).

Site-scale annual yield changes are expected to be relatively short-lived as the remaining trees in the thinned stands increase their growth rate and uptake of nutrients and water. Douglas-fir and western hemlock canopies respond quickly to thinning by stopping self-pruning of lower branches, expanding branch length, and growing longer and denser crowns (Chan et al. 2004). Chan and others (2004) note that canopy expansion and closure was evident five years after thinning in 40- to 70-year-old headwater forests of western Oregon. Figure III–4 shows canopy expansion and closure following commercial thinning in Sections 11, 12 and 13, T.21S., R.9W., which is inside the Big Creek-Lower Umpqua River subwatershed.

Low flow

Small increases in site-scale low flows following thinning may benefit aquatic species during the summer if wetted width and stream volume increase and stream temperatures are reduced. Harvest-related low flow increases are generally short-lived though, 5 to 10 years, and the additional quantities of stream flow represent a small component of annual yield (Harr 1976, Reiter and Beschta 1995).

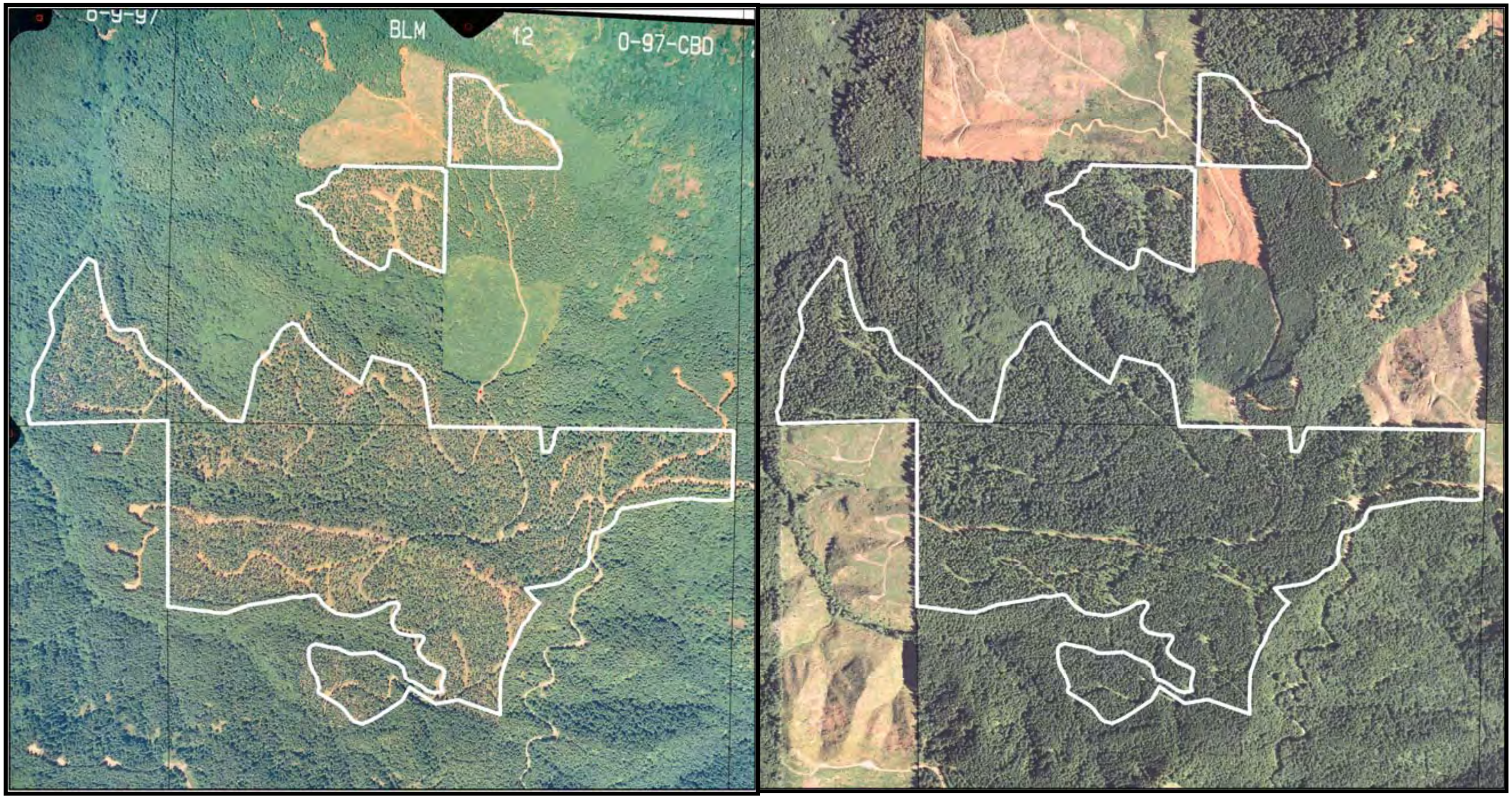

Figure III–4: Scare Ridge thinning T.21S., R.9W., Sections 11, 12 and 13. The aerial photo on the left, taken in 1997, shows 50-year-old stands that were thinned in 1996 using a prescription similar to the Proposed Action. The 2005 photo, on the right, shows canopy development 9 years post-harvest.

Any low flow increases on tributary streams will have a negligible affect on the temperature-limited section of the Umpqua River that flows through the analysis area. Brown and coauthors (1971) observed that the influence of a tributary's water temperature on a receiving stream is proportional to its discharge. During July and August, when stream temperatures are generally the highest, tributary flow can be measured in gallons per minute. In contrast, the Umpqua's mean monthly flow near Elkton during July and August is 1,700 cfs and 1,100 cfs respectively.

Peak flow

Under the Proposed Action Alternative, thinning-related site-scale peak flow increases may occur due to reductions in transpiration and interception, but the timing and magnitude of such events will likely be of little consequence to stream channel morphology. Headwater channels adjacent to most of the proposed units are resistant to changes in slope, entrenchment, and sinuosity because they are confined by narrow valleys and bedrock. Wood recruited from adjacent hillslopes is typically large in relation to the size of these first and second order channels and is therefore resistant to movement, even with increasing flow.

In much of the western Cascades, and elsewhere in western Oregon and northern California, the largest post-harvest water yield increases occur during the fall months when maximum differences in soil water content exist between cut and uncut areas. In the fall, a smaller proportion of rain is required for soil moisture recharge in cut areas, so a larger proportion can go to stream flow (Harr 1976). Stream flows from the first fall rains are usually small and geomorphically inconsequential in the Pacific Northwest (Ziemer 1998). By winter, when soil moisture levels are at full capacity in both cut and uncut areas, relative increases in peak flows from harvest units are considerably less than those produced by storm events. In the spring, reduced transpiration in harvested areas contributes to peak-flow increases.

Regional studies demonstrate that smaller peak discharge events, or those with shorter return periods, are more likely to be increased by timber harvest activities than larger peak flow events or those with longer return periods.

In coastal northern California, single tree, small group selection cutting, and tractor yarding of second-growth redwood and Douglas-fir over the entire 1,047-acre South Fork Caspar Creek watershed did not significantly change peak streamflow events that occur about eight times a year (Ziemer 1998). Furthermore, there was no significant change in the largest peak flows that have 10-year and longer return intervals. For smaller flows, the first peak flows in the fall increased 300% following harvest. Ziemer (1998) notes that the effect of logging on peak flow was best predicted by the percent of area logged divided by the sequential storm number, beginning with the first storm in the fall; i.e. the second storm of the fall produced half the response to logging when compared to the first storm.

The largest increases in peak flows documented for the Alsea Watershed Study occurred in the fall in watersheds that were most extensively clearcut. Average peak flows from a 175-acre clearcut increased 16 cubic feet per second per square mile in the fall and 10 cubic feet per second per square mile in the winter following harvest (Harr et al. 1975). Average fall peak flow increased 27 cubic feet per second per square mile below one of three buffered patch-cuts in a 750-acre watershed (the 35-acre patch was 90% clearcut). Overall, harvest-related peak flow increases were not statistically significant for the same 750-acre watershed that was 25% patch-cut with 50 to 100-foot-wide stream buffers.

The magnitude of peak discharge response differed by event size for a relatively small clearcut basin with no roads in the H.J. Andrews Experimental Forest. In the first five years after harvest of a 237-acre watershed, the average peak discharge of small events increased by more than 75%. Although the mean peak discharge of larger events increased by 25%, Jones and Grant (1996) found that this change was statistically insignificant. The largest peak flows, those with return periods in excess of 5 years, were also not significantly increased (Rothacher 1973).

The H. J. Andrews 237-acre clearcut was further analyzed by Jones (2000) in a summary of peak discharge response to forest removal. The author concluded that changes in evapotranspiration associated with forest harvest and re-growth apparently accounted for significant increases (31% to 116%) in peak discharges during the first post-harvest decade in eight treated basins in the western Oregon Cascades, but the events that were affected were small (<0.28-year return periods).

Based on a review of regional harvest and stream flow studies, including those mentioned above, the National Marine Fisheries Service Northwest Fisheries Science Center issued a memo stating the effects of timber harvest are most pronounced in small basins. The studies were based on basins generally less than a few square kilometers and are measured in relatively small flood events, less than a one or two-year recurrence interval (Collier 2005). The same memo also says, ". . . it is difficult to argue convincingly (based on the literature) that changes in peak or low flows due to timber harvest alone will have significant effects on habitat and salmon populations."

Any site-scale thinning-related peak flow increases will not be measurable at the drainage, subwatershed, and watershed scales for a number of reasons. First, thinning will produce a relatively small stream flow response, and the ability of individual small watersheds to affect downstream discharge decreases as small streams form increasingly larger drainage networks (Garbrecht 1991). Second, the temporal and spatial variability of precipitation and the variable timing of peak flows from individual small basins across the analysis area will complicate change detection. Third, staggered harvests and relatively rapid vegetation recovery will disperse flow effects in time and space. Approximately fifteen sales are proposed between fiscal year 2008 and fiscal year 2011, and purchasers will have three years to harvest each sale. The three subwatersheds with the most proposed harvest acres, Lutsinger Creek-Sawyer Creek, Paradise Creek, and Little Mill Creek-Weatherly Creek, will likely have multiple entries. Fourth, interannual flow variability will be greater than the magnitude of any peak flow increase, and the size of any increase will likely fall within the 5 to 10 percent error associated with stream flow measurements (USGS 1992).

CHANNELS AND LARGE WOOD

Density management within the Riparian Reserves will increase tree growth rates in streamside areas that deliver wood to channels via windthrow, landslides, and debris flows. Thinning second-growth stands ensures larger tree size in a shorter period than would occur without thinning.

Large wood is integral to the maintenance and restoration of aquatic habitat on federal lands. Large wood delivered to channels in the short-term from tree felling within no-harvest buffers for yarding corridors and over the long-term via natural recruitment will provide several benefits. Large wood, which is resistant to downstream transport during higher winter flows, creates low gradient depositional stream reaches with channels that are narrow, deep, and connected to the floodplain. By controlling the storage and transport of sediment and organic matter, logjams moderate peak flows and store water for gradual release during the summer low flow period. Increased summer flows contribute to lower stream temperatures.

Density management thinning in the Riparian Reserves will benefit intermittent as well as perennial streams. One purpose of the Riparian Reserves is to maintain the structure and function of intermittent streams (USDA-FS; USDI-BLM 1994b, pg. B-13). Small headwater streams function as one of the dominant storage reservoirs for sediment in mountainous terrain given an adequate supply of in-stream wood (May et al. 2004). Studies in the Oregon Coast Range (May and Gresswell 2003a; 2003b) and Cascade Range (Swanson et al. 1982; Grant and Wolff 1991) indicate fluvial transport of sediment and wood in low order high gradient streams is minimal in the interval between debris flows. Large wood recruited from adjacent hillslopes and riparian areas is typically large in relation to the size of the channel and therefore resistant to movement. As wood continues to accumulate, the water storage capacity of low order channels also increases and positive feedbacks are initiated (May and Gresswell 2003b). Sediment stored behind in-stream wood increases streambed roughness and decreases local channel gradient reducing the capacity for sediment transport. Subsurface flow becomes more important and surface water velocities decrease as a greater proportion of the streambed becomes covered by sediment.

WATER TEMPERATURE

The proposed action will have a negligible incremental effect on water temperature because density management thinning in the Riparian Reserves will not measurably increase the temperature of any stream, including the temperature-limited streams listed in Table III-6. The pattern and intensity of site-level forest treatments will not produce shade loss and corresponding temperature gain that exceeds the range of natural variability or the measurement error of temperature monitoring equipment. Streamside vegetation in no-harvest buffers will provide shade from 10 a.m. to 2 p.m. during the period of greatest solar loading, and post-harvest canopy closure will be greater than 50% in upslope areas that provide shade during the less critical morning and afternoon hours (USDA-FS; USDI-BLM 2005).

Cable yarding corridors, necessary in some of the proposed units, will not measurably increase stream temperatures. Natural openings will be used as much as possible and far less than 250 feet of yarding corridors will be allowed within any 1,000-foot reach of stream (USDI-BLM 1995, pg. D-5). Most yarding corridors will cross intermittent streams that have discontinuous flow or no flow during the time of the year when water temperature is a concern. Shrub growth in the 12-foot wide corridors, and canopy growth adjacent to the corridors will reestablish some shade as soon as the first year following harvest.

Yarding corridors are somewhat analogous to gaps created naturally in riparian buffers. In a recent study of riparian and aquatic habitats of the Pacific Northwest, Everest and Reeves (2007) state that although little research has been done on gap dynamics in riparian buffer strips, gaps created by both stem snap of weakened trees and uprooting of healthy trees probably have minimal effects on summer and winter water temperatures.

SEDIMENTATION

The proposed action will have a negligible incremental effect on sediment delivery to streams because the project is designed to minimize sediment delivery to all water bodies within and adjacent to the proposed harvest units.

In a recent two-year study of surface erosion and sediment routing following clear cut logging in western Washington, Rashin and others (2006) found stream buffers were most effective at preventing sediment delivery when timber falling and yarding activities were kept at least 10 meters from streams and outside of steep inner gorge areas. The Proposed Action Alternative excludes stream-adjacent slumps, inner gorge areas, and vegetation within at least 30 feet of streams from harvest.

The no-harvest buffers will adequately protect bank stability because the contribution of root strength to maintaining stream bank integrity declines at distances greater than one-half a crown diameter (Burroughs and Thomas 1977; Wu 1986, both cited in FEMAT 1993, pg. V-26). In addition, no-harvest buffers will make effective filter strips because most undisturbed forest soils in the Pacific Northwest have very high infiltration capacities and they are not effective at overland sediment transport by rain splash or sheet erosion (Harr 1976; Dietrich et al. 1982).

Dropping individual trees in channels for yarding corridors will cause negligible sedimentation. Cut trees will not be repositioned, and shrubs and existing downed wood in and over the channel will protect stream banks. Dropping trees in corridors, if necessary, will provide additional bank protection during yarding. Full log suspension is required over perennial streams and is typically achieved over intermittent streams in steep terrain. Bare mineral soil exposed by skidding logs will be covered with slash within 50 feet of any channel to trap sediment and prevent erosion.

PROPOSED ACTION: ALTERNATIVE 1 - ALDER CONVERSION

STREAM FLOW

Thirteen red alder stands in three subwatersheds will be harvested as part of the Proposed Action (Table III-9). The individual units are relatively small and buffered, are spread over seven drainages, and together make up less than one-half of one percent of their respective subwatersheds.

Table III-9: Alder Conversion Unit Acres

Subwatershed	Unit	Acres
Little Mill Creek-Weatherly Creek	2A	5.9
	2C	32.3
	4C	1.2
	4E	10.6
	4F	15.3
	4A	4.0
	4B	5.6
	6A	13.1
	74a	4.6
	73a	8.4
	Total	**101.0**
Vincent Creek	4D	39.2
	Total	**39.2**
Lutsinger Creek-Sawyer Creek	14	23.4
	55a	3.1
	Total	**26.5**

Based on the regional studies introduced in the thinning section and the additional information presented below, the proposed alder patch cuts may increase short recurrence interval peak flows, but these flows will be of little consequence to fisheries and aquatic habitat.

In coastal northern California, Ziemer (1998) noted a mean peak flow increase of 35% in entirely clearcut tributaries to North Fork Casper Creek and a 16% mean peak flow increase in partially clearcut tributaries for those flows that occur about twice a year. The clearcut drainages in the study were predominately second-growth stands of coast redwood and Douglas-fir, ranged in size from 24 to 66 acres, and the partial cut tributaries ranged in size from 135 to 948 acres with a 30% to 45% cut area respectively. Ziemer noted the large peak flows, which tend to modify stream channels and transport most of the sediment, usually occur during mid-winter after the soil moisture deficits have been satisfied in both logged and unlogged watersheds. These larger events were not significantly affected by logging in North Fork Caspar Creek.

The effects of clearcut logging a 237-acre drainage in the western Oregon Cascades has been evaluated by a number of authors using long-term peak flow records. Their conclusions reinforce the idea that peak flow magnitude following harvest tends to increase, with the largest increases occurring in smaller runoff events (recurrence interval <1 year). Rothacher (1973), Jones and Grant (1996), and Thomas and Megahan (1998) all found increases in the smaller peak flows following harvest, but the larger peak flows, variously defined in the three papers as flows with recurrence intervals >1 year, >0.4 year, and >2 years respectively, showed no change. Another interpretation of the peak flow records led Beschta and coauthors (2000) to conclude that treatment-related peak flow increases amounted to 28%, 16%, and 9% for flow events with recurrence intervals of 0.4 year, 1 year, and 5 years respectively.

Any site-scale peak flow increases resulting from individual patch cuts and adjacent thinning will likely be undetectable further downstream. Storm flow response of small basins is affected primarily by hillslope processes, which are sensitive to management activities. The geomorphology of the channel network, which is less likely to be affected by management activities, is primarily responsible for the storm flow response of larger basins (Robinson et al. 1995). In addition, storm intensity is variable across the landscape and peak flows from individual tributaries are often out of phase.

CHANNELS AND LARGE WOOD

Trade-offs exist when managing alder-dominated stands for both large wood and litter input to streams. The proposed no-harvest buffers ensure leaf and other litter inputs to streams will be maintained while having a limited effect on the time needed to regenerate conifers able to provide large durable pieces of wood.

Studies indicate that variable width no-harvest buffers, between 30 and 50 feet wide, will capture much of the hardwood litter input potential in streamside alder stands 60 to 100 feet tall. According to FEMAT (1993, pgs. V-26, V-27), the effectiveness of riparian floodplain forests to deliver leaf and other particulate organic matter declines at distances greater than approximately one-half a tree height away from the channel. In a study of source distances for coarse woody debris entering small streams (1^{st} through 3^{rd} order) in western Oregon and Washington, McDade and others (1990) found that more than 83 percent of hardwood pieces originated within 10 meters (33 feet) of the stream channel, and all hardwood pieces were delivered from within 25 meters (82 feet) of the channel. In a recent study of riparian litter inputs to streams in the central Oregon Coast Range, Hart (2006) reports that deciduous sites provided significantly more vertical litter inputs at the stream edge than coniferous sites, and there was no indication that annual litter inputs were moving more than 5 meters (16.4 feet) down slope at ground level.

The width of an alder retention strip next to a stream will affect the number of conifer boles that will ultimately fall into the stream and the diameter of the conifer boles where they intersect the channel. The relationship of tree dbh to the diameter of the part of the tree bole entering the stream, assuming the fallen tree does not slide down the slope[10], is shown in Table III-10.

Table III-10: Bole Diameter in Inches at 16-Foot Intervals Up an Average Tree in each DBH Class.

DBH	16 ft.	32 ft.	48 ft.	64 ft.	80 ft.	96 ft.	112 ft.	128 ft.	144 ft.	160 ft.	176 ft.	192 ft.	208 ft.
12 in.	10	9	9	6	5	-	-	-	-	-	-	-	-
16 in.	13	12	11	9	8	5	-	-	-	-	-	-	-
20 in.	16	15	14	12	11	9	6	-	-	-	-	-	-
24 in.	19	18	17	15	14	12	10	7	-	-	-	-	-
28 in.	22	21	19	18	16	13	11	7	-	-	-	-	-
32 in.	24	23	22	20	18	16	14	11	8	-	-	-	-
36 in.	29	28	27	25	24	23	20	18	15	12	9	-	-
40 in.	32	31	30	28	27	25	23	21	19	16	13	10	-
44 in.	33	32	31	29	28	26	25	23	21	19	16	13	10
48 in.	37	36	34	33	31	29	27	25	23	21	18	15	11

Data is based on log taper and board foot tables for Douglas-fir on the Coos Bay District. Diameters below the heavy line are greater than or equal to 20 inches.

In a project where a 32-foot alder retention strip is used between a stream and the conifer regeneration area, the conifers adjacent to the retention strip will need to be about 28 inches in diameter before they can be expected to deliver pieces of woody debris larger than 20 inches in diameter to the stream. In an alder conversion project where a 64-foot wide alder retention strip is retained between a stream and conifer regeneration area, the conifers adjacent to the alder retention strip will need to be about 32-inches in diameter before they can be expected to deliver pieces of wood debris at least 20 inches in diameter at the stream. To provide a sense of perspective, the height of the tallest red alder, at age 50 years, will be about 60 feet on a poor site and 100 feet on a very good site (sources summarized by Puettmann 1994). Since Douglas-fir and red alder respond differently to site productivity, a good site for one species does not necessarily equate as a good site for the other. It takes about 50 years to grow an average 20-inch dbh Douglas-fir stand at low stocking levels and 80 to 100 years at more dense stocking levels.

Maintaining no-harvest alder buffers larger than those already specified would delay future large wood recruitment with little improvement in the potential to capture hardwood litter.

WATER TEMPERATURE

The proposed action will have no incremental effect and therefore no cumulative impact on water temperature because alder conversion in the Riparian Reserves will not increase the temperature of any stream. No-harvest buffers will protect the primary and secondary shade zones. The primary shade zone intercepts solar radiation between 10 a.m. and 2 p.m. and the secondary shade zone intercepts sunlight during the morning and afternoon. Shrubs in the no-harvest buffers, wood debris in and over the channels, and local topography will provide redundant layers of shade.

Base flow increases following alder harvest, no matter how small or short-lived, may benefit aquatic species if the higher flows result in increased stream volume and wetted width, and lower summer stream temperatures.

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[10] While doing a study on wind damage to stream buffer strips, Andrus and Froehlich observed that root wads, even on very steep ground, rarely slid down hill more than 20 feet (Observation reported in McGreer & Andrus 1992).

SEDIMENTATION

The proposed action will have a negligible incremental effect on sediment delivery to streams because the project is designed to minimize sediment delivery to all water bodies within and adjacent to the proposed harvest units.

Some short-term localized soil displacement may occur upslope due to felling and yarding. However, the no-harvest buffers, directional felling of corridor trees to provide bank protection, and slash placement on mineral soil in corridors adjacent to channels will adequately protect aquatic resources.

PROPOSED ACTION: ALTERNATIVE 1 - NEW ROADS

The Proposed Action includes constructing 149 relatively short road segments or spurs to facilitate logging (Table III-11 and Appendix B).

Newly constructed roads will occupy roughly 42 acres or 0.02% of the analysis area[11]. Following harvest, 75 segments accounting for approximately 22 acres will be decommissioned or fully decommissioned[12]. This includes closing all 6.12 miles of new dirt roads and 5.38 miles or 34% of the new rock roads. Portions of seventeen spurs ranging in length from 0.01 mile to 0.23 mile, averaging 0.07 mile, and totaling approximately 1.27 miles will be constructed in Riparian Reserves. Eleven of these spurs will be decommissioned or fully decommissioned. Rock roads near ridges outside of the Paradise Creek Key Watershed will be left open. Forty-two of the 149 spurs are behind locked gates, and 27 of these segments will remain open post-harvest. At the option of the purchaser, dirt roads may be rocked to facilitate winter logging. The rock may remain on roads after decommissioning.

Table III-11: New Roads Summary

Subwatershed	Number of road segments	Total Rock (mi.)	Total Dirt (mi.)	Length range (mi.)	Average length (mi.)	Number decommissioned	Number fully decommissioned	Number of stream crossings
Lutsinger Creek-Sawyer Creek	69	6.73	2.54	0.01-0.77	0.13	30	0	3
Little Mill Creek-Weatherly Creek	41	4.96	2.22	0.03-0.92	0.18	14	0	2
Paradise Creek	28	3.04	1.09	0.03-0.40	0.15	0	28	0
Vincent Creek	4	0.39	0.10	0.08-0.20	0.12	1	0	0
Big Creek-Lower Umpqua River	3	0.32	0	0.05-0.16	0.11	0	0	0
Halfway Creek	2	0	0.17	0.07-0.10	0.09	2	0	0
Mehl Creek	1	0.11	0	0.11	N/A	0	0	0
Wassen Creek	1	0.10	0	0.10	N/A	0	0	0
Totals	**149**	**15.65**	**6.12**	**N/A**	**N/A**	**47**	**28**	**5**

[11] Acreage estimate based on a 16-foot compaction width.
[12] Although decommissioned and fully decommissioned roads will receive the same treatment (i.e. intermittent culvert and fill removal, subsoiling or tilling, mulching and seeding, water barring, barricading to prevent vehicle passage), only decommissioned roads may be reopened and maintained for future use.

STREAM FLOW

According to Gucinski et al. (2001) there is little basis to evaluate the hydrologic functioning of the road system at the scale of an entire watershed or landscape because few studies have explicitly considered how road networks affect the routing of water through a basin. An understanding of the effect of roads is complicated by the complex hydrological processes occurring within a watershed and by the fact that construction of forest roads is often closely followed by timber harvesting (Royer 2006). Although measuring the cumulative hydrologic consequence of building and modifying roads in the analysis area is problematic, Best Management Practices will effectively minimize the incremental impact of individual road segments.

Road-related peak flow increases detrimental to fisheries and habitat are not likely because the proposed project incorporates protective design features, including those specified in the Resource Management Plan management directions (USDI-BLM 1995, pg. 69, 70), and best management practices (USDI-BLM 1995, pg. D-3, D-4) to keep new roads hydrologically disconnected from streams and unstable slopes.

Three techniques will be used to prevent continuous surface flow between new roads and streams. First, 88%, or 131 of the 149 proposed road segments, will be located on or near ridges thereby reducing the interception of hillslope runoff. Roads may affect peak flows by intercepting subsurface flow and converting it to surface flow, effectively increasing the density and runoff efficiency of streams in a watershed. Rapid delivery of water to stream channels during a storm via this expanded network can advance the timing and increase the magnitude of peak flows (Wemple et al. 1996). Midslope road segments perpendicular to subsurface flows paths with cutslopes that intersect most of the soil profile are especially problematic (Jones 2000; Wemple 1998 cited in Jones 2000). Roads constructed near ridges pose less of a risk because they avoid or minimize interception of flow paths (Croke and Hairsine 2006; Royer 2006).

The second technique to prevent continuous surface flow between roads and streams involves preferentially outsloping road segments to disperse runoff and facilitate infiltration into the fill slope. The direct transport of inslope ditch flow to a stream channel and the transport of ditch relief culvert water to a stream via a channel or gully are two processes that increase road and stream connectivity (Gucinski et al. 2001; Croke and Hairsine 2006). Outsloping eliminates the need for ditches and ditch relief culverts and disperses intercepted water back into slow subsurface pathways.

Figure III–5: Erosion on the 22-8-32 road in the Lutsinger Creek-Sawyer Rapids subwatershed. This spur would be renovated for access, and decommissioned following project completion.

The third technique to prevent continuous surface flow between roads and streams consists of minimizing the number of stream crossings and routing ditch flow away from channels and onto planar or convex slopes. The proposed project involves only five intermittent stream crossings on the eighteen proposed midslope spurs. New culverts will be installed during the dry season. Thirteen of the eighteen midslope spurs will be decommissioned or fully decommissioned following harvest. This includes removing three of the stream crossing culverts and their fills during the dry season.

SEDIMENTATION

Roads have the potential to increase sediment delivery to stream channels; however, Reid and Dunne (1984) found that the amount of sediment produced by a road is highly variable depending on the traffic intensity and surface type. In a study of sediment production from forest road surfaces in siltstone and sandstone geology, the authors measured 130 times as much sediment coming from a heavily used road compared with an abandoned road, and a paved road yielded less than 1% as much sediment as a heavily used gravel road. In addition and especially important, the road drainage network must be connected to a stream channel in order to deliver sediment-laden runoff. Heavily used roads with poor surfaces that are adjacent to a stream channel have the highest capacity to deliver sediment and reduce water quality.

Proposed new road construction, use, and decommissioning will have a negligible incremental effect on sediment delivery to streams and no detectable cumulative impact at the drainage, subwatershed, and watershed scales. As mentioned above, most new roads will be located on or near ridge tops and, with the exception of five intermittent stream crossings, all roads will be disconnected from the drainage network. Road surfaces and drainage features will be maintained during active hauling and seasonally during non-hauling periods. Aside from harvest activities, new roads will have little or no traffic. One hundred and forty three of the 149 spurs are dead ends and the six through roads are behind locked gates. The installation and removal of stream crossing and ditch relief culverts will not cause sediment to enter surface water because construction will occur in intermittent channels during the dry season.

PROPOSED ACTION: ALTERNATIVE 1 - ROAD RENOVATION AND IMPROVEMENT

Poorly constructed and poorly maintained older roads are a greater risk to aquatic resources than the proposed new roads built to current standards. Renovation and improvement of these older roads that access units in the proposed project will allow the District to address a variety of problems across a relatively large geographic area. Treatments such as grading and culvert replacement at intermittent stream crossings will be completed during the dry season to prevent sediment delivery to surface water and provide long-term benefits.

Renovation and improvement of existing roads provides an opportunity to correct drainage problems. For example, running surface erosion along the seasonally passable 22-8-32 road (Figure III–5) will be treated as part of harvest activities in units 62A, B, and C. Diverted ditch flows are concentrating in wheel ruts and flowing over fill slopes because existing water bars have been damaged by traffic and filled with fine sediment. Crowning or outsloping the road will improve drainage in the near-term and excavating new water bars and blocking access will leave the road in an erosion-resistant condition when the project is done.

Road renovation and improvement also provides an opportunity to restore stream channels and the natural routing of sediment, water, and wood. Two buried stream crossing structures with diversion potential on Spur K in the Paradise Creek subwatershed will be temporarily replaced with culverts and then the pipes and their associated fills will be removed post-harvest. Both crossings are on intermittent, non fish bearing streams.

CONSISTENCY WITH AQUATIC CONSERVATION STRATEGY OBJECTIVES

COMPONENTS OF THE AQUATIC CONSERVATION STRATEGY

The components of the Aquatic Conservation Strategy are Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. These components are designed to work together to maintain and restore the productivity and resilience of riparian and aquatic ecosystems (FEMAT 1993, pg. II-37 - II-40 and V-32).

The Northwest Forest Plan incorporates the components of the Aquatic Conservation Strategy (USDA-FS; USDI-BLM 1994b). The direction provided by the Northwest Forest Plan is such that compliance with the Standards and

Guidelines will implement the Aquatic Conservation Strategy and accomplish the goals set forth in the Aquatic Conservation Strategy objectives. As such, the Northwest Forest Plan Standards and Guidelines constitute the implementation, or fifth, component of the Aquatic Conservation Strategy (Reeves et al. 2006).

The Northwest Forest Plan Record of Decision was signed before the Coos Bay District, and other Westside BLM Districts, completed their Resource Management Plans. The Northwest Forest Plan Record of Decision directed the BLM to "proceed with completing those [resource management] plans in accordance with this decision" (USDA-FS; USDI-BLM 1994b, pg. ROD 12). Consequently, the Management Actions/Direction contained in the Coos Bay District Resource Management Plan are consistent with or are more restrictive than the Northwest Forest Plan Standards and Guidelines.

Specific information on the components of the Aquatic Conservation Strategy follows.

Riparian Reserves:

Riparian Reserves include lands along streams, unstable areas, and potentially unstable areas where special standards and guidelines direct land use. Riparian Reserves Standards and Guidelines, listed on pages C-31 through C-38 of the Northwest Forest Plan Record of Decision (USDA-FS; USDI-BLM 1994b) are incorporated into the Coos Bay District Record of Decision and Resource Management Plan (USDI-BLM 1995, pg. 13 - 17) as Management Actions/Direction. Generally, management actions/direction for Riparian Reserves prohibits or regulates activities that retard or prevent attainment of Aquatic Conservation Strategy objectives.

Key Watersheds:

Key watersheds are a system of watersheds that serve as refugia crucial for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species.

Key Watersheds overlay portions of all land use allocations in the Coos Bay District and place additional management requirements or emphasis on activities in those areas. In Key Watersheds, the District prepares watershed analyses prior to resource management activities, reduces existing road mileage or does not construct a net increase in road mileage, and emphasizes watershed restoration.

Paradise Creek is the lone Key Watershed in the project area and there will be a net decrease in road mileage post-project (Table II-12).

Watershed Analysis:

Watershed analysis consists of procedures for conducting analysis that evaluate geomorphic and ecological processes operating in specific watersheds. The watershed analysis should enable watershed planning that achieves Aquatic Conservation Strategy objectives. Watershed analysis provides a basis for monitoring and restoration programs and the foundation for delineating Riparian Reserves.

The Umpqua River-Sawyers Rapids watershed (formerly called the Middle Umpqua River watershed) contains 91% of the proposed harvest acres and the remaining acres are spread among six surrounding subwatersheds.

The initial watershed analysis work in the Middle Umpqua River watershed consists of three analyses completed at different scales and covering different parts of the watershed. The documents are the Middle Umpqua Frontal (1994), Paradise Creek (1995b), and Upper Middle Umpqua (1997). The Middle Umpqua River Watershed Analysis completed in 2003 and revised in 2004 is a second iteration document that replaces the earlier subwatershed scale documents. The following watershed analyses include the subwatersheds that contain 9% of the proposed harvest units: Smith River (1995, Roseburg BLM), Middle Smith River (1995), Smith River (1997, prepared by the Forest Service with BLM cooperation), Upper Umpqua (2002, Roseburg BLM, 2nd iteration), Elk Creek/Umpqua River (2004, Roseburg BLM), and Mill Creek-Lower Umpqua River (2005, 2nd iteration).

Watershed Restoration:

Watershed restoration is a comprehensive, long-term program of watershed restoration to restore watershed health and aquatic ecosystems, including the habitats supporting fish and other aquatic and riparian-dependent organisms. The program's most important components are control and prevention of road-related runoff and sediment production, restoration of the condition of riparian vegetation, and restoration of in-stream habitat complexity.

The Management Actions/Direction for Watershed Restoration (USDI-BLM 1995, pg. 8) includes:

"Preparing watershed analyses and plans prior to restoration activities." As mentioned above, this has been completed for the project area.

"Focusing watershed restoration on removing some roads and, where needed, upgrading those that remain in the system." The timber sales give BLM the ability to proactively renovate and improve frequently traveled and abandoned roads that would otherwise receive no treatment except in response to a problem that threatens safe vehicle passage. A program of renovation, improvement, maintenance, and decommissioning excess roads will minimize logging traffic related sediment delivery to stream channels and reduce the risk posed by ongoing road surface erosion.

"Applying silvicultural treatments to restore large conifers in Riparian Reserves." One purpose of the project, as stated in Chapter 1 of this EA, is to improve the stand structure in Riparian Reserves by thinning out excess trees in overstocked stands to enhance the growth and vigor of residual trees. This will provide larger and healthier trees while maintaining native species diversity. Alder conversion will restore conifers to sites that previously supported conifers. These actions implement the management direction for Riparian Reserves (USDI-BLM 1995, pg. 13). "Apply silvicultural practices for Riparian Reserves to control stocking, re-establish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives." The Aquatic Conservation Strategy and Density Management chapters in the Middle Umpqua River Watershed Analysis document contain more information regarding the role of thinning and conversion treatments in attaining Riparian Reserve function.

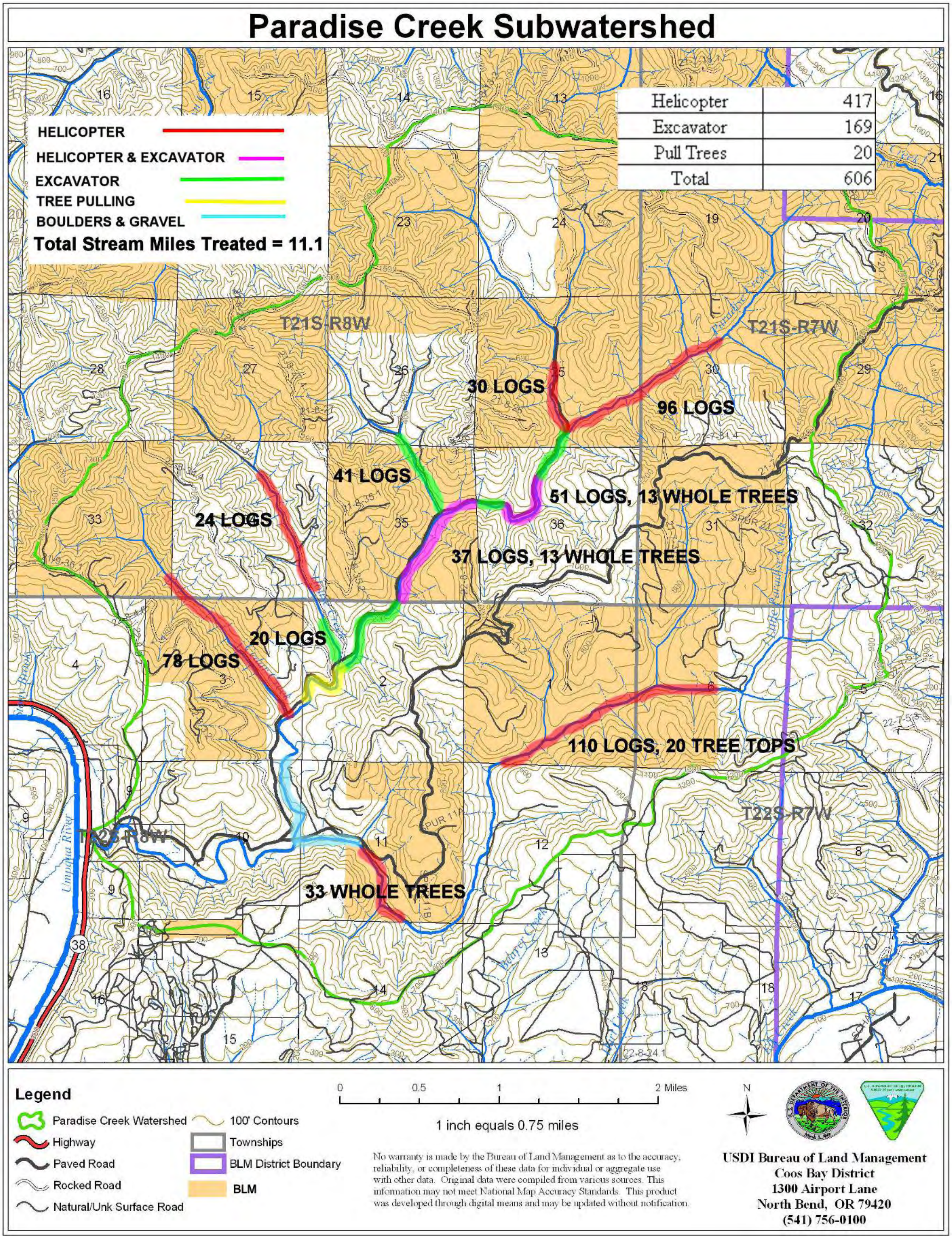
"Restoring stream channel complexity." The Paradise Creek Key Watershed is the focus of a multi-year stream enhancement effort involving the Coos Bay District BLM, the Partnership for the Umpqua Rivers, Roseburg Resources Corporation, and private landowners. Map III–1 shows completed log, tree, and boulder placement sites on Paradise Creek, Little Paradise Creek, and tributary streams. Thinning and alder conversion are being pursued because the long-term quality of aquatic habitats depends on the ability of the Riparian Reserves to deliver large, durable wood to channels and floodplains. More in-stream enhancement work in the project area, including culvert replacement, is summarized in the watershed analysis documents.

AQUATIC CONSERVATION STRATEGY OBJECTIVES

A determination of consistency with respect to satisfying the nine objectives of the Aquatic Conservation Strategy is presented below.

Maintain and restore the distribution, diversity, and complexity of watershed and landscape features to ensure protection of the aquatic systems to which species, populations, and communities are uniquely adapted.

Thinning well-stocked and overstocked stands regenerated following timber cutting will restore the distribution, diversity, and complexity of watershed and landscape features to insure protection of aquatic systems. Moving relatively homogenous single-story forests into the understory reinitiation stage of stand development sooner will result in greater vegetative species diversity, multi-canopy structure, and larger average tree size with subsequently larger snags and down wood. Several functions of the Riparian Reserves, including large wood delivery to streams and riparian areas, and wildlife habitat, will benefit from having larger conifers sooner.


Paradise Creek Subwatershed
HELICOPTER
HELICOPTER & EXCAVATOR
EXCAVATOR
TREE PULLING
BOULDERS & GRAVEL
Total Stream Miles Treated = 11.1
Helicopter 417
Excavator 169
Pull Trees 20
Total 606
T21S-R8W
T21S-R7W
T22S-R7W
30 LOGS
96 LOGS
41 LOGS
51 LOGS, 13 WHOLE TREES
24 LOGS
37 LOGS, 13 WHOLE TREES
20 LOGS
78 LOGS
110 LOGS, 20 TREE TOPS
33 WHOLE TREES
Umpqua River
Legend
Paradise Creek Watershed
Highway
Paved Road
Rocked Road
Natural/Unk Surface Road
100' Contours
Townships
BLM District Boundary
BLM
0 0.5 1 2 Miles
1 inch equals 0.75 miles
N
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Coos Bay District
1300 Airport Lane
North Bend, OR 79420
(541) 756-0100

Map III–1

Project design features will maintain and create diverse habitat features. Immature stands in the Late-Successional Reserves and Riparian Reserves will be thinned by cutting the overtopped, intermediate, and the smaller co-dominant Douglas-firs. Other species of conifers and hardwoods will be retained to provide species, spatial, and structural diversity. A variety of techniques will be used to provide near term and future canopy gaps that will add to overstory and understory diversity. These include cutting quarter-acre gaps and leaving small patches of alder, which will eventually create additional gaps when those alder die. Snags will be reserved from cutting and down logs in certain decay classes will be left on site. Dominant conifers including remnant individual trees and groups of trees, which contain platforms suitable for marbled murrelets will be reserved. Bigleaf maples and myrtles will also be reserved.

The natural distribution of red alder within the project area will be maintained even though alder conversion is proposed. On a watershed scale, alder stands contribute to landscape scale diversity by providing contrasting conditions to those found in conifer stands. Alder stands are naturally renewed and thus perpetuated on sites subject to frequent disturbance such as slide tracks and channel migration zones. The project proposal excludes these areas from harvest and instead concentrates on sites previously disturbed by timber harvest and road construction. The conversion areas have evidence of older conifer stumps, have scattered and clumped conifers growing in them, or are shown on older aerial photographs to have supported conifers or grassy areas prior to harvest.

Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These lineages must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Spatial and temporal connectivity within and between watersheds will be maintained by buffering all streams within and adjacent to the thinning and alder conversion units, excluding certain habitat features from disturbance such as minor conifer and hardwood species, snags, and decaying logs, and retaining a nearly continuous canopy of dominant trees post-harvest. Riparian-dependent organisms will continue to use habitats within the no-harvest buffers. Over time, the release of understory shrubs and trees on the adjacent upslope will provide habitat connectivity at several canopy levels.

Accelerating the growth of stream-adjacent conifers by thinning will hasten the restoration of riparian and aquatic habitats within the project area and benefit all life history stages of salmonids. The abundance and survival of salmonids is often closely linked to the abundance of large woody debris in stream channels. Based on habitat surveys, summarized in the hydrology section, there is a lack of both riparian conifers greater than 20 inches in diameter and key pieces of large woody debris. Larger trees will produce larger logs that will positively influence habitat and physical processes for years and decades.

No permanent roads or culverts will obstruct routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species. Culverts installed and replaced on intermittent channels will match the natural channel planform, cross-section, and gradient, and they will pass a 100-year flow including allowance for bed load and debris.

Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Project design features will maintain the physical integrity of the aquatic system. Streamside vegetation buffers will be used to prevent sediment delivery and protect bank stability, beneficial litter inputs, and shade. Dropping individual trees in channels for yarding corridors will cause negligible bank disturbance because the cut trees will not be repositioned and shrubs and existing down wood in and over the channel will cushion the impact. Full log suspension will be required over perennial streams and will typically be achieved even over intermittent streams in steep terrain. Harvest-related peak flows may occur due to reductions in transpiration and interception, but the timing and magnitude of such events will be of little consequence to stream channel morphology.

Replacing perched and/or undersized culverts on intermittent streams and decommissioning stream crossings will restore restricted channels, reducing bank stress and erosion. Installation of five intermittent stream crossings on new road segments will affect bank and bottom configurations on a minute portion of the stream network. To minimize the risk of debris plugging and maintain passage for aquatic organisms, these culverts will be installed to match natural channel dimensions, patterns, and profiles. At least three of the five culverts and their fills will be removed at the conclusion of the project.

Large wood delivered to channels in the short-term from tree felling for yarding corridors and more importantly over the long-term via natural recruitment from thinning and conversion areas will provide several restorative benefits to the aquatic system. Large wood will create low gradient depositional stream reaches that are narrow, deep, and connected to the floodplain. These areas will increase the availability and quality of spawning and rearing habitat and they will be less susceptible to heating. Logjams will moderate peak flows and store water for gradual release during the summer low flow period.

Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain in the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

The proposed project will not measurably increase water temperatures, lead to more than negligible sedimentation of streams, or result in the release of hazardous materials.

Thinning in the Riparian Reserves will not measurably increase water temperature because vegetation, which produces shade during the period of greatest solar loading from 10 a.m. to 2 p.m., will be protected in no-harvest buffers, and canopy closure will be greater than 50% in upslope areas that provide shade during the less critical morning and afternoon hours. Natural openings will be used for cable yarding corridors as much as possible, and a majority of the corridors will cross intermittent streams that have discontinuous flow or no flow during the summer when water temperature is a concern.

Alder conversion in the Riparian Reserves will not increase water temperatures because the primary and secondary shade zones will be protected in no-harvest buffers. Shrubs, wood in and over the channels, and local topography will provide redundant layers of shade.

Road renovation, improvement, construction, and maintenance activities will occur during the dry season. If haul occurs on gravel roads during the wet season, silt trapping straw bales, or other sediment control devices, will be located in ditch lines where road-generated sediment has the potential to degrade aquatic and riparian habitats.

Refueling of gas or diesel-powered machinery will not be allowed in close proximity to stream channels, and contractors will be required to have a spill prevention containment and countermeasures plan to minimize the likelihood of contamination reaching a waterway.

Maintain and restore the sediment regime under which an aquatic ecosystem evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Harvest activities will not accelerate mass soil movement and stream erosion in the short-term. No-harvest buffers will provide bank stability and filtering, and partial cutting will maintain live roots that bind the soil. The roots of different trees in a stand are intertwined unlike the tree crowns, which are spatially distinct. Consequently, thinning does not kill all the roots in the discrete areas of soil below the cut trees (Stout 1956 cited in Oliver and Larson 1990). Eis (1972) found that 45% of the selectively cut Douglas-firs in a stand were root grafted and half of the stumps were still alive 22 years after logging. Alder conversion units will contain comparatively fewer trees than thinning units post-harvest, but they will buffered and they will contain residual conifers and hardwoods.

Although road reconstruction and improvement will decrease sediment delivery and improve sediment routing at the site-scale, segments of the existing road network will continue to influence negatively the timing, volume, rate, and character of sediment input, storage, and transport. Undersized and/or misaligned midslope and valley bottom culverts create a physical obstruction to sediment, water, and wood movement. Replacing culverts with appropriately sized structures and decommissioning crossings will reduce the number of obstructions, but too few will be treated at the watershed scale to restore the natural sediment regime. New preferentially outsloped roads with few crossings located on ridges and benches will cause little disruption to local sediment storage and transport. All new culverts will match stream channels and most will be removed following harvest.

Thinning and alder conversion within Riparian Reserves will increase conifer growth rates in streamside areas that deliver wood to channels via windthrow, landslides, and debris flows. Returning large, decay resistant wood to project area streams will restore the sediment regime at the watershed scale over the long-term. Low order headwater streams adjacent and immediately downstream of the proposed units will especially benefit. Small headwater streams can function as one of the dominant storage reservoirs for sediment in mountainous terrain given an adequate supply of in-stream wood (May et al. 2004).

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 (i.e. movement of woody debris through the aquatic system). The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Reduced interception and reduced evapotranspiration following thinning and alder conversion make annual yield, low flow, and peak flow increases possible. Any increases however will likely be short-lived (few years), inconsequential to channel morphology, and not measurable at the drainage, subwatershed, and watershed scales. Small increases in site-scale low flows following harvest may be beneficial to aquatic species during the summer if wetted width and stream volume increase and stream temperatures are reduced.

Peak, low, and annual flows will remain within the range of natural variability at both the watershed and site-scales.

Maintain and restore the timing, variability, and duration of floodplain inundation and the water table elevation in meadows and wetlands.

The timing, variability, and duration of floodplain inundation will be maintained in the short-term at both the site and watershed scales. No-harvest buffers and full log suspension during yarding eliminate the risk of streambank soil compaction. Therefore, infiltration rates and the capacity of floodplains to store water will remain unchanged.

The proposed project seeks to ensure a long-term supply of large wood to restore the historical timing, variability, and duration of floodplain inundation. Large wood in higher gradient reaches (4 to 10%) creates steps and flats that will store relatively large volumes of sediment and near surface ground water. Over time, large wood will capture enough substrate in some lower gradient reaches to reconnect downcut channels with their floodplains and terraces and reestablish subsurface water storage capacity. Streams that have large amounts of deep gravel and well-connected terraces will typically have cooler water temperatures (IMST 2004). Alluvial gravels in floodplains store cold water from periods of high runoff and release the water gradually as flows recede in the summer (Coutant 1999 cited in IMST 2004).

Maintain and restore the species composition and structural diversity of plant communities in riparian zones and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

No-harvest buffers will protect bank stability, litter inputs, and shade, prevent sediment delivery, and maintain the species composition and structural diversity of plant communities in riparian zones (i.e. "Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics" (USDI-BLM 1995)).

Variable width no-harvest buffers that contain inner gorge areas, begin at the edge of the stream or floodplain, and extend upslope 30+ feet will provide adequate summer thermal regulation. Anderson et al. (2007) studied thinning of 30- to 70-year-old stands in western Oregon and concluded that buffers of widths defined by significant topographic breaks or the transition from riparian to upland vegetation appear sufficient to mitigate the affects of upslope thinning on the microclimate above topographically constrained first and second-order streams. The authors found that microclimate gradients in headwater riparian zones were strongest within 10 meters of the stream center, "a distinct area of stream influence within broader riparian areas."

Thinning and conversion in Riparian Reserves outside of the no-harvest buffers will accelerate the development of large woody debris and the recruitment of understory trees responsible for providing the size, age, and species diversity associated with late successional stands. Stand components that currently provide structural diversity such as minor conifer species and hardwoods, snags, and down wood will be protected during harvest.

Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

According to Chan and others (2004):

> *Exclusion of timber harvest from Riparian Reserves has been assumed to maintain species diversity, ecosystem integrity and protection of ecosystem functions. The 'hands-off' assumption may have been valid in an ecological context when humans had little impact on disturbance regimes and ecological processes in forests. However, many of the forests designated as Riparian Reserves under the Northwest Forest Plan were previously managed for timber production and are characterized by relatively dense, uniform, 30- to 70-year-old even-aged stands of Douglas-fir and western hemlock. These young stands are typically lacking in structural and biological diversity. Lack of complexity makes these stands poorly suited for supporting many riparian-dependent species, the northern spotted owl, and many other wildlife species (Carey 1995; Lindermayer and Franklin 2002* [cited in Chan et al 2004]*).*
>
> *A passive management option is to assume that over time young stands within Riparian Reserves will naturally develop desired characteristics and functions while forgoing timber harvest for commodity production. However, these stands typically remain in the stem-exclusion stage (Oliver and Larson 1996* [cited in Chan et al 2004]*), and therefore depauperate of desired structural characteristics, for extended periods of time (potentially exceeding 100 years).*

Thinning will decrease the time each stand is in the stem exclusion stage thus moving each stand more rapidly into the understory reinitiation stage of stand development. Thinning in stands that have already entered the understory reinitiation stage will promote a more vigorous understory and allow plants with lower shade tolerance to maintain a better presence in the stand. Along with this successional progression is a more rapid attainment of average stand diameters of 20 inches and larger. This corresponds to a shift from secondary habitat to primary habitat conditions for several mammals and attainment of nesting conditions for several birds associated with late-successional forests (sources summarized by Harris 1984, pgs. 59-64 and displayed in figures 5.11- 5.13 of the same). Wildlife habitats associated with large diameter trees include large diameter snags, large diameter down wood, prey substrates provided by large surface areas of coarse deep-fissured bark, deep canopies, large limbs and platforms, and cavities and other structures found in damaged or injured large trees (Neitro et al. 1985; Weikel and Hayes 1997).

Thinning will reduce the numbers of small diameter snags and small down wood material derived from boles that the stands would have otherwise produced through suppression mortality. Thinned stands, however, will produce larger diameter snags and down wood sooner than if the stands were left unthinned. Further, the larger diameter snags and wood material will provide habitats for a longer period, and they will meet the habitat requirements for more species than would small diameter material (Kimmey and Furniss 1943; Bartels et al. 1985; sources summarized in Neitro et al. 1985).

AQUATIC HABITAT/FISHERIES, INCLUDING THREATENED & ENDANGERED SPECIES

AFFECTED ENVIRONMENT

FISH SPECIES OCCURRENCE

Table III-12: Fish Species within Project Area
Includes the Umpqua River-Sawyer Rapids Watershed and Surrounding Subwatersheds (USDI-BLM 2004)

Common Name	Scientific Name
Native Salmonid Species	
Coho salmon	*Oncorhynchus kisutch*
Chinook salmon	*Oncorhynchus tshawytscha*
Steelhead/rainbow trout	*Oncorhynchus mykiss*
Coastal cutthroat trout	*Oncorhynchus clarki clarki*
Other Native Fish Species	
Pacific lamprey	*Lampetra tridentate*
Western brook lamprey	*Lampetra richardsoni*
River lamprey	*Lampetra ayresi*
Umpqua chub	*Oregonichthuys kalawatseti*
Three-spine stickleback	*Gasterosteus aculeatus*
Sculpin (various sp.)	*Cottus species*
Redside shiner	*Richardsonius balteatus*
Umpqua dace	*Rhinicthys cataractae*
Speckled dace	*Rhinicthys osculus*
Long nose dace	*Rhinicthys cataracatae*
Umpqua pikeminnow	*Ptychocheilus umpquae*
Largescale sucker	*Catostomus macrocheilus*
Green sturgeon	*Acipenser medirostris*
White sturgeon	*Acipenser transmontanus*
Non-Native Fish Species	
Smallmouth bass	*Micropterus dolomieu*
Mosquito fish	*Gambusia affinis*
Fathead minnow	*Pimephales promelas*
Bluegill	*Lepomis macrochirus*
American shad	*Alusa sapidissima*
Brown bullhead	*Ameiurus nebulosu*

Table III-12 lists the fish species known or believed to occur within the boundaries of the Umpqua River-Sawyer Rapids watershed, including the mainstem Umpqua River, and the adjoining subwatersheds.

Endangered Species Act listed species

The Umpqua River-Sawyer Rapids watershed and surrounding subwatersheds are located within the Oregon Coast Evolutionary Significant Unit, which extends south from the Columbia River to Cape Blanco. The following summarizes the Endangered Species Act status of salmonids within the Evolutionary Significant Unit.

The NOAA Fisheries Service issued an open letter to the United States Congress, on May 14, 2004, stating, "after re-evaluating the listing of 26 species of salmon and steelhead, and considering the science on hatcheries, we have preliminarily determined to propose re-listing at least 25 of the 26 species." As a result, Oregon Coast Coho salmon was proposed for listing as "Threatened" under the Endangered Species Act on June 14, 2004 (50 CFR Parts 223 and 224). On June 16, 2005, the NOAA Fisheries Service stated that six more months would be needed to review new information provided by the State of Oregon. On January 16, 2006, the NOAA Fisheries Service determined that Oregon Coast Coho is "not warranted" for listing under the Endangered Species Act. Oregon Department of Fish and Wildlife and Oregon Natural Heritage Program list 1 still identifies the Oregon Coast Coho as "Critical," which confers Bureau Sensitive status to the species.

On April 15, 2004, the NOAA Fisheries Service changed some species from "Candidate" to "Species of Concern." This new terminology was introduced to reflect better those species that listing ". . . was 'not warranted,' but significant concerns or uncertainties remained regarding their extinction risk and/or threats . . ." (64 CFR 19975). The Oregon Coast steelhead (*O. mykiss*) Evolutionary Significant Unit was moved to the "Species of Concern" category.

On December 14, 2004, the NOAA Fisheries Service filed proposed rules to designate Critical Habitat for 20 species of listed salmon and steelhead in the Pacific Northwest (64 FR 74572). The Oregon Coast Coho salmon was included in this proposal.

Table III-13: Other Known or Suspected Special Status Fish, Aquatic Snail, Insect Species

Common Name	Scientific Name	Status	Species Information	Step #1 *Species Present on District Lands?*	Step #2 *Habitat Present/ Accessible in Action Area*	Step #3 *Species Present in Action Area?*	Step #4 *Will the proposed Action Affect this Species?*	Step #5 *What will the Effects be in Scope and Intensity?*
Fish								
Coho salmon (OC)	*Onchorhynchus kisutch*	FPT	anadromous, spawn and rear (1.5 yr) in smaller freshwater streams before migrating to ocean	Yes	Yes	Yes	No	N/A
Millicoma dace	*Rhinichthys cataractae ssp.*	OR- Sen	Coos River Basin, rubble areas in swifter waters	Yes	No	No	No	N/A
Snails								
Rotund lanx (snail)	*Lanx subrotundata*	OR- Sen	Freshwater snails found in large, turbulent water of large rivers. Confined to mainstem Rogue and Umpqua Rivers	Suspected	Yes	No	No	N/A
Robust walker	*Pomatiopsis binneyi*	OR- Sen	Perennial seeps, shallow mud banks and marsh seeps leading into shallow streams. Documented only in Chetco River drainage.	Suspected	Yes	No	No	N/A
Pacific walker	*Pomatiopsis californica*	OR- Sen	Wet leaf litter and vegetation near flowing or standing water in shaded areas, high humidity. Documented in the Lower Millicoma River subbasin.	Suspected	Yes	No	No	N/A
Newcomb's Littorine Snail	*Algamorda newcombiana*	OR- Sen	Bays/river edge	Suspected	Yes	No	No	N/A
Montane Peaclam	*Pisidium ultransmontanum*	OR- Sen	Mountain streams; pools; beaver ponds	Suspected	Yes	No	No	N/A
Insect								
Caddisfly	*Rhyacophila chandleri*	OR- Sen	Mountain streams	Suspected	Yes	No	No	N/A
Hairy Shore Bug	*Saldula villosa*	OR- Sen	Riparian vegetation of water bodies	Suspected	Yes	No	No	N/A

Special status aquatic species

The Table III-13 above lists other known and suspected special status aquatic species, and whether they will be affected by the proposed action.

DISTRIBUTION OF FISH SPECIES IN THE PROJECT AREA

See the Maps E-1-3 in Appendix A, seasonal restrictions, fish distribution, and ODFW habitat surveys for known distribution of salmonids within the Umpqua River-Sawyer Rapids watershed and surrounding subwatersheds. The distribution data is based on information obtained from the Oregon Department of Fish and Wildlife and summer period presence/absence surveys conducted by BLM staff over the past decade. There are numerous stream reaches on private lands, primarily in the agricultural and forestlands, which the BLM staff have not surveyed that are included in the Oregon Department of Fish and Wildlife aquatic habitat surveys.

Surveys of habitat use by salmonid species in these watersheds go back over a decade so the present known distribution of Coho and Chinook salmon and steelhead and cutthroat trout is established with high confidence. The exact distribution of all fish species in these watersheds however, is not known. In a study conducted on the West Fork Smith River, by the Environmental Protection Agency, Ebersole (2005 personal communication) documented upstream movement by PIT tagged juvenile Coho salmon into summer intermittent streams at the on-set of substantial winter rains. Within these watersheds, there may be seasonal undocumented use of small tributaries by fish when access is good due to increased flow volumes. Stream features, such as impassable barriers or high stream gradient can preclude fish access to small tributaries even during wet periods. Fish species such as lamprey, anadromous or resident forms, and sculpin could occur in stream reaches upstream of salmonids, but this has not been documented.

Table III-14: Fish Bearing Stream Miles by Subwatershed

Subwatershed Name	Fish Bearing Miles	Total Stream Miles
Big Creek-Lower Umpqua River	0	2.28
Halfway Creek	0	0.27
Little Mill Creek-Weatherly Creek	1.19	21.77
Lower Camp Creek	0	0.66
Lower Elk Creek	0.58	3.29
Lutsinger Creek-Sawyer Creek	2.66	29.38
Paradise Creek	3.10	26.31
Upper Camp Creek	0.02	0.02
Vincent Creek	0	0.47
Grand Total	7.55	84.46

Most of the stream miles within the units are relatively small, high-gradient stream courses. Most are 1st to 3rd order streams, and are not fish bearing but do eventually connect into a downstream fish bearing stream. Twenty-nine units are known to contain portions of fish-bearing stream reaches. A total of 84.46 stream miles are contained within all sale units and of this total only 6.97 stream miles (0.60 miles of fish bearing) are in units in adjacent subwatersheds. Of the 84.46 miles of stream channel across all the sale units only 9 % or 7.55 stream miles contain fish as shown in Table III-14. Cutthroat trout are found in all 7.55 stream miles. Coho salmon are found in 5.30 miles or 70% of the 7.55 fish bearing stream miles and Chinook salmon are found in only 0.27 miles of the 7.55 miles of stream or 3.5% of the fish bearing stream miles.

FISH HABITAT

In 1994 through 1996, the major landowners and watershed councils in the lower Umpqua and Smith River basins conducted aquatic habitat surveys. Oregon Department of Fish and Wildlife surveyed most of named streams in the Umpqua River-Sawyer Rapids watershed (Appendix A: Table III-16 and Maps E-1, 2, & 3 Seasonal restrictions, fish distribution, and ODFW habitat surveys). Some additional surveys of previously unsurveyed streams were done in 2005. Stream reaches in units in the adjacent subwatersheds are short and are not shown in Table III-16. Some in-stream restoration and storm-related habitat changes have occurred since the early surveys were done; however, those surveys remain are the best available information.

These surveys measured levels of many in-stream and riparian habitat features important to aquatic life and stream function. The Oregon Department of Fish and Wildlife established benchmarks for many of these features that are used to compare conditions across streams (Table III-15). Each habitat category is given a weighted value that is multiplied by the point values of 4, 3, 2 and 1, excellent to poor, and the sum of these are used to come up with an overall rating. This rating is a means of comparing stream reaches or whole streams in order to prioritize management proposals.

Streams were surveyed based on logical reaches that were broken out by habitat features such as tributary junctions. Each stream reach is rated relative to the benchmarks. The final cumulative rating for all streams is a "fair."

Table III-15: Oregon Department of Fish and Wildlife Aquatic and Streamside Habitat Benchmarks

Habitat Category	Benchmark Weighted Value (1-5)	4- Excellent	3- Good	2- Fair	1- Poor
Pools					
Pool Area %	3	>44.9	30-44.9	16-29.9	<16
Residual Pool Depth (Small 1st-3rd Order)	4	≥ 0.7	0.5-0.6	0.3-0.4	<0.3
Residual Pool Depth (Large 4th Order & Greater)	4	≥ 1.0	0.8-0.9	0.5-0.8	<0.5
Riffles					
Width/Depth Ratio	3	≤ 10.4	10.5-20.4	20.5-29.4	≥ 29.5
% Silt/Sand/Organics	2	≤ 1	2-7	8-14	≥ 15
% Gravel	3	≥ 80	30-79	16-29	≤ 15
Shade					
Riparian Vegetation (Dominant species ≥ 15cm)	2	≥ 45	30-44.9	16-29.9	≤ 15
% Shade (Stream < 12 meters wide)	2	≥ 80	71-79	61-70	≤60
% Shade (Stream > 12 meters wide)	2	≥ 70	61-69	51-60	≤50
Large Woody Debris					
Pieces/ 100 meters of stream	3	≥29.5	19.5-29.4	10.5-19.4	≤ 10.4
Volume/ 100 meters of stream	3	≥39.5	29.5-39.4	20.5-29.4	≤ 20.4

Pools

The ratings table shows many stream reaches had an excellent rating in the percent pools column. This could be misleading since all pool types (e.g. scour pool; plunge pool; dammed pool) were compared equal. If only high quality pools, such as dammed pools and plunge pools are considered, then most of the excellent ratings would change to poor or fair rating. Percent pool does not directly lead to a good comparison with the residual pool depth category where the majority of reaches rated poor with no reaches in the excellent rating.

Width/depth

The width-to-depth ratio is important in understanding a stream's adjustments to the water's energy in its channel, and the ability of various discharges within the channel to move sediment. Surveys are conducted in the low flow summer period but still should reflect quality in-stream habitat if present. Most stream reaches have a poor width to depth ratio reflecting a more uniformly wide and shallow channel, which is not quality habitat for fish production.

Riffles

Riffle ratings for gravel, and silts, sands, and organics give an indication of dominate particle size. No measurements of gravel depth were taken so the quality of the gravel for insect production and spawning habitat is not considered. Also not taken into consideration is the vast reaches of bedrock that dominate many stream channels with measurements ranging up to 65% in some stream reaches. Bedrock channels have low structural diversity and low fish and invertebrate production, and generally have poor width to depth ratios.

Table III-16: ODFW Habitat Ratings for Streams Surveyed in the Umpqua River-Sawyer Rapids Watershed

Stream Reach	Percent Pool /Rating	Residual Pool Depth /Rating	Width to Depth Ratio /Rating	Riffles, Silt, Sand, & Organics /Rating	Riffle Gravel /Rating	LWD Pieces /Rating	LWD Volume /Rating	Overall Rating
Burchard Cr. #1	21/Fair	0.4/Poor	17.7/Good	35/Poor	15/Poor	9.0/Poor	4.7/Poor	Poor
Burchard Cr. #2	20/Fair	0.4/Poor	8.5/Ex	40/Poor	29/Fair	27.9/Good	33.6/Good	Fair
Burchard Cr. Trib	15/Poor	0.4/Poor	7/Ex	33/Poor	28/Fair	23.0/Good	26.5/Fair	Fair
Burchard Cr. Trib	9.0/Poor	0.3/Poor	5.2/Ex	34/Poor	26/Fair	25.9/Good	32.4/Good	Fair
Cedar Cr.	36.0/Good	0.3/Poor	11.5/Good	4.0/Good	41.0/Good	22.8/Good	33.6/Good	Fair
House Cr. #1	69.1/Ex	0.4/Poor	80.8/Poor	26.0/Poor	69.0/Good	12.5/Fair	13.9/Poor	Fair
House Cr. #2	46.8/Ex	0.4/Poor	65.7/Poor	30.0/Poor	68.0/Good	24.1/Good	54.0/Ex	Fair
Lt. Mill Cr. #1	24.6/Fair	0.6/Fair	27.2/Fair	-	65.0/Good	13.2/Fair	36.5/Good	Fair
Lt. Mill Cr. #2	66.7/Ex	0.4/Poor	14.9/Good	-	76.0/Good	4.8/Poor	6.0/Poor	Fair
Lt Paradise Cr 1	21.2/Fair	0.5/Fair	130.4/Poor	11.0/Fair	10.0/Poor	14.8/Fair	21.2/Fair	Fair
Lt Paradise Cr. 2	245.3/Ex	0.5/Fair	108.1/Poor	43.0/Poor	45.0/Good	1.5/Poor	8.7/Poor	Fair
Lt Paradise Cr. 3	35.9/Good	0.4/Poor	77.3/Poor	6.0/Good	43.0/Good	8.0/Poor	3.7/Poor	Fair
Lt Paradise Cr. 4	96.1/Ex	0.4/Poor	50.0/Poor	12.0/Fair	45.0/Good	9.6/Poor	8.4/Poor	Fair
Lutsinger Cr. #1	60.9/Ex	0.4/Poor	53.2/Poor	21.0/Poor	17.0/Fair	16.3/Fair	14.9/Poor	Fair
Lutsinger Cr. #2	72.2/Ex	0.5/Poor	100.4/Poor	30.0/Poor	46.0/Good	32.6/Ex	68.6/Ex	Fair
Lutsinger Cr. #3	72.1/Ex	0.3/Poor	109.1/Poor	27.0/Poor	20.0/Fair	15.9/Fair	7.5/Poor	Fair
Lutsinger Cr. #4	37.9/Good	0.3/Poor	149.8/Poor	21.0/Poor	41.0/Good	21.8/Good	16.4/Poor	Fair
Lutsinger Cr. #5	54.7/Ex	0.3/Poor	66.1/Poor	74.0/Poor	37.0/Good	23.4/Good	25.0/Fair	Fair
Lutsinger Cr. #6	95.6/Ex	0.4/Poor	38.8/Poor	15.0/Poor	19.0/Fair	5.4/Poor	3.9/Poor	Fair
Lutsinger Cr. Trib #1	67.7/Ex	0.3/Poor	57.9/Poor	36.0/Poor	34.0/Good	27.3/Good	25.5/Fair	Fair
Lutsinger Cr. Trib #2	72.0/Ex	0.3/Poor	65.1/Poor	36.0/Poor	38.0/Good	16.2/Fair	29.1/Fair	Fair
Paradise Cr. #2	45.7/Ex	0.5/Fair	37.0/Poor	0.0/Ex	22.0/Fair	44.5/Ex	224.2/Ex	Fair
Paradise Cr. #3	55.8/Ex	0.0/0	49.4/Poor	13.0/Fair	20.0/Fair	5.2/Poor	1.1/Poor	Poor
Paradise Cr. #4	51.3/Ex	0.5/Fair	65.9/Poor	12.0/Fair	22.0/Fair	13.7/Fair	11.0/Poor	Poor
Paradise Cr. #5	61.6/Ex	0.3/Poor	72.2/Poor	26.0/Poor	61.0/Good	4.6/Poor	6.7/Poor	Poor
Paradise Cr. #6	64.2/Ex	0.3/Poor	64.7/Poor	25.0/Poor	78.0/Good	36.3/Ex	49.4/Ex	Fair
Paradise Trib #2	35.4/Good	0.4/Poor	64.7/Poor	0.0/Ex	56.0/Good	34.4/Ex	29.6/Good	Fair
Paradise Trib #2	22.8/Fair	0.4/Poor	27.0/Fair	18.0/Poor	63.0/Good	3.6/Poor	5.9/Poor	Fair
Patterson Cr.	62.8/Ex	0.3/Poor	43.2/Poor	23.0/Poor	50.0/Good	6.8/Poor	6.4/Poor	Fair
Purdy Cr. #1	42/Good	0,5/Fair	9.2/Ex	20/Poor	9.0/Poor	45.1/Ex	52/Ex	Fair
Purdy Cr. #3	10/Poor	0.4/Poor	9.4/Ex	21/Poor	21/Fair	33.9/Ex	52.5/Ex	Fair
Purdy Cr. #4	12/Poor	0.4/Poor	9.0/Ex	53/Poor	17/Fair	57.4/Ex	41.9/Ex	Fair
Purdy Cr. #5	12/Poor	0.5/Fair	5.1/Ex	52/Poor	23/Fair	18.5/Fair	21.7/Fair	Fair
Purdy Cr. #6	3.0/Poor	0.4/Fair	5.9/Ex	51/Poor	26/Fair	19.5/Good	13.7/Fair	Fair
Purdy Cr. Trib 1	4.0/Poor	0.4/Fair	4.5/Ex	50/Poor	26/Fair	32.3/Ex	49.5/Ex	Fair
Purdy Cr. Trib 2	0	0	4.7/Ex	82/Poor	5/Poor	85.4/Ex	22.3Fair	Fair
Sawyer Cr. #1	45.0/Good	0.6/Fair	40.0/Poor	35.0/Poor	57.0/Good	6.3/Poor	6.0/Poor	Fair
Sawyer Cr. #2	47.0/Ex	0.4/Poor	42.0/Poor	36.0/Poor	42.0/Good	1.4/Poor	1.8/Poor	Fair
Sawyer Cr. #3	47.0/Ex	0.4/Poor	27.5/Fair	34.0/Poor	54.0/Good	7.4/Poor	24.7/Fair	Fair
Weatherly Cr.#1	65.2/Ex	0.6/Fair	70.5/Poor	18.0/Poor	36.0/Good	11.4/Fair	8.4/Poor	Fair
Weatherly Cr.#2	48.4/Ex	0.5/Fair	53.1/Poor	18.0/Poor	50.0/Good	11.1/Fair	9.5/Poor	Fair
Weatherly Cr.#3	68.2/Ex	0.5/Fair	38.3/Poor	22.0/Poor	58.0/Good	4.3/Poor	3.8/Poor	Fair
Weatherly Cr.#4	63.2/Ex	0.4/Fair	53.2/Poor	16.0/Poor	62.0/Good	24.1/Good	22.4/Fair	Fair

Large wood in channels

Only seven channel reaches have an “excellent” rating for both the numbers of pieces and the volume of large woody material in the channel. Nearly twice (13) that many reaches show a poor rating for both number of pieces and volume. Large wood plays a major role in creating and maintaining structural diversity and quality pool habitat, supporting gravel deposition, and improving width to depth ratios.

In-stream restoration

Habitat surveys provide the baseline habitat condition for most fish-bearing streams in the watershed. They also indicate what habitat features are lacking in streams. In-stream restoration in the Umpqua River-Sawyer Rapids watershed, and other fifth field watersheds, have centered on providing large structure in the form of large boulder clusters or weirs and large logs in stream channels. In-stream structures act to retain gravel, other pieces of wood and organics, including fish carcasses as well as providing cover for fish and other aquatic life.

FISH PASSAGE

Replacing culverts that block or hinder adult or juvenile fish passage, and/or are not structurally sound, is a major restoration action in the Coos Bay District. Generally, all stream crossing culverts installed before 1994 are undersized by current standards. The oldest culverts are nearing or past the end of their design life. In addition to restricting access to habitats, these conditions can restrict or block streamflow, cause chronic sediment delivery, and risk road failure.

Properly sized culverts open inaccessible stream reaches to migratory fish and other aquatic life, as well as, providing for substrate and wood routing and prevent road failures. Most major culverts under BLM-controlled roads in this watershed, which cross fish-bearing streams, have been replaced during the past 12 years. These new culverts are designed to pass all life stages of fish. This has opened several miles of upstream habitat to fish use. Some culverts in the general project area, including a subset under roads accessing proposed units, have not been upgraded to current standards. These place the associated roads at risk of failure and prevent upward movements of fish and other aquatic life.

Combined efforts of watershed councils, private landowners, the Oregon Department of Fish and Wildlife and BLM have restored 21 miles of stream habitat and replaced six fish-passage culverts in the watershed. Culvert replacement projects are coordinated with watershed councils. To date, restoration has focused primarily in the Paradise Creek, Weatherly Creek, Butler/Lutsinger Creek and Sawyer Creek subwatersheds.

NO-ACTION ALTERNATIVE

FISH HABITAT

Riparian area conifer and hardwood vegetation, which contribute directly to aquatic habitat features, will receive no treatment. Shade levels, large wood debris input, organic matter and nutrient input, streambank stability, and sediment retention will remain at current levels over the area covered by this proposal. Under the no-action alternative, opportunities to manage stand densities across the landscape would be delayed or foregone. The benefits derived from enhancing these structural characteristics in the project area would be delayed due to the intense competition between individual trees within overstocked stands. Habitat conditions for species that are associated with or depend upon mature riparian habitats would remain unchanged over all but the very long-term.

Without catastrophic natural events contributing materials to stream channels, aquatic habitat conditions will remain overall in the “fair” category until conifer stands reach mid-seral to late-seral condition. At that stage, large trees start to contribute durable large woody material to the stream channel increasing habitat complexity. This condition may not be achieved for many decades. Under the no-action alternative, there will be a gradual improving trend in aquatic and fish habitat condition over the very long-term.

IN-STREAM RESTORATION

The local watershed council, the “Partnership for the Umpqua Rivers” has been very active in aquatic habitat restoration within the entire Umpqua River basin. They excel in bringing partners together to plan, fund, and implement restoration projects. Most projects consist of culvert replacement for fish passage or placing large log and boulder structures into fish-bearing streams to provide habitat structure that were removed through stream clearing or fire, or are no longer reach streams through because they are intercepted by roads. Restoration projects have also been done by BLM prior to the involvement of the "Partnership for the Umpqua Rivers" in the lower Umpqua River. These restoration efforts focused only on the BLM-owned stream reaches. In-stream projects have been completed in Lutsinger Creek, Weatherly Creek, and Paradise Creek over approximately 10 miles of stream. Opportunities for restoration still exist in the Umpqua River-Sawyer Rapids watershed. Additional restoration projects are planned through the watershed council and will be implemented as funding is obtained.

PROPOSED ACTION: ALTERNATIVE I - COMMERCIAL THINNING/DENSITY MANAGEMENT THINNING

FISH HABITAT

Project design features are identified for ground disturbing management actions to prevent or reduce impacts to fish and aquatic habitats. Implementation of project design features and best management practices will reduce, and in many cases eliminate, direct and indirect measurable adverse impacts to these habitats and their associated species. As proposed, only 32 units are immediately adjacent to streams that are fish bearing. Of the 84.46 miles of stream channel contained within or adjacent to the sale units only 7.55 miles (8%) are fish bearing. Cutthroat trout are found in all 7.55 miles (8%), while Chinook salmon are in 0.27 miles (0.3%) and Coho are found in 5.3 miles (6.3%) of the total stream miles.

Unit boundaries are designed to locate fish bearing streams toward unit edges, thus buffering streams from ground disturbing activities. Perennial and fish bearing streams will, on average, receive a 60-foot no-harvest buffer. This means that these streams are physically buffered, with no new harvest related activities occurring on or over stream channels except widely spaced narrow yarding corridors. Within the entire sale area, 2.53 miles of fish-bearing streams are within unit borders and will require physical buffers from harvest activities. Of the 2.53 stream miles buffered within sale units, Chinook salmon are in 0.19 miles (7.5%), Coho salmon are found in 1.21 miles (48%) and cutthroat trout are in all 2.53 miles.

TIMBER HARVEST ACTIVITIES

All perennial streams including fish bearing streams will receive, on average, a 60-foot no-harvest buffer on both sides of the channel. In many locations, this distance will be greater than 60 feet, and in some locations, such as the north side of a stream where there is no effective shading by adjacent conifers, it may be reduce to 30 feet. This distance will be enough to protect fish and aquatic habitat in both the long and short term.

Timber harvest activities are proposed over a period of approximately 7 years; however, operations on individual sales may be delayed thus extending the period. By regulation, timber removal on any individual sale is limited to 3 years except when the rights to cut and remove timber are extended for specific reasons allowed in the regulations. The number of units proposed for harvest that buffer fish bearing streams are spread about equally over several years. In any one year, no more than 2.51 miles of fish bearing streams will be adjacent to with harvest units.

As described in the Vegetation section of this chapter, density management thinning within the Riparian Reserves will set the stand trajectory toward reaching mature forest characteristics at a more rapid rate. This is important since most key piece sized large wood recruits to stream channels from within the Riparian Reserve. Mature forest characteristics of streamside buffer areas will be delayed, so these areas will contribute smaller wood to channels through natural mortality.

Roads

The project area has an extensive existing road network including a well-maintained paved mainline road system. Paved road systems generally parallel major streams systems. Some new ridgetop roads will be constructed to accommodate timber harvest; however, no new roads will be constructed on or within the riparian zone of any perennial stream. Most of the new roads consist of short spurs off main roads extending out short ridgelines to landing sites. Most of the new road surfaces will be rocked. However, some new construction will be out rocky ridges and will require no surface rock. These naturally surfaced roads will be seasonally restricted for timber hauling and will be weather proofed between use and at the end of hauling.

Portions of seventeen spurs ranging in length from 0.01 mile to 0.23 mile, averaging 0.07 mile, and totaling approximately 1.27 miles will be constructed within Riparian Reserves. None of these new spurs are on floodplains, and none of them are in the Riparian Reserve of a perennial stream channel. These spurs are on or near ridgetops inside the Riparian Reserves of headwall streams. Eleven of these spurs will be decommissioned or fully decommissioned at the end of project activities.

Log yarding

The existing and planned ridgetop road system will allow roads to be used as a continuous landing system, and by that, reduce the number of yarding corridors crossing stream channels. Yarding corridors which cross streams will be needed in some areas to implement forest management, but will be kept to a maximum width of 12 feet. Full log suspension would be required over all stream channels in stream crossing corridors.

An estimated 445,949 feet (84.46 miles) of stream channel is inside the units of this proposed project. Approximately 357 yarding corridors over stream channels will be needed to thin these units. With corridors averaging of 12 feet wide, the cumulative length of stream channel inside the yarding corridors would be approximately 4,284 feet. This is approximately 1% (0.96%) of the total stream channel length inside the proposed units. Approximately 39,864 feet of fish-bearing stream channel are inside or adjacent to harvest units. Fourteen yarding corridors are proposed to cross over fish-bearing stream reaches for a cumulative total of 168 feet of open canopy over stream corridors, or 0.4% of the total fish-bearing reach length. Intermediate lift trees will be used to minimize damage to stream canopy cover over fish bearing reaches.

CUMULATIVE EFFECTS

Because no detrimental impacts to fish populations or their habitats are expected to result from the proposed projects, no negative short or long-term cumulative effects are anticipated. However, the cumulative effects to local fish populations, in-stream habitat, and riparian-dependant species are likely to be beneficial.

The BLM, the Partnership for the Umpqua Rivers, and private timber companies will continue to cooperate to join resources for completing additional miles of aquatic and fish habitat restoration. The long-term positive effects of density management in Riparian Reserves combined with the aggressive restoration efforts of land owners within the local watershed will provide for improved stream function and fish habitat over the long-term.

Forest management activities can have direct impact on aquatic and fish habitat include timber harvest, road construction and upgrades, log haul, and log yarding. An analysis of the effects of these activities on aquatic and fish habitat in shown in Appendix Table F–2. The analysis considers the position of management activities on the landscape related to streams, distance of ground disturbing activities from fish bearing streams, and any connectivity to fish bearing stream reaches. It also takes into consideration project design criteria, and best management practices to determine the potential of impacts to aquatic and fish habitat. Considering this guidance it is determined that there is no loss of fish or aquatic habitat and no direct or indirect delivery mechanism for sediment entry to any fish bearing stream across all sale units.

GEOLOGY

AFFECTED ENVIRONMENT

Geologic resources are normally not affected by timber harvest actions. Instead, the geologic characteristics of the project area may determine the use of special project design features or incorporation of additional best management practices. The use of these features and practices is employed to reduce or eliminate adverse impacts to other resources, particularly aquatic resources including water quality. Nonetheless, the effects of management actions on geologic process are addressed to determine if the proposed action will result in increased risk to resources of value.

The project areas are located in the Tyee sedimentary basin. The stratigraphies within the project include members of the Tyee Formation and Elkton Formation. All of the units are sedimentary sandstone, siltstone, and mudstone, exhibiting characteristics attributed to the Elkton and Tyee Formations.

Associated hazards of the Elkton Formation include erosion and mass movement. Mass movement includes all forms of movement, ranging from creep to slumps to debris torrents (Beaulieu and Hughes, 1975). The silt portions of the unit are more susceptible to slumping and rotational failures.

Associated hazards of the Tyee Formations, and those similar in lithology, include rapid erosion, flash flooding, rapid mass movement, and stream bank erosion. Steepness of slope, angle of stratigraphy dip, and different combinations of stratigraphy type, moisture, and disturbance determine the types of failures. Geologic units of the project have been mapped with up to 13-degree dip. However, not all geologic structures are mapped.

No faults were identified within the project areas. The units are located within an anticline-syncline structure. The only geologic implication of this feature is that the stratigraphic dip directions change and can be opposites on either side of the anticline-syncline axis; however, the mapped dip angles are minor.

NO-ACTION ALTERNATIVE

This alternative would have minimal direct, indirect, or cumulative impacts on existing geologic conditions. Continued development of the natural system would not affect the underlying stratigraphy except in the aspects of geologic time. Large-scale landslides would not be impacted by this alternative. Localized rotational and translational slides would continue to be impacted where existing roadbeds truncate the slide body flow path. Geomorphology of the area would continue to have the present influences of the current road systems. Landslides and debris flows are natural components of the geologic processes within the watershed and would continue at the present rate.

PROPOSED ACTION: ALTERNATIVE I - COMMERCIAL THINNING/DENSITY MANAGEMENT THINNING/ALDER CONVERSIONS

This alternative would have minimal direct, indirect, or cumulative impacts on existing geologic conditions. Continued development of the natural system would not affect the underlying stratigraphy except in the aspects of geologic time. Project activities, likewise, would not have short or long-term impacts to geologic processes within the watershed. With implementation of the project design features, the frequency of large-scale landslides would not be affected by this alternative. The removal of trees within the commercial thinning harvest areas will not decrease slope stability, as the root systems would largely be left intact. The alder conversion areas are located on relatively stable slopes and similar projects within the watershed have not resulted in increased erosion or landsliding.

The intersection of dip planes or the reactivation of currently inactive slides by road construction may create minor localized slope erosion. However, the maximized use of existing road systems and the use of previously compacted surfaces in new road construction for this alternative reduce the possibility of these impacts.

The construction of new road systems that cause the mobilization of dip beds or reactivate pre-existing slides could add to the current impacts of a road system. However, the minimization of new road systems has mitigated most of this potential and no cumulative increase in major landsliding is expected within the watershed.

SOILS

AFFECTED ENVIRONMENT

The soils within the project are derived from the Elkton Formation and the Tyee Formation. They include:

Absaquil-Honeygrove-McDuff Complex
Atring Gravelly Loam
Atring-Larmine Complex
Atring-Larmine-Rock Outcrop Complex
Bateman Silt Loam
Damewood-Bohannon-Umpcoos Complex
Digger-Bohannon Complex
Digger-Bohannon-Umpcoos Complex
Digger-Preacher Complex
Digger-Umpcoos-Rock Outcrop Complex
Fernhaven-Digger Complex
Honeygrove Gravelly Clay Loam
Honeygrove-Peavine Complex
McDuff-Absaquil-Honeygrove Complex
Meda Loam
Orford Gravelly Silt Loam
Preacher Loam
Preacher-Bohannon Complex
Preacher-Bohannon-Digger Complex
Preacher-Bohannon-Xanadu Complex
Rock Outcrop-Umpcoos Complex
Sibold Fine Sandy Loam
Umpcoos-Rock Outcrop-Damewood Complex
Wintley Silt Loam
Xanadu Gravelly Loam

The highest percent of area compaction exists in Unit 42 with 21.89 percent of the acreage showing compaction. However, this is due to the presence of natural rock banding and not due to management activities. All other units are below the maximum area of allowable compaction of 12% (USDI-BLM, 1995). The Timber Production Capability Classification, with the appropriate management directives, have been applied to this project.

NO-ACTION ALTERNATIVE

This alternative would have minimal direct, indirect, or cumulative impacts on the existing soil condition and current activities. The current road system allows access by motor vehicles on existing natural surfaced roads, which may cause the disruption of soils and erosion controlling vegetation, allowing for mobilization of sediments to the waterways.

The no-action alternative would not provide for the repair, maintenance, or decommissioning of roads that are in poor or undrivable condition. Surface water flows have heavily rutted some of these roads creating the potential for sediment delivery to streams. Failing stream crossings would continue to bleed sediment, and some would continue to present a risk of sudden failure. The regeneration of a forest soil O-horizon would continue. Slow decompaction of historically impacted soils would also continue under the influence of natural processes such as root growth, animal burrowing, organic accumulation, and development of an O-horizon. Through extended time, these processes may return the soils to a pre-management condition.

PROPOSED ACTION: ALTERNATIVE I - COMMERCIAL THINNING/DENSITY MANAGEMENT THINNING/ALDER CONVERSIONS

Cable logging would create temporary surficial ground disturbance by movement of soil where logs are suspended on one end. The effect would be a temporary impact of less than 1% of the cable yarding area with vegetation growth reclaiming the affected areas within a few growing seasons.

Road construction along slopes may create minor soil failures that are normally resolved with routine road maintenance. New road construction would slightly increase the area of compacted soils, however, the maximized use of existing road systems, the use of previously compacted surfaces for road renovation and "new road" construction, and the implementation of the design features for this alternative would reduce these impacts. Total area compaction for each unit, except unit 42 is estimated to be less than the limit placed by the Coos Bay District Record of Decision and Resource Management Plan (USDI-BLM, 1995).

Some soil erosion from cutbank sloughing and from the road surface can be expected, especially from heavy rains during the first winter following construction, harvest, and site preparation activities. It is not anticipated that these sediments would enter the streams, due to the location of the roadbeds. Surface erosion generated during the harvest, road and landing construction would migrate very short distances before being filtered by duff and woody materials. Seeding, mulching, and/or slash covering (as defined by the design features) of the bare soils would minimize the impacts created by road and landing construction and yarding corridors.

Renovation of existing roads would consist of roadside brushing, reshaping, and restoring the surface where necessary, maintaining or improving drainage structures, and applying rock surface where needed. Currently low- or no-maintenance roads used by the project would be upgraded to current standards. As described in the design features, where needed, the installation of water bars and removal of any culverts would be included as part of the decommissioning after harvest activities.

Ground-based harvesting with current technology will produce little compaction. The main requirements would be that the operators ensure that there is ample slash under the equipment (there should be no exposed mineral soil), to minimize passes to the greatest extent, and to use existing compacted skid roads for main pathways (Cafferata, 1992).

Based on the analysis of the historic and existing compaction, as well as review of the proposed harvest systems, total compaction for temporary spurs and the ground-based and cable yarding systems will not exceed the 12% threshold defined in the Resource Management Plan.

As stated earlier, at present, the upper six inches of old skid roads within the timber sale units have recovered to partially recovered from previous timber sale activity. On the old skid trails, trees have begun to seed in and a duff layer of ½-inch to 1½-inches has developed on the surface. Ranging from approximately one to five inches below ground surface, a fragipan is still present. Subsoiling of the old skid roads may not be necessary because total compaction is below the 12% limit.

Because fragipans resulting from existing roadbeds are still present, renovation of these systems would not increase road related compaction. Therefore, there would be no cumulative impact of road related soil compaction and infiltration loss would be minor and localized. Surface water would be transferred to immediately adjacent areas where the infiltration capacity is adequate to prevent surface erosion or gullying. No adverse cumulative watershed impacts are expected to occur as a result of road renovation, improvement, construction, or decommissioning.

Additional compaction would be realized by the creation of new roads. However, the total compaction is below the limit recommended in the Coos Bay District Record of Decision and Resource Management Plan (USDI-BLM, 1995).

WILDLIFE HABITAT AND T & E SPECIES

NO-ACTION ALTERNATIVE

Under the no-action alternative, second growth stands within the project area would continue in their current development trajectory. The overstocked conifer stands would continue to exhibit suppression-related morality resulting in the smaller understory trees dying. The larger more dominant trees will rapidly occupy whatever growing space is freed by the death of the smaller trees and limiting resources available to the understory vegetation. As described in the vegetation section, the stands will eventually emerge from the stem exclusion stage and enter into the understory reinitiation stage of stand; however, due to high stand densities, the development of late-successional habitat characteristics would be postponed. A single story canopy with a narrow size and age range would continue to dominate the stand. In the absence of disturbance, vertical stand complexity would remain relatively unchanged over the next several decades. Individual tree crown development would continue to be narrow, with small branches and low live crown ratios. The herbaceous/shrub layer would show little development until such time that the stand opens up through competition or disturbance.

Stand projection simulations suggest that it will take unthinned stands 200 years to produce large-diameter forest structure associated with late-seral stands (USDI BLM 2001). In contrast, Tappeiner et al. (1997) found that many Coast Range old-growth stands developed under low stocking densities and developed large diameter trees capable of providing large structure by the time those trees were 50 years-old.

Some species associated with mid-seral stands would continue to use the project area, and would benefit from the delay of late-successional habitat conditions. Hayes (2001) found that unthinned stands of similar age and structure maintained species such as the Pacific-slope flycatcher (*Empidonax difficilis*) and golden-crowned kinglet (*Regulus satrapa*). Though some species are more common in dense, unthinned stands, no species are known to depend on this development stage (Hayes et al. 1997).

The current trajectory of snag and coarse wood development would continue. Snags and coarse wood would primarily come from the suppressed crown classes and would generally be smaller than the dominant overstory trees. As suppression mortality continued, there would be an increase in species associated with this habitat as flushes of snags and coarse wood become available. Species utilization depends on the size of the material, stage of decay, as well as amount on the landscape. Primary cavity excavators such as the pileated woodpecker (*Dryocopus pileatus*) uses a variety of snag sizes for foraging, but generally prefers larger snags for nesting. Due to tree size, most of the snags and coarse wood in the project area would provide foraging substrate, but would not provide nesting habitat except for smaller of cavity nesting species. Longevity of the snags and down wood would be short due to the overall size of the material and swiftness of decay.

NORTHERN SPOTTED OWL

Under the no-action alternative, stands in the project area would continue to provide spotted owl dispersal habitat. Late-successional conditions, which would provide suitable nesting habitat for spotted owls, would be delayed because of the current high stocking levels of the stands.

MARBLED MURRELET

Except for the few remnant trees, the project area is not currently providing suitable habitat for marbled murrelets. Development of large trees with potential nesting structure would be delayed under the no-action alternative. The stand development trajectory of densely stocked conifer would remain different from that which occurred in most stands that currently provide suitable habitat.

BIG GAME SPECIES

Adequate hiding and thermal cover for big game would remain in the proposed project area. Forage would remain low on BLM land within the project area; however, in the short term, forage habitat is increasing on private ownership in the project area. Disturbance from harvest or road work on BLM land would not occur. Road densities on private lands within the watershed would increase slightly over current levels.

PROPOSED ACTION: ALTERNATIVE I - COMMERCIAL THINNING/DENSITY MANAGEMENT THINNING/ALDER CONVERSIONS

THREATENED AND ENDANGERED WILDLIFE SPECIES OCCURRENCE AND HABITAT

BLM administers about 35% (33,269 acres) of the Umpqua River-Sawyer Rapids watershed. Nearly all of this BLM land within the watershed is capable of becoming or remaining suitable habitat for spotted owls and marbled murrelets. Approximately 77% (25,528 acres) of the BLM administered, habitat-capable acres within the watershed are currently protected by Late-Successional Reserves including unmapped LSRs, administrative withdrawals (primarily sensitive soils), Riparian Reserves, or Congressional withdrawals.

Within the analysis area, 19 spotted owl sites are known to occur on BLM lands. Eleven of these sites are alternate sites where individual spotted owls have changed locations. According to GIS data, portions of 57 proposed units are adjacent to habitat that includes suitable spotted owl nesting habitat. Seasonal restrictions would apply to those portions of units within distances that may cause disturbance, as described in Chapter II, project design features and Table II-6; unless an evaluation of site-specific conditions indicates that restricted distances may be modified. Examples of site-specific conditions, which would be considered, include topographic shielding from noise, local ambient noise levels, duration of disturbance, type and number of disturbances, no nest occupation during the breeding season, or other factors that may decrease the level of potential disturbance.

There are no currently valid marbled murrelet surveys for the analysis area. Surveys for murrelets were conducted between 1994 and 2000 in portions of 12 sections in the analysis area in conjunction with previous projects. None of the surveys indicated that murrelets were present. The period of validity of the surveys has now expired and all suitable marbled murrelet habitats are now considered unsurveyed suitable habitat. There are no known occupied marbled murrelet stands within the project area. GIS data indicates that portions of 54 proposed units may be within 100 yards of unsurveyed suitable marbled murrelet habitat. Potentially disturbing activities would be seasonally restricted in those areas, as described in Chapter II project design features and Table II-7 unless site-specific conditions warrant an adjustment of the restricted area. Any reduction in the area requiring restrictions would be evaluated on a case-by-case basis. Factors to be considered include the type and duration of the disturbance, the probability of the adjacent habitat being occupied, based on habitat quality, including the size and number of potential nesting platforms, prevalence of moss, height and density of secondary canopy trees, and topographic shielding or other factors which may lesson the potential disturbance.

The proposed action would not result in the removal of suitable habitat for spotted owls or marbled murrelets. All proposed units located within the Late-Successional Reserve are also within designated northern spotted owl and marbled murrelet Critical Habitat Units. The habitat in all proposed units is considered spotted owl dispersal habitat, and the more open stand following thinning would continue to provide dispersal habitat.

OTHER SPECIAL STATUS WILDLIFE SPECIES AND HABITAT

On July 9, 2007, it was announced that the bald eagle has been removed from the list of threatened and endangered species. The USFWS rationale for delisting the bald eagle placed considerable emphasis on the proportion of the bald eagle population currently nesting on federally controlled lands, and the existing protections afforded them. As such, those existing protection measures should be maintained (BLM Information Bulletin No. 2007-107). When a Federally listed species becomes de-listed, the species is then categorized a Bureau sensitive species.

Eight bald eagle nest sites have been identified within the analysis area. No suitable habitat for bald eagles would be removed in this action. A part of one proposed unit is within 800 meters of one currently active bald eagle nest. Potentially disturbing activities would be seasonally restricted in this area, as described in Chapter II project design features and Table II-8, unless surveys indicate that bald eagles are not using the nest site. There are no known bald eagle roosts within 800 meters of any of the proposed units.

There are no known sites for any former survey and manage wildlife species. Although survey and manage species restrictions have been removed for wildlife species, and protection is no longer required, the proposed project is expected to have long-term beneficial effects to habitat for former survey and manage species. The proposed action would not reduce canopy closure below 60 percent in the Douglas-fir dominated commercial thinning units, which has been considered the minimum level for red tree voles and previous survey and manage mollusk species. Following thinning, the conifer stands are expected to progress to improved red tree vole habitat sooner than if thinning did not occur.

One special status mollusk species, *Prophysaon vanattae pardalis* (spotted tail-dropper), is thought to be a habitat generalist and may occur within the project area. The species is poorly known from 17 sites range-wide. Of the 14 sites where habitat was described: four (29%) were found in late-seral coniferous forests (forests greater than 80 years old), eight (57%) were found in mid-seral stands 46 to 75 years old, and two were found in residential/urban settings that included a city sidewalk and a firewood pile. Because of limited specific information on the spotted tail-dropper, a reasonable assumption is that its habitat requirements may be similar to that of other local forest-dwelling members of the genus *Prophysaon*. Research on other mollusk species in the genera (*P. coeruleum, P. dubium,* and *P. andersoni*) indicated no significant difference in the number of detections between thinned and unthinned stands. Previous data for stand conditions where *Prophysaon* species have been found indicates that canopy closure of 60% ±10% may provide suitable conditions in the Coast Range (Duncan, pers. comm.). Only incidental surveys targeting the spotted tail dropper have been conducted because the proposed project is not considered a threat to the persistence of the species.

There are no known caves, mines, or abandoned wooden bridges or buildings, which are known to be used as bat roosts, within any of the units. No other known sites of any special status wildlife species occur within the proposed units.

MIGRATORY BIRDS

Management direction for migratory birds on BLM lands stems from three sources. They are; the Migratory Bird Treaty Act (MBTA) of 1918 which legislated agreements on bird conservation in the United States, Canada, Japan, Mexico and the former Soviet Union; Executive Order 13186 which identifies the responsibilities of Federal agencies to protect migratory birds; and, the North American Bird Conservation Initiative (NABCI) which strengthens bird conservation among the United States, Mexico, and Canada. These measures direct the BLM to integrate bird conservation principals and practices into land management planning and to analyze proposed actions for their effects on migratory birds and their habitat.

The NABCI, by facilitating the development and exchange of information, established a relationship between entities concerned with the status and protection of birds and federal land management agencies. For example, Partners in Flight developed a Continental Landbird Conservation Plan (Rich et al, 2004) that provides information on bird habitat associations and conservation concerns and opportunities. Regionally, Partners in Flight developed Conservation Strategy for Landbirds in Coniferous Forest of Western Oregon and Washington (Altman, 1991). The plan bases its assessment on selected focal species whose habitat relationships may be used to represent a larger array of birds. The plan provides the framework from which agencies may assess impacts from proposed projects, including timber sales.

Using the regional plan, the BLM assessed the potential affects of the proposed actions on focal species that may occur within forested stands on the project area. In general, there are two types of stands proposed for treatment. The first are heavily stocked, even-aged (approximately 50 years-old), and with single canopies and few shade-tolerant shrubs or trees in the understory. The second are hardwood stands composed of nearly 100% red alder.

OVERALL TREND

The project would improve or maintain conditions for most land birds by increasing stand habitat variability across the planning area. The conifer harvest prescriptions will result in more rapid tree growth, deeper crowns, and more light in the understory. Hardwood prescriptions will result in the availability of early seral habitat in the short-term. Because of these actions, birds associated with shrubs and multi-layered canopies will benefit while those associated with high canopy closures and deciduous trees will be displaced. However, given the preponderance of the latter habitats across the landscape, the proposed actions represent a net benefit to land birds, at least in the short-term (10 years). Canopy closure in the treated conifer stands is expected to return to pre-project levels within 10-15 years.

Within stand habitat variability will be increased through the following actions:

1. The inclusion of unlogged “leave islands” in both hardwood and conifer stands.
2. Harvest prescriptions to provide variable thinning densities.
3. Retention of minor tree species.
4. Creation of small canopy gaps.
5. Retention and creation of down logs and snags.

Approximately 7,628 acres (45%) of the BLM managed stands inside the analysis area are in the same age classes and provide similar habitats as do the units in the proposed project, but will not receive treatment under this project. The untreated stands will continue on their current developmental trajectory, and thus will experience the same effects as described under the no-action alternative. These highly stocked and dense canopied stands will continue to limit deciduous understory development until they transition into the understory reinitiation stage of stand development (20-50 years).

WODIP data identifies approximately 7,047 acres of hardwoods inside the analysis area across all ownerships (Appendix A-Map B Hardwood stand and proposed units.) Of this, approximately 717 acres of hardwoods are distributed across the proposed units. One hundred sixty-seven acres, or 23% of that hardwood area, are red alder stands proposed for conversion to conifer stands. As described in the vegetation section, the 167 acres of conversion would prove habitats for early-seral associated wildlife species. Hardwood habitats will be retained inside no-treatment areas including stream channel buffers.

The retention of hardwood species other than alder, and the selection of a portion of the dominant alder as leave trees, will maintain a hardwood component to the habitats inside the proposed thinning units. Naturally occurring mortality will, through time, result in the decline of acres supporting alder in the areas managed for late-successional habitats and watershed protection. However, naturally occurring disturbances will provide conditions allowing alder regeneration and thus a permanent presence of alder-associated habitats on the landscape.

As displayed in Table III-17, the proposed action is expected to have the following local effects on the eleven focal species of migratory birds within treated units in the next 10-15 years:

- improve populations of five focal species,
- maintain populations of three focal species, and
- decrease populations of three two focal species.

Because each focal species represents more than one bird species, the numbers above represent overall trends for a variety of species that share similar habitats (Altman, 1999).

Table III-17: Focal Species and Expected Outcomes within the Project Area Units, Based on Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington

Focal species	Key Habitat	Current long-term*/ short-term** Population trends	Expected No-Action Trend	Expected Proposed Action Trend
Hermit Warbler	Closed conifer canopy	Increase/increase	Increase	Decrease
Pacific-slope flycatcher	Deciduous canopy trees	Decrease/decrease	Increase	Decrease
Hammond's flycatcher	Open mid-story conifers	Stable/stable	Stable	Stable
Black-throated Gray Warbler	Deciduous canopy trees	Stable/stable	Stable	Decrease
Wilson's Warbler	Deciduous shrubs and trees	Stable/decrease	Decrease	Increase
Winter Wren	Forest floor complexity	Stable/decrease	Stable	Increase
Hutton's Vireo	Deciduous subcanopy/understory	Stable/stable	Decrease	Increase
Olive-sided flycatcher	Large residual open conifer canopy trees	Decrease/decrease	Stable	Stable
Western bluebird	Snags in early seral	Decrease/decrease	Stable	Stable
Orange-crowned warbler	Deciduous vegetation	Decrease/decrease	Decrease	Increase
Rufous hummingbird	Nectar-producing plants	Decrease/decrease	Decrease	Increase

Source: Altman, 1999
* Long-term trends from 1966-1996
**short-term trends from 1980-1996

OTHER WILDLIFE SPECIES AND HABITAT

There are no known unique or special habitat areas within the proposed units. There are very few large snags in any of the units. Most of the existing snags and down logs do not meet the Coos Bay District Record of Decision/Resource Management Plan recommendations due to small size (less than 15 inches) or advanced beyond decomposition class 2 (USDI BLM 1995).

Recommendations for snag creation following the thinning operation will be based on the availability of conifer trees of sufficient diameter to provide nesting habitat for primary excavator bird species. Stand diameters following thinning generally would not allow meeting the habitat requirements for all of these species. Therefore, recommendations within the units that meet the minimum size requirements in the smaller two-thirds of the trees in the stand would be for snag creation of the largest available of these trees in total numbers of snags to attempt to support 100% of the species. This approach would follow watershed analysis recommendations (USDI-BLM 2004) and would result in creation of one to five snags per acre, depending on the land use allocation, and the diameter of the largest trees in the smaller two-thirds of the stand. The created snags would be conifer trees only, and in proportion to the species presence in the stand. All existing snags would be retained, and not included in the snag creation prescription. Snags created as a result of logging operations, or any suitable snag that remains after logging regardless of the origin, would be included if they meet the minimum height and diameter requirements of approximately 50 feet tall and 15 inches in diameter. Approximately 50% of the created snags will be in small groups of up to six snags and the remainder of the snags will be distributed across the unit with emphasis on north-facing slopes.

Prescriptions for snag creation in the GFMA and Riparian Reserves would follow the general recommendation of 1.5 snags/acre in units where the largest available trees in the smaller two-thirds of the stand are 16 inches dbh or larger.

In Late-Successional Reserve units, where the largest available trees in the smaller two-thirds of the stand are 16 inches dbh or larger approximately two snags per acre would be created. Recommended distribution of snags would be to create approximately one snag per acre on south-facing slopes and three snags per acre on north-facing slopes. In all units, where the largest available trees in the smaller two-thirds of the stand are 16 inches dbh or larger, the tree diameters of the created snags would be within the 15-19 inch dbh range.

In Late-Successional Reserve units, where the largest available trees in the smaller two-thirds of the stand are 18 inches dbh or larger approximately four snags per acre would be created. Distribution of snags would be approximately three snags/acre on south-facing slopes and five snags/acre on north-facing slopes. In all units where the largest available trees in the smaller two-thirds of the stand are 18 inches dbh or larger, the tree diameters of the created snags would be within the 17-21 inch dbh range.

Recommendations for providing coarse woody material would be based on stand exam data indicating existing levels and availability on a unit-by-unit basis to provide the levels recommended in the watershed analysis. In general, down wood creation would occur in stands where the largest available trees in the smaller two-thirds of the stand are 18 inches dbh or larger. In stands meeting this minimum size standard, one tree per acre would be felled and left on site.

In stands where the largest available trees in the smaller two-thirds of the stand are less that 16 inches dbh, creation of snags and down wood would not be planned as part of this project. Stand development following the proposed action would provide increased availability of larger trees and improved potential to provide larger snags and coarse woody material in the future.

The proposed harvest areas are approximately 31 to 80-year old conifer plantations. The stands are typical even-aged second growth with high canopy closure, low structural diversity with little to no shrub or herbaceous layer. These stands have canopy closure exceeding 60% and often reach 100%, which allows very little ground vegetation. Stands of this type are used by approximately 36 species of wildlife for the primary purposes of feeding or breeding. An additional 92 species of wildlife are known to use stands of this type secondarily for feeding or breeding (Brown 1985). The expected species composition for this habitat type includes large mammals such as black bear, deer, elk, coyote, bobcat, and mountain lion. Smaller mammal species include bats, shrews, moles, weasels, squirrels, chipmunks, ground squirrels, porcupine, and mountain beaver. Bird species found in habitats such as these include Cooper's and sharp-shinned hawks, grouse, owls, and many species of neo-tropical migrant birds. Several species of salamanders, frogs, and snakes also use stands such as the proposed harvest area.

A large stick nest located in one unit, which had been active in early spring of 2006, was detected after activity at the nest had ceased. Evidence collected at the nest site did not determine a positive identification of the species using the nest, so additional surveys will be required in subsequent years to determine status. If the area is found occupied in the future by a protected species, buffering and seasonal restrictions would be applied as directed by the Coos Bay District Resource Management Plan (USDI-BLM 1995). To maintain important existing habitat features, the marking contractor will be instructed to reserve any tree containing any obvious existing nest, regardless of activity level, to protect potential nesting structures.

The density management thinning would reduce crown cover, which would allow development of additional ground vegetation. Many of the existing wildlife species will continue to use the stand. Thinning will remove trees that otherwise would have succumb to suppression mortality, and by that, reduce the number of snags and down trees produced in the near-term. The leave trees, having more growing space following thinning, would experience more rapid diameter growth. This will reduce the time needed to obtain the large trees necessary to provide large diameter snag and down wood habitats. When snags and down wood are recruited through suppression mortality, they come from small diameter trees in the intermediate and suppressed crown positions in the stand. Larger-diameter snags and down wood are typically recruited by small-scale disturbance agents in the dominant and codominant trees, such as mechanical injury or root disease. To maintain some existing smaller habitat structure, the logging contractor may leave standing any non-merchantable, defective, or small trees to provide short-term availability of these habitat features.

The wildlife species that may be found in the proposed units are included in a complete list of wildlife species known to occur on the Coos Bay District. This list is in Appendix T of the Final Coos Bay District Proposed Resource Management Plan and Environmental Impact Statement, Volume II (USDI-BLM, 1994). Several Special Status birds, mammals, and amphibian species potentially could occur in the proposed units. Table III-18 below lists Special Status species that occur on the Coos Bay District and the project-specific effects to the species.

Table III-18: Special Status Wildlife Species on the Coos Bay District

Common Name	Scientific Name	Key Habitat, Presence on Coos Bay District	Project Specific Effects, or Comments
Birds			
marbled murrelet	*Brachyramphus marmoratus*	Late-seral forest, potential occupied sites near proposed units	NLAA, seasonal and daily timing restrictions applied. No suitable habitat removal
Aleutian Canada goose (wintering)	*Branta canadensis leucopareia*	Coastal grass lands	None, not present
American peregrine falcon	*Falco peregrinus anatum*	Cliffs, no potential nest sites in analysis area	None, habitat not present
Arctic peregrine falcon	*Falco peregrinus tundrius*	Generalist; Cliffs (in breeding range)	None, only an occasional winter migrant on District
bald eagle	*Haliaeetus leucocephalus*	Late-seral forest, known nest sites within analysis area	None, seasonal restrictions applied. No suitable habitat removal
dusky Canada goose	*Branta canadensis occidentalis*	Open grasslands, wet meadows	None, not present
northern spotted owl	*Strix occidentalis caurina*	Late-seral forest, known occupied sites near proposed units	NLAA, seasonal restrictions applied. No suitable habitat removal
bobolink	*Dolichonyx oryzivorus*	Grassland	None, habitat not present
Lewis' woodpecker	*Melanerpes lewis*	Recently burned forest, oak/pine habitats	None, habitat not present
white-tailed kite	*Elanus leucurus*	Pastures, open grasslands; typically low elevations	None, habitat not present
Oregon vesper sparrow (CR, KM)	*Pooecetes gramineus affinis*	Grassland	None, habitat not present
purple martin (CR, KM)	*Progne subis*	Snags in early-seral habitats	None, habitat not affected
streaked horned lark (CR, KM)	*Eremophila alpestris strigata*	Open beach; open ground with short grass or scattered bushes	None, not present
trumpeter swan	*Cygnus buccinator*	Marsh, wet meadows, bogs, ponds	None, not present
Amphibians			
California slender salamander	*Batrachoseps attenuatus*	Late-seral forests, large down logs (especially class 3-4)	None, presence very unlikely
foothill yellow-legged frog	*Rana boylii*	Perennial streams with rock or sand substrate.	None, habitat not affected
Reptiles			
northwestern pond turtle	*Clemmys marmorata marmorata*	Lentic water (ponds, slow sections of rivers). Nests in open areas adjacent to water, can over winter in forest	None, habitat not affected
Invertebrates			
hoary elfin butterfly	*Incisalia polia maritima*	Maritime?	None, not present
insular blue butterfly	*Plebejus saepiolus littoralis*	Open areas, clover	None, habitat not present
mardon skipper	*Polites mardon*	Grass openings with Idaho Fescue and serpentine	None, habitat not present

Common Name	Scientific Name	Key Habitat, Presence on Coos Bay District	Project Specific Effects, or Comments
green sideband	*Monadenia fidelis beryllica*	Deciduous trees & brush in wet, undisturbed forest at low elevations.	Unknown
salamander slug	*Gliabates oregonius*	Mature conifer forest w/leaf litter	Unknown
Oregon shoulderband	*Helminthoglypta hertleini*	Rocky & talus substrates	None, habitat not affected
spotted tail-dropper	*Prophysaon vanattae pardalis*	Moist, mature forests w/deciduous/shrub layer. Coastal fog zone.	None, presence unlikely, habitat remains suitable
Tillamook western slug	*Hesperarion mariae*	Unknown	Unknown

This table includes Bureau Sensitive Species, but does not include marine or coastal species.
KM = Klamath Mountains
CR = Coast Range

IMPACTS ON WILDLIFE

Activities involved with the proposed action would have temporary disturbance impacts to a variety of wildlife species and could effect normal activities and expose individuals to additional risk. The smaller, less mobile species such as mollusks, amphibians, and small mammals, would be particularly vulnerable on a local level, but should not be seriously affected at a local population scale.

Yarding of logs across large down logs in advanced states of decay would cause damage to an important habitat feature, which would not be replaced in the short-term. Some existing snags would also be damaged as a result of the proposed action. Helicopter logging, as proposed for some units, would slightly reduce impacts to down logs in advanced decay classes.

Reports from a large study on the effects of commercially thinned and unthinned 40 to 55-year old Douglas-fir stands in the Oregon Coast Range indicate that bird detections and bird species richness have increased in thinned stands (Hagar et. al., 1996). Weikel and Hayes (1997) found that thinning for old-forest characteristics would likely have a positive impact on populations of cavity nesting birds in both the short and long-term.

Timber harvest in the proposed areas would decrease the amount of thermal and hiding cover for big game species. Thermal cover rejuvenates in approximately five to seven years in a commercially thinned area; however, thermal cover is not a limiting factor for big game populations within the project area. Increased understory growth following the proposed action may benefit elk and deer populations. Elk populations are currently at a low to moderate level with good growth potential. Improved foraging conditions would exist for big game animals in the hardwood conversion units until the new stands reach canopy closure. Limiting factors may be forage availability because of reduced harvest in the area over the past several years. Deer populations are lower than in the 1970s and 1980s and are stable or slightly decreasing (J. Toman, pers. comm.).

EFFECTS DETERMINATION FOR LISTED SPECIES AND CRITICAL HABITAT

Northern spotted owl

There are 19 known historic northern spotted owl sites in the analysis area, and several spotted owl core areas are within distances that would require seasonal restrictions on portions of several units. Additionally, Table II-6 identifies seasonally restrictions where potentially disturbing activities are in the proximity of suitable nesting habitat for owls where surveys have not been completed within the previous five years. This restriction is applied to avoid disturbance of new but unrecorded owl sites. Suitable nesting habitat for owls generally overlaps with marbled murrelet suitable habitat (See Appendix A - Map E-1, 2 & 3 Seasonal restrictions, fish distribution, and ODFW habitat survey reaches). The spotted owl seasonal restrictions would apply to approximately 75 harvest areas within 57 units, for a total of about 931 acres; however, the number of affected units may fluctuate depending upon final unit delineation. Within the seasonally restricted areas, no potentially disturbing activities would occur from March 1 through June 30, as described in Table II-6 in the project design features section of this document. The habitat within all units is considered spotted owl dispersal habitat, and the more open stand conditions following thinning would continue to provide dispersal habitat. Spotted owls have been observed within the project area; however, the project would not adversely affect suitable habitat for spotted owls and would not cause adverse disturbance to spotted owls. The effects determination would be that the project "may affect, but is not likely to adversely affect" spotted owls or spotted owl critical habitat.

Marbled murrelet

Many units are within distances that would require seasonal and daily timing restrictions on portions of the units because the units are near unsurveyed suitable habitat for marbled murrelets. The distances and restriction are described in Table II-7 and the project design features section of this document. Within the restricted areas, no potentially disturbing activities would occur from April 1 through August 5. Additionally, from August 6 through September 15, a daily timing restriction would limit potentially disturbing activity to the time between 2 hours after sunrise and 2 hours before sunset. The marbled murrelet restrictions would apply to approximately 72 harvest areas within 54 units, for a total of about 1,433 acres. The number of affected units may change depending on upon final unit delineation. Suitable habitat includes individual conifer trees, which have at least one suitable platform, and associated protective cover for the platform on the same tree or on a nearby tree. Suitable habitat is not located within the boundaries of the proposed units except as individual remnant trees or in small groups of remnant trees. Current guidance provides different recommendations for groups of less than six remnant trees within a five-acre moving circle, and groups of six or more trees within the five-acre moving circle. An explanation of the requirements is included in Project Design Feature - T&E Species - 5. Adherence to these requirements would result in a "may effect, not likely to adversely affect" determination for marbled murrelets and marbled murrelet critical habitat.

CUMULATIVE EFFECTS PROPOSED ACTION: ALTERNATIVE I

Cumulative effects of timber harvest at the landscape level were analyzed in the Final Supplemental Environmental Impact Statement (USDA-FS; USDI-BLM, 1994a) and mitigation measures have been incorporated into the Northwest Forest Plan Record of Decision (USDA-FS; USDI-BLM, 1994b). The implementation of the proposed action would be consistent with the Standards and Guidelines set forth in the plan.

Implementation of the proposed action would not have any appreciable negative impacts to any wildlife species including those listed as threatened or endangered. While the proposed action would reduce existing canopy density, it will accelerate progression to achievement of late-successional stand characteristics, including more complex forest structure in the future including larger trees with larger crowns. The resultant stand would be more similar to late-successional forest due to variation in density and distribution of overstory and understory vegetation. The growth of leave trees at lower densities would decrease the time needed for the creation of large diameter trees, snags, and large woody material on BLM lands within the project area.

BOTANY

AFFECTED ENVIRONMENT

The proposed commercial thinning/density management area exhibits mostly various plant associations of coniferous forests with some hardwood woodlands and some open grasslands. The most extensive plant associations are the early to mid seral stage western hemlock conifer stands. The early to mid seral stages portray 15- 40 year the forest whose canopy closure have rapidly lowered brush density and are just reaching first merchantability (USDI 1995). The vegetation reflects the gradual moisture transition, going west to east, from higher moisture coastal conditions to lower moisture, drier climate. The main geographical feature of the Watershed is the mountainous ridgelines that support timber stands intermixed with sporadic rock bands and waterfalls. Some of the steep rock bands which give support grass/forb communities and could be considered special habitats.

The majority of the density management thinning units are densely stocked, 30 to 60 year-old trees conifer plantations. Douglas-fir (*Pseudotsuga menziesii*) is the dominant over story species and can comprise an upwards of 80% of many of these stand. Western hemlock (*Tsuga heterophylla*) and Douglas-fir are the two major overstory components in western half of the proposed area. Grand fir (*Abies grandis*) Western hemlock and Douglas-fir are major components in the overstory in the eastern half of the proposed area. Western cedar (*Thuja plicata*), Grand fir, tanoak (*Lithocarpus densiflorus*) and Madrone (*Arbutus menziesii*) are minor overstory components that are usually present in most of the units in a widely scattered pattern. In some areas though, a higher concentration of one of these species can be located demonstrating a different plant association within the unit.

Remnant legacy trees of 80 years and older of mostly Douglas-fir and Grand fir can also be found scattered throughout the proposed project area either in large clumps or located sporadically in amongst the younger trees. The understory hardwood tree component is patchy with minor amounts of tanoak on the upper slopes and scattered red alder (*Alnus rubra*) and bigleaf maple (*Acer macrophyllum*) in drainage bottoms, wet areas, and along open and roadside areas. Understory shrub and herbaceous plants communities are underdeveloped in many areas due to dense canopy layer. Rhododendron (*Rhododendron macrophyllum*) and Oregon grape (*Berberis nervosa*) typically dominate the drier ridge tops, upper slopes, and south and west aspects. Vine maple (*Acer circinatum*), salal (*Gaultheria shallon*) and red huckleberry (*Vaccinium parviflorum*) typically dominate the more moist lower slopes, drainage bottoms, and north and east aspects which usually contain a low herbaceous cover typified by sword fern (*Polystichum munitum*) and sorrel (*Oxalis oregana*) in varied dense amounts in the semi-shaded canopied areas. Other fairly common shrubs and herbs found in the majority of the area are ocean spray (Holodiscus discolor), creeping blackberry (*Rubus ursinus*), salmonberry (*Rubus spectalibis*), bedstraw (*Gallium aparine*), redwood violet (*Viola sempervirens*) and trillium (*Trillium ovatum*).

Lichen diversity is often low in dense young stands due to limited light. Lichens typically are more abundant on the edges of these stands, in riparian areas where there are hardwood components, and in areas where there are canopy gaps and sunlight can penetrate the lower canopy and forest floor. Also, where older trees prevail, lichen populations tend to exist in abundance in both the upper and lower canopy vegetation. Previous windstorms produced numerous amounts cyano-bacteria lichens on the ground many of which are old-growth influenced. Older mature hardwood shrubs such as ocean spray (*Holodiscus discolor*) contain the greatest species richness for macrolichens and bryophytes (Muir et al. 2002).

Large class 3, 4 & 5 logs and stumps on the forest floor can be quite abundant in some units. These structures generally provide excellent habitat for a diverse array of bryophyte and lichen species particularly when they are uncharred from past post-harvest slash burning. A study shows that bryophyte cover appeared to be the greatest on older shrub stems (Muir et al. 2002).

Fungi quantity and species diversity is often fairly high in closed canopy stands. Habitat is present for special status fungal species as indicated by three species documented within project area. See Appendix C Appendix Table C–1. Various-sized patches of larger remnant trees which, serve as suitable host species for many fungi, are scattered throughout the proposed project area. Studies show that the older the trees present, the number of fungi species associated with it not only increases, but the variety of species also changes (Molina et al. 2001).

Many fungi form mycorrhizal connections (ectomycorrhizal) with the surrounding vegetation via root hair tips contributing to soil structure maintenance, lessening low moisture stress factors and provide a buffer from toxic metals (Amaranthus and Perry, 1994). Most trees species within the Pacific Northwest are ectomycorrhizal (Amaranthus and Perry, 1987) and can have up to eight species of fungi can be attached to one tree or shrub.

Fungi occupy a wide range of habitats including dead and down coarse woody debris, undisturbed soils, and suitable host species which is prevalent within most units. They also provide many ecosystem roles including decomposition of coarse woody debris; making nutrients available for many other species that depend on woody debris as a substrate; and help hold soil together which aids soil porosity and stability. The presence of larger remnant trees scattered throughout project area would potentially serve as suitable host species for fungal habitat. As plant species composition changes during forest succession, the fungi community undergoes change. Fungi succession is in response to changes in tree composition, tree age, and soil qualities, such as accumulation of organic matter (Molina et al. 1993). Retention of downed and decayed woody debris in the stand would provide continued support for ectomycorrhizal fungal activity (Amaranthus and Perry 1994). Decayed wood contain 25% higher moisture than the adjacent forest soil and existing fungus mycelium would potentially aid in the stands transformation. The potential for future snags and coarse woody debris creation is greater in thinned stands than unthinned stands (Bailey and Tappeiner, 1998).

POTENTIAL SPECIAL STATUS PLANT ASSOCIATED HABITAT AREAS WITHIN THE EA AREA

Grassy balds and rock bands

Several open grassy balds adorn the landscape within an area larger than a square mile in the northern portion of the proposed project. There are also open grassy balds with moisture mossy seeps in various locations throughout the proposed project area. These sites have a high probability of containing special status plant species habitat. Appendix Table C–2 and Appendix Table C–3 in Appendix C provides a complete list of all Special Status plant species known or suspected to occur on the Coos Bay BLM district that have potential habitat within the Umpqua River/Sawyer Rapids project area. The majority of the steep rock bands characterize many southern exposures of the steep mountainous terrain while sustaining thin soil structure dominated by mosses and forbs and delineated by hardwoods covered with epiphytic lichens. The moisture gradient of these open steep areas can range from very dry to extremely wet habitat creating ideal conditions for a wide variety of bryophytes, lichens, forbs and some shrubs. Mosses such as *Bryum* sps., *Fontinalis* sps., and *Racomitrium* sps. are some of the common varieties prevalent in such sunny, thin-soiled habitat. Forbs such as Hound’s tongue (*Cynoglossum grande*) and Fawn’s lily (*Erythronium* sps.) along with *Saxifrage* sp., *Lomatium* sp., *Phacellia* sp., *Nemophilla* sp. and Gold-backed fern (*Pentagamma triangularis*) are drier habitat indicators on the rock band. Drier bluffs within the Umpqua River Valley contain potential habitat for Koehler’s rockcress (*Arabis koehleri* var. *koehleri*), a Bureau sensitive species, and a state candidate for species of concern (ORNHIC 2007). Persistent moisture seeps that generate rich mossy hollows on open rocky balds are potential habitat for two Sensitive species: Thompson’s maiden (*Romanzoffia thompsonii*) and coffee fern (*Pellaea andromedifolia*). Thompson’s maiden occurs on rocky balds at Slater Creek and Kenyon Mountain near Remote. Coffee fern occurs at Cherry Creek Ridge and Irwin Rocks on the Coos Bay District.

The rock bands give support to a prolific legacy of older shrubbery that serve as hosts to epiphytic macrolichens scattered throughout the open and forested areas. The dominating shrubs consists of ocean spray, and poison oak (*Toxicodendron diversilobum*) while lower occurrences of California hazelnut (*Corylus cornuta* var. *californica*), and Baldhip rose (*Rosa gymnocarpa*) can be found intertwined amongst the vegetated areas. Douglas-fir, Western hemlock and Madrone (*Arbutus menziesii*) line the rock band edges, sharply defining the transition between the grassy open areas and the forested areas. Cyano-lichen and alectroid lichen species associated with old-growth stands are prevalent in tree branches along the rock band edges. Older tree branches and older shrub stems provide ideal substrate for several special status lichens. Forests edges and openings are potential habitat for some Special Status Species lichens such as *Bryoria subcana* and *Loberia linita*. *Bryoria subcana* is known from several sites in late-seral Douglas-fir forests on district.

Older remnant trees

Patches of older remnant trees (in excess of 80 years) exist scattered or clumped throughout the project area. These older trees are potential host sites for lichens, bryophytes and fungi species. Remnant older trees serve as important substrate for epiphytes and habitat for other species as well (Muir et al. 2002). These huge remnant tree boles on ridgelines provide substratum for macrolichens such as Bryoria subcana, which has more than one site located on older trees within the project area. Older tree branches and older shrub stems provide ideal substrate for several Special Status Species lichens. Appendix Table C–3, in Appendix C, lists the nonvascular Special Status Species on the Coos Bay District and summarizes habitat information.

Epiphyte hotspots

There are several open patches of concentrated hardwood shrubbery gaps called hotspots containing a high diversity of epiphytic nitrogen-fixing macrolichens scattered throughout the southern portion of the EA area. These areas potentially sustain the greatest species richness of both macrolichens and bryophytes on shrubs in open hardwood shrubby habitat. Hotspots typically have a higher rate of cyanolichens and can host a number of species not typically located in other areas of the stand types (Muir et al., 2002). Macrolichens such as Lobaria oregana and Pseudocyphellaria anthrapsis for example are associated with old-growth stands and remnant old trees in young-growth stands within the EA area.

The open rocky balds, the remnant trees and the open older shrubby patches amongst the older trees represent habitat that would be considered hotspots or have a higher probability of containing habitat for special status species that typically would not be located within a younger stand. Other habitat areas of interest for surveying within the project area are the riparian areas where there is a higher moisture gradient regime and contains a medium to high probability for containing special status plant species habitat. Typically, the plant associations present within the above described areas are different from the rest of the young densely stocked coniferous stand. These areas would have a higher probability of containing special status plants.

NO-ACTION ALTERNATIVE - COMMERCIAL THINNING/DENSITY MANAGEMENT

VASCULAR PLANTS

Most of the conifer stands are typical even-aged second growth 30 to 70 years old with a high canopy closure. Overall, these stands have low structural diversity due to dense stocking resulting in very little light reaching the forest floor. As a result, there would be less herb and shrubs cover in the understory than if the stand were thinned (Bailey & Tappeiner 1998). Special Status Species would tend to persist in the analysis area as the young stand of Douglas-fir would continue to follow successional stages that are typical of forests in the western hemlock, Douglas-fir, and grand fir vegetation series.

High-density stands fully occupy the available growing space, which in addition to limiting light availability at the forest floor, also limits availability of water and mineral nutrients for other plants (Parsons et al. 1994). Over time, the dense overstory canopy cover in the young stands would continue to limit vascular plant growth. Understory shrub and herb cover would be very low in most stands except were occasional gaps occur in the stands due to natural events such as blow down. The herbaceous and shrub layers would show little development until the stand is opened up to accommodate other varieties of vegetation through less competition of light, soil, and moisture.

Dense canopy cover in the young stands would continue to limit vascular plant growth. Under story shrub and herb cover would be very low in most stands except were occasional gaps occur in the stands due to natural events such as blow down. Under the no action alternative, it is probable that the stand would exhibit a percent of suppression mortality while in its current developmental trajectory. The herbaceous/shrub layer would show little development until the stand can be opened up to accommodate other varieties of vegetation through less competition of light, soil and moisture.

NONVASCULAR PLANTS

Young conifer stands would remain densely stocked with very little light reaching the forest floor. Light levels would remain low in the understory of the stands resulting in a continue decline and mortality of overtopped hardwood trees and legacy shrubs. High stocking levels cause trees to develop short crowns and constrain diameter growth of branches that remain alive. The no-action alternative would result in a gradual recruitment of new suitable habitats, such as gaps and deep-crowned heavy-limbed trees, and would result in the loss of existing habitats, or hotspots, such as hardwood trees and older shrubs (Neitlich & McCune 1997).

Bryophyte abundance would remain low except in areas where coarse woody debris, forest gaps, and hardwoods exist.

Forest management data is slowly becoming available regarding fungi richness and abundance. As plant species composition changes during forest succession, the fungus communities undergo change (Molina et al. 1993). Since plant-species composition would not be altered, and the present fungal community would not be disturbed, the current species association would likely persist.

Areas with coarse woody debris, forest gaps, and hardwoods would continue to host the greatest diversity of bryophytes (Rambo & Muir 1998). Riparian areas also typically support a high species richness and unique composition on shrubs. Lichen and bryophyte diversity would change in correspondence to changing light levels and plant species composition. Canopy gaps, remnant old growth trees, "wolf" trees and hardwoods would continue to be the primary areas of macrolichen diversity (Neitlich & McCune 1995). Areas with coarse woody debris, forest gaps, and hardwoods would continue to host the greatest diversity of bryophytes (Rambo & Muir 1998). As plant species composition changes during forest succession, the fungus communities undergo change (Molina et al. 1993).

NO-ACTION ALTERNATIVE - ALDER CONVERSIONS

VASCULAR PLANTS

There are approximately 166.6 acres of proposed alder conversion in 14 parcels within the project area. This constitutes about 0.05% of the entire watershed that will be converted from alder to conifer under the proposed action alternative.

The hardwood conversions are around 40-50 years old and are dominated by red alder. Red alder is a relatively short-lived species maturing around 70 years, with maximum age usually around 100 years (Worthington et al. 1962). Given the current trend of alder succession, the indirect effect of this action is that the over story canopy would begin to deteriorate allowing more light to reach the forest floor. Other hardwoods components such as tan oak and bigleaf maple would continue to thrive along with the understory vegetation. The red alder stands would continue to have under canopy dominated by salmonberry that tends to increase with or without the breakup of the overhead story (Hibbs et al. 1994).

CUMULATIVE EFFECTS

Special Status vascular plants that may occur in alder stands are not uniquely associated with red alder, but rather these species have ecological amplitudes that overlay an array of habitats. There are no populations of Special Status vascular plants are documented in the proposed alder conversion units. No action would forego an opportunity to manage for attributes favorable to special status vascular plants associated with mixed stands, conifer stands, or with the understory of multistory-stands.

NONVASCULAR PLANTS

Several nonvascular Special Status Species are associated with mature alders such as *Cetrelia cetrarioides*, *Diplophyllum plicatum* and *Erioderma sorediatum*. Most stands proposed for conversion are around 40-50 years of age, which is close to what is considered mature age for red alder (Worthington et al. 1962). Within the next few decades, the over story will start to break up creating gaps in the canopy. Canopy gaps, remnant old growth trees, wolf trees, and hardwoods are primary areas of macrolichen diversity in forested stands (Neitlich & McCune 1997). A large hardwood component with gaps created by break up of the over story would promote favorable conditions for macrolichen diversity in these units.

There is limited data available on the effects of forest management as related to fungi richness and abundance. As plant-species composition changes during forest succession, the fungus communities undergo change (Molina et al. 1993). Since plant-species composition would not be altered, and the present fungal community would not be disturbed, the current species association would likely persist.

CUMULATIVE EFFECTS

Lichen and bryophyte diversity would change in correspondence to changing light levels and plant species composition. Canopy gaps, remnant old growth trees, wolf trees, and hardwoods would continue to be the primary areas of macrolichen diversity (Neitlich and McCune 1997). In the absence of disturbance, the stand could remain vertically unchanged over the next several years.

PROPOSED ACTION: ALTERNATIVE I - COMMERCIAL THINNING/DENSITY MANAGEMENT

VASCULAR PLANTS

Currently many of the density management thinning units have a dense canopy cover with little light reaching the forest floor. The lack of light reaching the forest floor reduces the cover of shrubs and forbs (Klinka et al. 1996) almost to the point of nothing but trees prevail in the forest. Thinning young Douglas-fir stands increases the development of multistory stands. Conifer regeneration is recruited while small overstory trees survive and the understory growth increases (Bailey & Tappeiner 1998).

Suspected terrestrial Special Status plants (e.g. *Eucephalus vialis*, *Cimicifuga elata* and *Pellaea andromedifolia)* could be affected by ground-based machinery used in timber harvest. Logging equipment could displace soil increasing the potential for establishment of non-native or invasive species. Helicopter logging, as proposed for some units, could reduce impacts to those areas that have a higher propensity for supporting special status species described earlier. Direct effects to the Sensitive status species can be avoided in the project area because known sites would be protected with buffers

Variable-density thinning and differences in thinning by aspect would occur to some extent throughout the proposed project. This could provide some beneficial indirect effects to those Special Status plants that require more light, such as *Eucephalus vialis* or *Illiamna latibracteata* by opening up the canopy providing more light. However, even-spaced harvest methods do not produce a patchy, diverse understory that fosters development of late-seral forest characteristics. Also, biological legacies including large live trees, down wood, and tree and shrub diversity is needed (Carey & Curtis1996). Some of this is provided through the retention of both older remnant trees found scattered throughout the project area and variable hardwoods located within the riparian areas.

CUMULATIVE EFFECTS

Similarities in understory vegetation between young, unthinned stands and old-growth stands suggest that native vascular plants in the Coast Range are quite resilient to environmental change (Bailey et al. 1998). Species richness, composition, total cover, and individual species frequency and cover have been shown to be indistinguishable to native plant species after severe disturbances such as logging and burning in the Coast Range in after more than 50 years (Oliver 1981).

NON-VASCULAR PLANTS

Conventional commercial thinning appears to have little effect on the epiphytic macrolichen communities in young stands (Peterson & McCune 1998). Conventional thinning prescriptions can result in a reduction in the number of tree species present in a stand, loss of remnant old trees and small diameter trees and wider the spacing between trees (Peterson & McCune 1998). However, incorporating gap creation and retention of hardwoods, wolf trees, and old-growth remnant trees can benefit the majority of epiphytic macrolichens in young conifer stands (Neitlich & McCune 1997).

In areas where past management or disturbances have largely eliminated suitable substrates for lichens, retaining remnant trees, which survived past disturbances, can provide sources of green algal-foliose pioneer lichen species that can slowly spread outward to recolonize the sites. Since lichens, both cyanolichens and alectorioid lichens, grow slowly and disperse slowly (Bailey 1976), retaining the larger trees should conceivably prove and larger and potentially more varied sources of lichen propagules for future inoculation of conifers and hardwoods.

Variable-density thinning, along with retention of older remnant trees, gap creation, and retention of islands of unthinned trees, increases the range of potential habitats. This, in turn, favors increases in species richness of several macrolichen groups, such as old-growth and hardwood associates, as well as generalists when compared to even-spaced thinning (Muir et al. 2002). This may be due to lower level of disturbance, higher moisture level, larger remnant old trees, and the presence of hardwoods. Proliferation of epiphytes in hardwood stands contributes to the abundance of light during the cool and moist seasons when they are most active physiologically (Muir et al. 2002)

Thinning and opening young, dense, managed stands would favor bryophyte abundance (Rambo & Muir 1998). Retention of hardwoods species during thinning would contribute to a diverse and abundant bryophyte community (Rambo & Muir 1998). The retention of remnant old-growth trees will ensure a continuing supply of coarse woody debris to the forest floor (Rambo & Muir 1998). Removal of red alder and damage to exiting existing older shrubs would temporarily decrease bryophyte diversity. Bryophyte cover appeared to be the greatest on older shrub stems and damage to shrubs during thinning may temporarily lower bryophyte abundance (Muir et al. 2000).

CUMULATIVE EFFECTS

Retaining legacy trees, particularly hardwoods and large conifers, can mitigate the damage to the shrub substrates by providing sources of propagules to recolonize shrubs that are regenerating, resprouting, and expanding in response to increased light to the forest floor. Opening the canopies would allow new shrubs to become established, which could provide new substrates for the lichens and bryophytes. Bryophyte abundance is lower in dense stands and positively correlated with canopy gaps, percentage of hardwoods, and incident solar radiation (Rambo & Muir 1998). Following thinning, tree crowns expand to recapture the newly created growing space. By the eighth year, canopy closure will approximate pretreatment conditions in those stands thinned to a relative density of 35 or higher (Chan & Cole 2002). In summary, macrolichen communities in thinned stands differed from those in old-growth stands and landscape-level hotspots, yet were comparatively similar to unthinned young-growth stands.

Areas with coarse woody debris, forest gaps, and hardwoods would continue to host the greatest diversity of bryophytes (Rambo & Muir 1998). Bryophyte cover appeared to be the greatest on older shrub stems and damage to older shrubs during thinning may lower bryophyte abundance (Muir et al. 2002).

There is limited data available on the effects of forest management as related to fungi richness and abundance. Chanterelle (*Cantharellus cibarius*), a common species of ectomycorrhizal fungi, was found to fruit in significantly lower numbers following thinning (Pilz et al. 2002); however, several recently thinned stands on the eastern edge of the Coos Bay District have abundant chanterelle as recently as one year following ground-based harvest. Declines were greatest in the most heavily thinned stands. It is likely that as the trees resume vigorous growth and the forest canopy closes, then chanterelles would fruit at the same levels prior to the thinning. Further studies are needed to verify this hypothesis (Pilz et al. 2002).

As plant species composition changes during forest succession, the fungal community undergoes change. Fungi succession is in response to changes in tree composition, tree age, and soil qualities, such as accumulation of organic matter (Molina et al. 1993). Retention of downed and decayed woody debris in the stand would provide continued support for ectomycorrhizal fungal activity (Amaranthus & Perry 1994). Decayed wood contain 25% higher moisture than the adjacent forest soil and existing fungus mycelium would potentially aid in the stands transformation. The potential for creating large snags and coarse woody debris is greater in thinned stands than unthinned stands (Bailey & Tappeiner, 1998).

PROPOSED ACTION: ALTERNATIVE I - ALDER CONVERSIONS

VASCULAR PLANTS

Despite dramatic loss of plant cover in response to clear-cut logging and slash burning of experimental watersheds (Halpern 1989, Halpern & Franklin 1990), loss of diversity is a short-lived phenomenon. Within two years after burning, species richness exceeded old-growth levels. Most additional taxa are native, ruderal herbs (Halpern & Spies 1995). Thus, dramatic changes could be expected in plant cover, but these changes would be short-lived.

CUMULATIVE EFFECT

Currently, of the 94085 acres within the Umpqua River-Sawyer Rapids watershed, 37.6% is on federal lands, which equates to over 35,000 acres. In the proposed project area, after the hardwood conversions, the hardwood cover would drop less than 1% or approximately 168 acres of the 7050 acres of hardwood present in the Umpqua River-Sawyer Rapids watershed area.

Species richness, composition, total cover, and individual species frequency and cover have been shown to be indistinguishable to native plant species after severe disturbances in the Coast Range such as logging and burning in stands greater than 50 years (Oliver 1981). Thus, no adverse cumulative effects in vascular plant species richness or abundance are expected.

NONVASCULAR PLANTS

Within the alder conversion areas, lichen and bryophyte species abundance would initially drop dramatically. Pioneer species such as green algal-foliose lichens and early successional bryophytes would slowly recolonize the new conifer plantation. These impacts could be mitigated in areas where remnant conifer, particularly the larger trees, as well as some other hardwoods that may be present are retained. The most important action promoting the accumulation of old-growth associated epiphytic lichens is the retention of propagule sources in and near cutting units. These propagules are typically provided by older, remnant trees (Sillett et al. 2000). In addition, richness of forest floor bryophytes is enhanced when a full range of coarse woody debris decay classes is present (Rambo & Muir 1998). Thus, leaving down wood, particularly any conifer trees that may be present would be helpful in developing bryophyte species richness in the ensuing young conifer plantation.

Nonvascular Special Status species associated with mature alders such as *Cetrelia cetrarioides*, *Diplophyllum plicatum* and *Erioderma sorediatum* could be adversely affected by ground-based machinery used in timber harvest or fuels reduction activities or form burning handpiles. Removal of the alder canopy will also change stand-level environmental conditions, such as increased light and temperature and reduced atmospheric moisture; however, effects of the proposed activities on Special Status Species plants that occur in the proposed project area will be avoided because known sites would protected with buffers. If any special status vascular or nonvascular plant species is encountered incidentally while surveying, the site would be protected using known site management recommendations developed by interdisciplinary team on the Coos Bay District (Brian et al. 2002) unless directed otherwise by management.

Ectomycorrhizal fungi are sensitive to changes in soil temperature, soil compaction, and the erosion that can accompany forest harvest (Molina et al. 1993). As plant species composition changes during forest succession, the fungal communities also undergo change (Molina et al. 1993). Intense ground disturbances contribute to plants losing connection with their fungal counterparts as the result of disruption and loss of organic matter (Amaranthus & Perry 1994). Following harvest, a change in species composition would likely occur in the stands as early-seral fungal species become more predominate. The exact effects of these changes are unknown, as there are limited data on the effects of forest management on fungi richness and abundance. Ectomycorrhizal fungi present in adjacent stands to will aid the establishment of new vegetation in the disturbed areas provided stand regeneration occurs soon after logging (Amaranthus & Perry 1994).

Where ground disturbance activity occurs within the project area, the preservation of large dead wood on the forest floor would be conducive to enhancing transition of the previous stand and the pioneering vegetation of the upcoming one (Amaranthus & Perry 1994).

CUMULATIVE EFFECT

There is a strong correlation between the biomass of lichen species and forest age (Neitlich 1993). As the conifer stand becomes established, the lichen biomass would slowly increase (Neitlich 1993). In these newly established plantations, hotspots for macrolichens would include gaps, hardwoods, “wolf” trees, and any old growth remnant trees (Neitlich & McCune 1995). Retention of coarse woody debris ranging from all classes would help promote the bryophyte flora (Rambo & Muir 1998).

Green trees, snags, downed wood retention, and riparian reserves would provide propagule and species source across the landscape. Adjacent lands would provide a source for dispersal of both lichens and bryophytes onto newly established plantations in time.

FUELS

AFFECTED ENVIRONMENT

HISTORY

The watershed has a history of large fires that have altered landscape vegetation patterns. With few exceptions, the oldest stands regenerated following fires in the 1700s. Several large-scale Coast Range fires that burned in the middle of the 19th century, including the 1868 Coos Bay Fire, were known to have burned areas within the watershed. More recently, the 1938 Smith River Fire and the 1951 Vincent Creek Fire burned large areas within the watershed. Modern-day fire exclusion, agricultural practices, and logging have dramatically altered landscape-level vegetation patterns. Fires that now occur are typically human caused or are directly related to human activity and infrastructure. They usually burn mostly surface fuels with occasional individual or group tree torching and are commonly suppressed before they exceed half an acre. Under more extreme weather conditions, particularly late summer early fall east winds, fires are resistant to control and have the potential to escape initial attack and become quite large. The most recent example is the 1,080-acre Austa Fire in 1999, which burned approximately 20 miles north of the analysis area in the Siuslaw River drainage. The 800-acre Siuslaw River Fire occurred 15 miles southwest of Veneta, Oregon in 2002, and the 650-acre Sulphur Fire burned 5 miles southeast of Mapleton, Oregon in 2003. All of these fires exhibited extreme fire behavior including sustained crown fire runs resulting in large areas of stand replacement severity.

Recent harvest areas on both private and BLM administered lands within the analysis area have received some form of site preparation or fuels treatment to prepare the sites for reforestation by (1) reducing fuel/slash loadings and to (2) reduce or retard establishment of brush and non-commercial species. Most commonly, the site preparation treatments have been broadcast burns, hand or machine piling followed by burning, and herbicide applications. The resulting effects are conifer stands that are relatively uniform in composition, densely stocked with uniform texture and generally lack a diversity of canopy structure.

A few stands that were not successfully planted or seeded with conifer, or which were left to natural regeneration, are dominated by red alder.

FIRE REGIME-CONDITION CLASS

Fire regime condition class (FRCC) is a classification of the amount that current vegetation has departed from the presumed historical vegetation reference conditions (Hann and Bunnell 2001; Schmidt and others 2002; Hardy and others 2001; Hann and others 2004). This departure results in changes to one or more of the following ecological components: vegetation characteristics; fuel composition; fire frequency, fire severity and pattern; or other associated disturbances processes. Departure is measured in three broad classes: low (FRCC 1), moderate (FRCC 2) and high (FRCC 3) departure from the natural or historical regime. Low departure is considered to be within the natural range of variability, while moderate and high departures are outside of that range. Typically, in FRCC 2 and 3, one or more fire return intervals have been missed due to fire exclusion. Areas of high departure (FRCC 3) are at increased risk of losing key ecosystem components due to fire effects.

Fire regime-condition classes in the Umpqua River- Sawyer Creek analysis area were delineated using LANDFIRE rapid assessment data. That assessment established that on BLM managed lands and on most all other adjoining ownerships, there are no areas of high departure. Almost all areas in the watershed show moderate degrees of departure, and are classified as FRCC 2. Thinning, density management and regeneration harvest activities combined with appropriate fuels treatments within the analysis area, at a minimum, would maintain FRCC 2, and would help to move the condition class trend of the analysis area toward a FRCC 1 rating.

Land ownership patterns within the analysis area are fragmented due to the history of land settlement and the revestment of the Oregon and California grant lands. Most of the corporate private lands are intensively managed industrial forestlands. Much of the analysis area has a history of extensive use by the public for various recreational activities, primarily hunting and fishing, and these activities often occur during periods of high fire danger. Because of the risks of human-caused wildfire to valuable commercial timber stands and wildlife habitats, post-harvest activity fuel loadings often require treatment for hazard reduction in the areas of highest public use. During extreme fire danger, the Oregon Department of Forestry may limit access and use of public and private lands within the watershed and the adjacent region. In areas where tree regeneration is practiced, fuels treatments are normally planned to improve sites for planting, to reducing logging slash, and to set back competing vegetation.

AVAILABLE WATER SOURCES

Existing water sources on private and BLM lands are somewhat limited in the proposed project area. Four improved heliponds on BLM lands fall within the analysis area. One of these heliponds was used for critical initial and extended attack fire suppression in 2005 and 2006. Other water sources in the analysis area are pump chances in streams that recharge during the wet season by intermittent stream flows or by rain and several man-made fire ponds. Typically, these sites are used for prescribed fire holding and mop up activities and for emergency fire suppression.

NO-ACTION ALTERNATIVE

The no-action action alternative would result in increasingly crowded stand conditions and increased mortality within the overtopped and suppressed trees, resulting in a long-term build up and accumulation of dead or dying fuels on the ground and within the canopy. These conditions could make the stands more vulnerable to damaging wildfire and would hamper fire control efforts during a fire event.

Under the no-action alternative, the BLM managed lands would remain at a moderate to high risk of loss to wildfire. Stand densities, characteristics and composition that may help to improve the stand level and landscape level fire regime-condition class would not be achieved.

PROPOSED ACTION: ALTERNATIVE 1- COMMERCIAL THINNING/DENSITY MANAGEMENT THINNING/ ALDER CONVERSIONS

Under the proposed action alternative, there would be short-term but manageable increases in activity related surface fuel loadings and short-term increased risk of damaging wildfire in the affected areas. Harvest and other management activities associated with the proposed action would result in short term and sporadic increases in human activity, which in turn may increase the possibility of human-caused or operational wildfire. These types of fire events occur infrequently within the District; however, all operations utilizing power-driven equipment are required to operate in accordance with State fire regulations and restrictions, including having fire-fighting equipment on site during the fire season and posting of a watchperson or specific time periods after mechanical operations cease to operate.

Harvest activities would create openings in the project areas that may mimic openings caused by naturally occurring fire. When done properly, the proposed harvest activities would present a unique opportunity to re-establish landscape level diversity in stands, which more closely resembles the species composition and disposition that would occur if natural fire were still present on the landscape. Thinning dense and stagnating stands may reduce the long-term vulnerability of the stand to a damaging wildfire by removing or reducing accumulated fuel loadings that contribute to extreme fire behavior such as a crown fire. The proposed treatments could facilitate fire suppression activities by providing safer access and egress for firefighters as well as for counter-firing opportunities in the event of an extreme fire occurrence (Omi & Martinson, 2002).

Smoke from any prescribed fire activities would contribute to minor short-term increases in particulate matter in the surrounding air shed. All prescribed fire activities would be conducted in compliance with the Oregon Smoke Management Plan, (OAR 629-43-043).

The commercial thinning, density management and alder conversion projects would have a beneficial cumulative effect at the watershed scale by reducing the continuity of standing fuels and consequently lowering risk of damage to fire, increasing stand resiliency to fire, and moderating future fire behavior potential. The affects from smoke released from slash disposal would be minor because of the relatively small acreage being burned and any prescribed burning that takes place would occur spatially over time.

NOXIOUS WEEDS

AFFECTED ENVIRONMENT

Scotch broom (*Cytisus scoparius*), French broom (*Genista monospessulana*), and Himalayan blackberry (*Rubus discolor*) are common weed species within the watersheds. Noxious weeds have the ability to out compete and in some cases eliminate native vegetation by competing for water, sunlight, nutrients, and physical space. The broom species are also able to fix nitrogen and establish on nutrient-poor sites. This adaptation gives these species an advantage over many native species. Known locations of plants are generally scattered and are relatively small in size, consisting of less that 20 individuals in isolated locales. However, there are a few locations of Scotch broom with well over thousands of individuals along road and within recent regeneration harvest units. On private industrial forestland, noxious weeds are often effectively controlled through the application of herbicides. On public land, herbicide use is presently restricted to areas immediately adjacent to existing roads. Within existing BLM plantations, the broom species can be controlled by pulling or cutting until the seedlings outgrow the competitive height of the broom.

Other less competitive noxious weeds, such as Canada thistle, Klamath weed, tansy ragwort and bull thistle also are present; however, they do not occur in sufficient numbers to be of management concern, are managed through biological control efforts, and are not expected to increase to a level that would jeopardize management objectives of landowners.

Locations of noxious weeds are commonly found along roads or within disturbed areas adjacent to roads. The majority of the road systems have been inventoried for weeds since 1997, and most inventoried BLM locations of brooms have been treated in 2002, 2003, 2005, 2006, and 2007. On-going inventories are performed and treatment occurs in the spring when plants are in bloom. Weeds may be spread by human activities, such as vehicles and equipment, or naturally, as in wind-borne or animal transported seeds. The BLM controls the spread of noxious winds by requiring vehicle washing, conducting annual weed surveys, and treating all weed infestations along BLM controlled roads.

NO-ACTION ALTERNATIVE

Commercial log hauling, administrative traffic, and recreational driving would continue on existing open roads. BLM would continue to monitor and treat existing and new noxious weed populations using manual and chemical applications on BLM managed lands and along BLM controlled roads. Previously treated noxious weed sites would be slower in returning due to the past treatments. The analysis area has been intensively inventoried, treated, and monitored for weeds in the past and regular treatment of known weed sites will continue as funding remains available. Control of noxious weeds on private lands is expected to continue where needed to ensure survival and growth of plantations.

PROPOSED ACTION: ALTERNATIVE 1- COMMERCIAL THINNING/DENSITY MANAGEMENT THINNING/ALDER CONVERSIONS

New road construction routinely exposes bare soil areas which may allow for the introduction of pioneer species, some of which could be noxious weeds. Under the special provisions of the timber sale contract, the contractor is required to apply a mixture of grass seed and mulch on all disturbed areas establishing a ground cover that is reasonably effective in suppressing noxious weeds. Application of rock to the road surface may introduce weed seed from the quarry site of origin; however, this rarely occurs unless the gravel is stockpiled for at least one generation of a weed species. Processing of the rocked roads and hauling of logs is not conducive to establishment of noxious weed seedlings and follow up monitoring and treatment is an effective control method on BLM roads in the project area. All logging, road construction, and site preparation equipment that operates off of the gravel and natural surfaced roads would be required to be washed prior to entering BLM lands. BLM controlled haul routes and potential landing locations will be inventoried for noxious weeds and treated, either mechanically or chemically, prior to hauling from the harvest units. Roads and landings will be monitored on an annual basis to identify new invaders and treat them using an integrated pest management approach.

No new noxious weed populations are likely to occur within harvest units after yarding with a skyline system. New road construction and renovation could increase the chances of some scattered noxious weed populations occurring along road systems depending on the rock source, effectiveness of washing equipment, pre-harvest weed treatment of the haul road system, and post-harvest inventory and treatment. The design features outlined in the action alternative, i.e., pre-harvest inventory and treatment, washing of equipment prior to entry, mulching/seeding, post-harvest inventory and treatment, and continued monitoring and treatment, would help reduce the risk of noxious weed spread. Other District projects such as manual maintenance, pre-commercial thinning, and site prep activities specifically address prevention and removal of noxious weeds through mechanical methods. Annual inventory of the road system would continue to identify any new populations and treat those weeds with mechanical or chemical methods to control the spread. Any new species of noxious weeds that were identified within the Umpqua River-Sawyer Rapids analysis area would be managed using integrated pest management techniques.

Due to the active management of noxious weeds by landowners within the watershed there should be no cumulative increase in noxious weed infestation within the Umpqua River-Sawyer Rapids watershed. Most of the existing noxious weeds only thrive in an open canopy environment, particularly in regeneration harvest areas and roadside openings. As the canopy levels increase on all ownerships, existing noxious weed sites will become completely shaded out. The annual monitoring and treatment of roadside infestations will reduce the level of infestations, particularly along BLM controlled roads as well as private controlled roads on BLM lands.

RECREATION RESOURCES

AFFECTED ENVIRONMENT

OFF-HIGHWAY VEHICLES

Currently the District has no areas open for off-highway vehicle use and none are planned. Off-highway vehicles and all-terrain vehicles may use BLM roads; however, non-street-legal vehicles, such as quads, are not permitted on state or county road systems. This means the quad user must live near access to the BLM roads, or haul the quad in from elsewhere. Vehicles are permitted on the roads only. Vehicles are not authorized or permitted to travel cross-country or off the road.

RECREATION FACILITIES

There are no developed recreation sites in or near any of the project areas and none are planned. Several roads accessing BLM land cross private land. Consequently, locked gates or tank traps limit travel on a subset of these roads. The Umpqua River and State Highway 38 bisect the project area. There are two big game hunting units in the project area, the Siuslaw unit to the north of the river and Tioga unit to the south. Fishing on the Umpqua River is seasonally popular. Dispersed recreational activities observed over the years in this area include exploring backcountry roads, hunting, camping, mushroom picking, water play in the streams and target shooting.

There are no estimates of the numbers of visitors using the proposed project area for dispersed recreation; however, there are estimates of the number of visitors using the main highways and nearby recreation sites. The Oregon Department of Transportation estimates 3,814 vehicles travel Highway 38 daily, or about 1.4 million vehicles per year. The Vincent Creek and Smith River Falls Recreation Sites located on the Smith River Road, 35 miles northeast of Reedsport, Oregon and approximately 20 miles to the northwest of the project area, each receive approximately 7,000 visitors per year. One-lane roads passing through the proposed project area connect the Smith River Road to Highway 38.

VISUAL RESOURCES MANAGEMENT (VRM)

Available forestland within a quarter-mile of state and federal highways are managed to meet VRM Class II or VRM Class III objectives as designated in the Resource Management Plan. A portion of the analysis area, located in sections 5 and 7, T. 22 S., R. 8 W., are within a quarter-mile of State Highway 38. Management directions for VRM Class II areas are to retain the existing character of the landscapes, and management actions may be seen but should not attract the attention of the casual observer. Management directions for VRM Class III areas are to partially retain the existing character of the landscape, and management activities may attract attention but should not dominate the view of the casual observer (USDI-BLM 1995, pg. 41).

NO-ACTION ALTERNATIVE

Recreation use would not be affected if the no-action alternative is selected. The number of visitors is expected to remain the same. Much of the area is privately owned and the same type of use occurs on the flat areas and areas near water on the accessible private land as does on accessible public lands. Public access to BLM roads and flat areas to pull off and park or camp would remain the same.

PROPOSED ACTION: ALTERNATIVE 1 - COMMERCIAL THINNING/DENSITY MANAGEMENT THINNING/ALDER CONVERSIONS

The proposed action may provide additional opportunities for dispersed camping where flat areas created by landings remain available to the public. The commercial harvest will temporarily increase big game visibility or modify animal movement due to the more open condition of the vegetation following harvest. The temporary spur roads may attract some use while they are open, but vehicle use will end when these temporary roads are closed. Closed roads will provide short-term foot access for hunters and weekend campers. The overall number of people using the area for recreational purposes is not expected to measurably increase since most newly constructed roads will be decommissioned after harvest. Neither the type of use or pattern of recreational activity expected to change.

Based on years of direct communication between the District recreation staff and visitors in or near the analysis area, most recreational visitors are primarily repeat visitors and are either residents of the local region or returning to it. Due to the checkerboard ownership pattern of the landscape, they are used to or often involved in timber management activities, the steep terrain, and the limited road access. Due to the dispersed nature of the proposed harvest areas, the temporary impacts to vegetation, and the decommissioning of the newly constructed roads, there will be no cumulative increase in recreational use resulting from this project.

The proposed commercial thinning projects will retain a continuous forest cover; thus implementing Alternative 1 would not attract the attention of a casual observer within the VRM class II or III areas. In addition, the angle of view and foreground obstructions hide many proposed project areas a quarter of a mile from Highway 38 within the VRM class II or III area. There will be no cumulative increase in openings due to the proposed actions along Highway 38.

CULTURAL RESOURCES AND NATIVE AMERICAN CONCERNS

A Class I inventory review of project documentation and records check shows no known cultural resources in the immediate vicinity of the proposed project area. The lack of recorded cultural resources and relatively recent, 30 to 60-year old, disturbance history produced during previous logging activities indicate intact cultural resources would not be affected by this project. If potential cultural resources are encountered during this project, all work in the vicinity would be stopped and the District Archaeologist would be notified.

SPECIAL MANAGEMENT AREAS

There are no special management areas in or near the project area.

WILDERNESS AREAS

There are no existing or potential wilderness areas within or near the project area.

WILD AND SCENIC RIVERS

There are no existing or candidate wild or scenic rivers in or near the project area.

AREAS OF CRITICAL ENVIRONMENTAL CONCERNS (ACEC)

There are no existing or proposed areas of critical environmental concern within the proposed treatment area. The proposed project will not have any known affects on any proposed area of critical environmental concern.

ENVIRONMENTAL JUSTICE

The proposed areas of activity are not known to be used by, or are disproportionately used by, American Indians, minorities, or low-income populations for specific cultural activities, or at greater rates than the general population. This includes their relative geographic location and cultural, religious, employment, subsistence, or recreational activities that may bring them to the proposed areas.

SOLID AND HAZARDOUS WASTE

NO-ACTION ALTERNATIVE

A hazardous material Level I survey was conducted on the project area. No hazardous material sites were found. There are no known past uses that would indicate a potential solid or hazardous waste problem.

PROPOSED ACTION: ALTERNATIVE 1 – COMMERCIAL THINNING/DENSITY MANAGEMENT THINNING/ALDER CONVERSIONS

The proposed action is subject to applicable provisions for Petroleum Product Precautions under the Oregon Forest Practices Act (reference: OAR 629-57-3600), and Spill Prevention, Control and Countermeasures under Oregon Department of Environmental Quality provisions (reference: OAR 340-108).

No effects from solid or hazardous wastes are anticipated from the proposed action, unless a release of hazardous materials occurs because of operations. Depending upon the substance, amount, and environmental conditions in the area affected by a release, the impacts could range from short-term to more extensive and longer lasting. Minor amounts, less than 2 gallons, of diesel fuel, gasoline, or hydraulic fluid leaking from heavy equipment onto a road surface, with little or no chance of migrating to surface or ground water before absorption or evaporation would be an example of minimal impact.

If a petroleum substance is released at or above the State of Oregon reportable quantity of 42 gallons, or has the likelihood of reaching ground or surface water regardless of the amount, it could cause more serious impacts to the environment. This impact could range from localized contamination of soil and vegetation, to entry into surface water and toxic effects upon fisheries and aquatic life habitat. The greater the quantity of material released, the more likely that adverse effects would occur. These effects would depend on variable pathway conditions such as seasonal water levels, flow velocity, and rainfall.

Human health is not likely to be at risk under the proposed alternative as there are no known domestic water sources located within or downstream of the proposed projects. He BLM conducted public scoping of the project and no comments were received regarding domestic water use on the public lands within the project area.

Access road or skid trail closures would reduce the available area of potential illegal dumping of solid and hazardous waste along roadsides. Based on years of on-site monitoring of timber harvest on other similar projects within the District, there will be no short or long-term cumulative impacts due to the release of solid or hazardous waste materials resulting from this project. In the last decade, the BLM has only recorded one hazardous waste spill associated with timber harvest that resulted from a log truck going off the road and leaking a small quantity of diesel fuel adjacent to Moon Creek. These types of events are extraordinary and are not considered to be reasonably foreseeable.

CHAPTER IV.: LIST OF AGENCIES AND INDIVIDUALS CONTACTED

The public was notified of the planned EA through the publication of Coos Bay District's semi-annual Planning Update.

Sixteen adjacent landowners were contacted during the scoping process.

Public agencies and interested parties were notified with e-mail scoping letters as part of the Coos Bay District office’s Web Update process.

The following public agencies and interested parties were notified with hard copy scoping letters:

NOAA National Marine Fisheries Service
Southern Oregon Timber Industry Association
Klamath-Siskiyou Wildland Center
Bonneville Power Administration
USDI Bureau of Indian Affairs
Association of O&C Counties
Confederated Tribes of CLUS
Confederated Tribes of the Grande Ronde
Western Field Office–Oregon Natural Resources Council
Wildlife Management Institute
Cindy Soderholm
Donald Fortenot
Hugh Kern
Plum Creek Timber Lands LP
Douglas Timber Operators
Kalmiopsis Audubon Society
Coast Range Association
Sierra Club
Umpqua Watersheds Inc.
Smith River Watershed Council

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APPENDIX A.: MAPS UMPQUA RIVER SAWYER RAPIDS

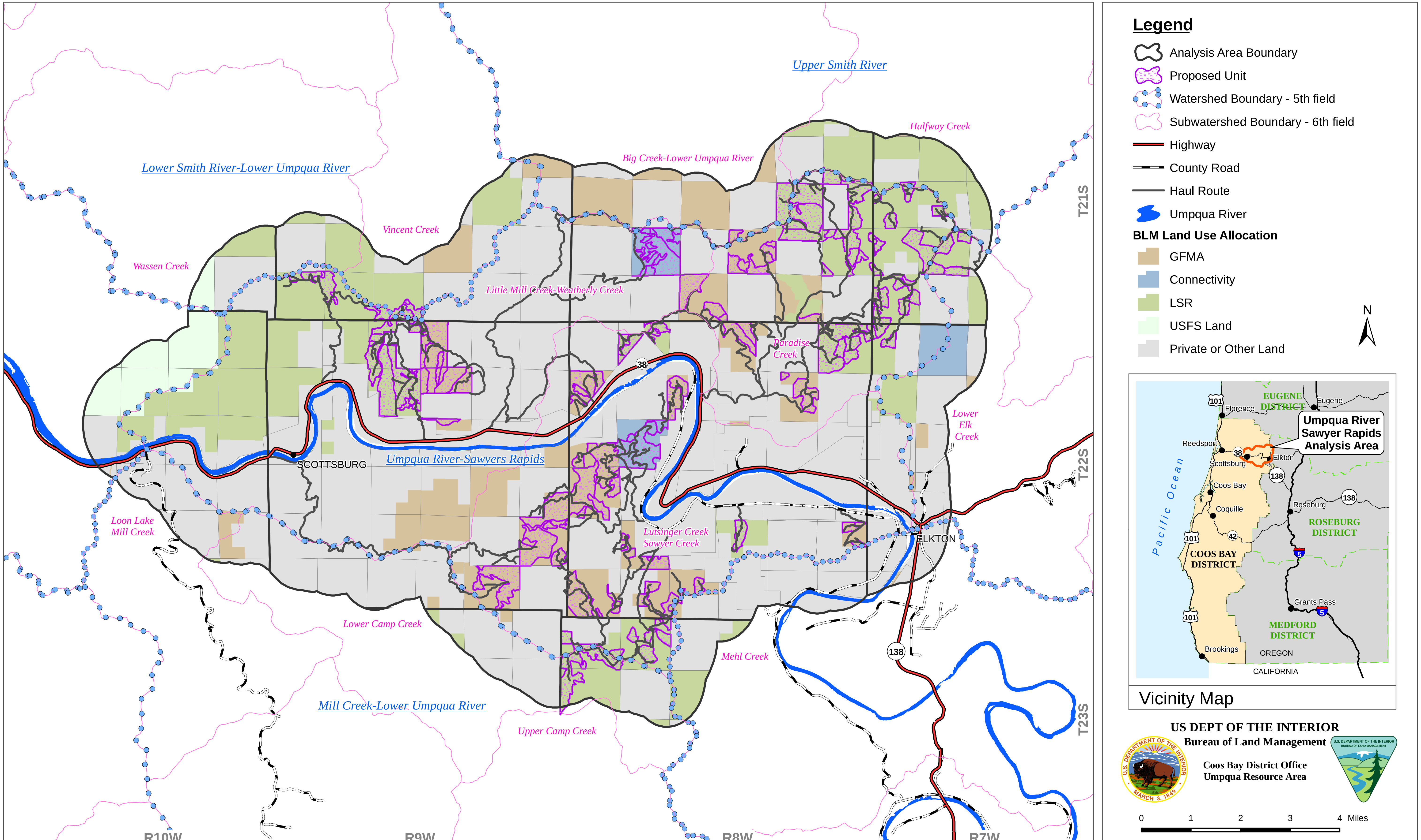
Project Area Map A – Overview of Proposed Units, Land Use Allocations, and General Vicinity

Project Area Map B – Hardwood Stands and Proposed Alder Conversion Units

Project Area Map C 1, 2, 3 – Proposed Unit Locations, Prescriptions, Road Work, and Stream Buffers

Project Area Map D 1, 2, 3 –Yarding Methods and Road Decommisioning

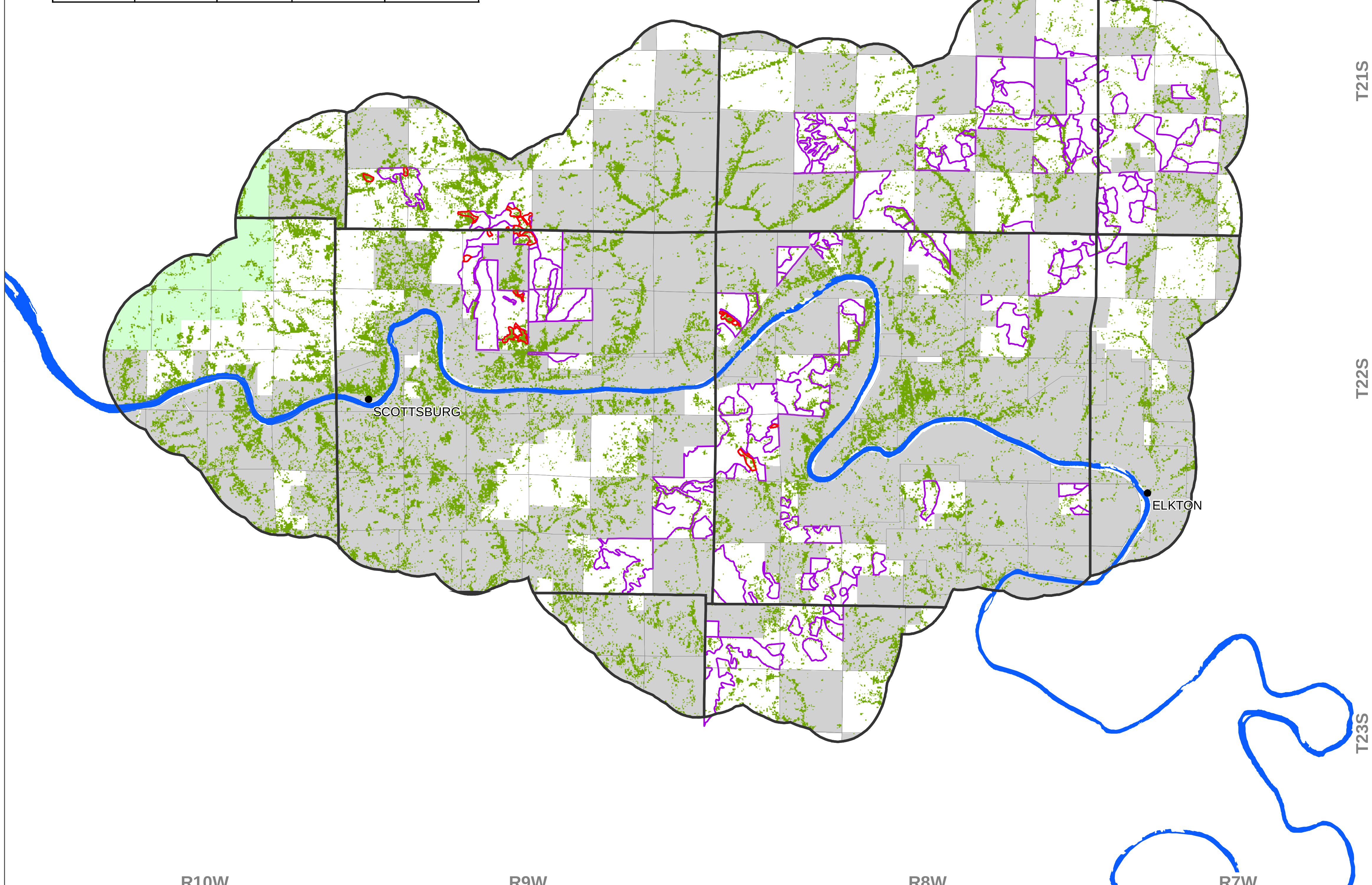
Project Area Map E 1, 2, 3 –Seasonal Restrictions, Fish Distribution, and ODFW Habitat Survey Reaches



Umpqua River Sawyer Rapids EA Map A: Overview of proposed units, land use allocations, and general vicinity.

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.

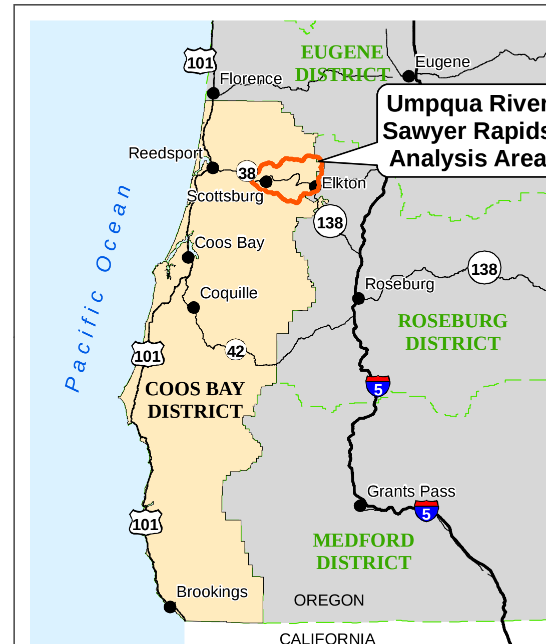
Analysis Area Totals (acres)				
Total Hardwoods	Hardwoods on Federal Land	Proposed Units	Proposed Alder Conversion Units	Total Hardwoods in Proposed Units
7,047	2,577	9,208	167	717



Legend

- Hardwoods
- Analysis Area Boundary
- Alder Conversion Unit
- Proposed Unit
- Umpqua River
- BLM Administered Land
- USFS Land
- Private or Other Land

N



Vicinity Map

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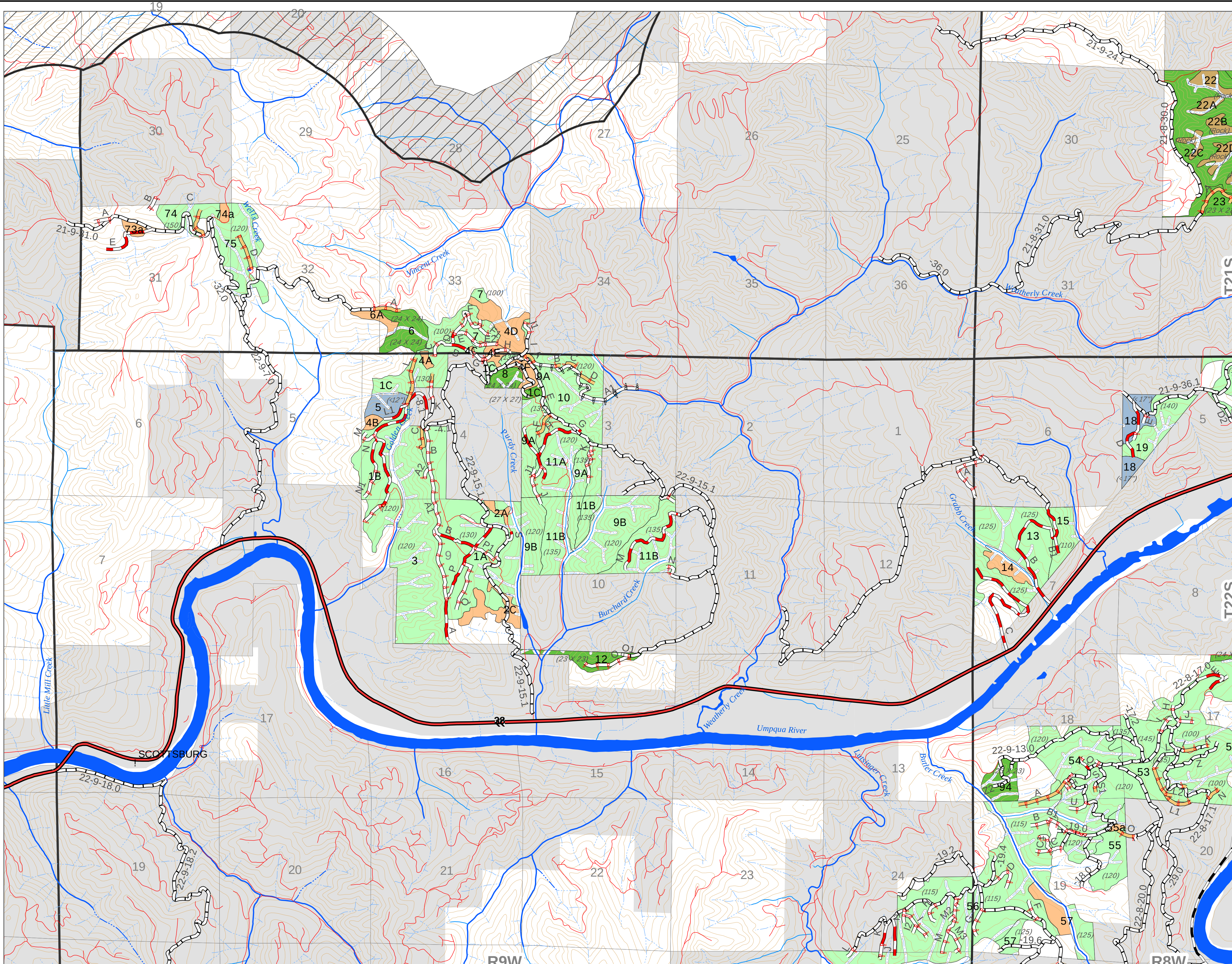
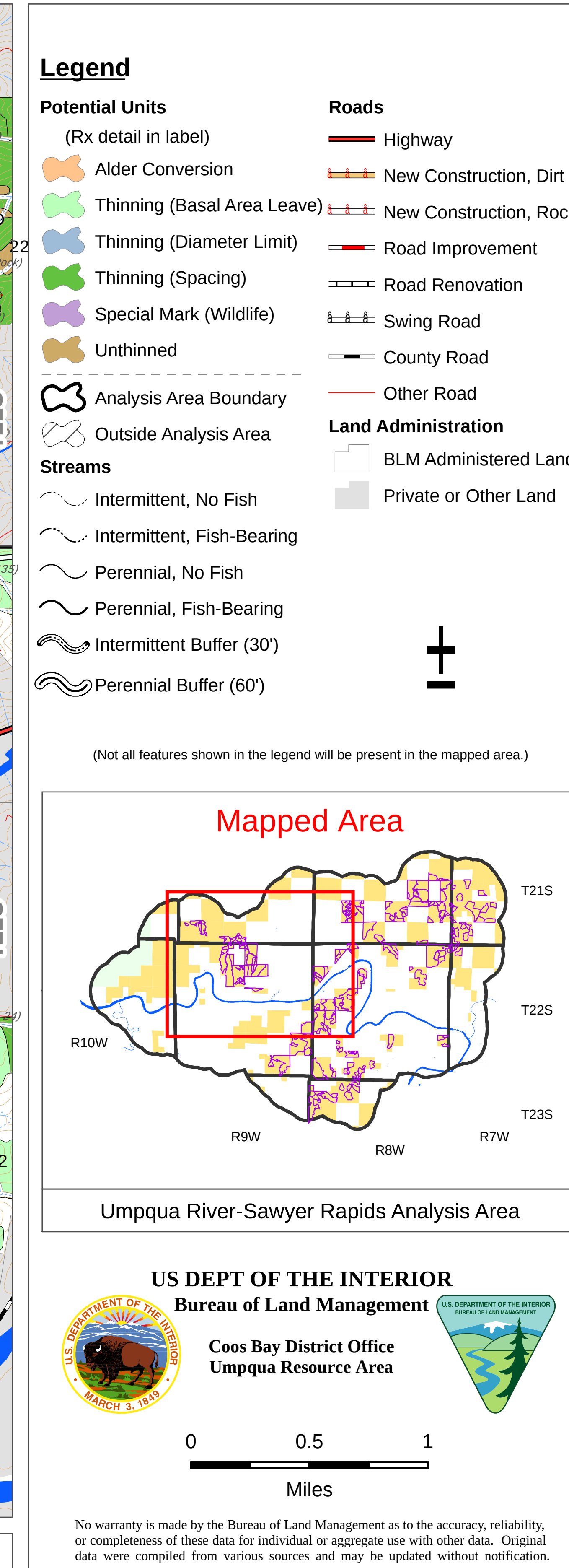
Coos Bay District Office
Umpqua Resource Area

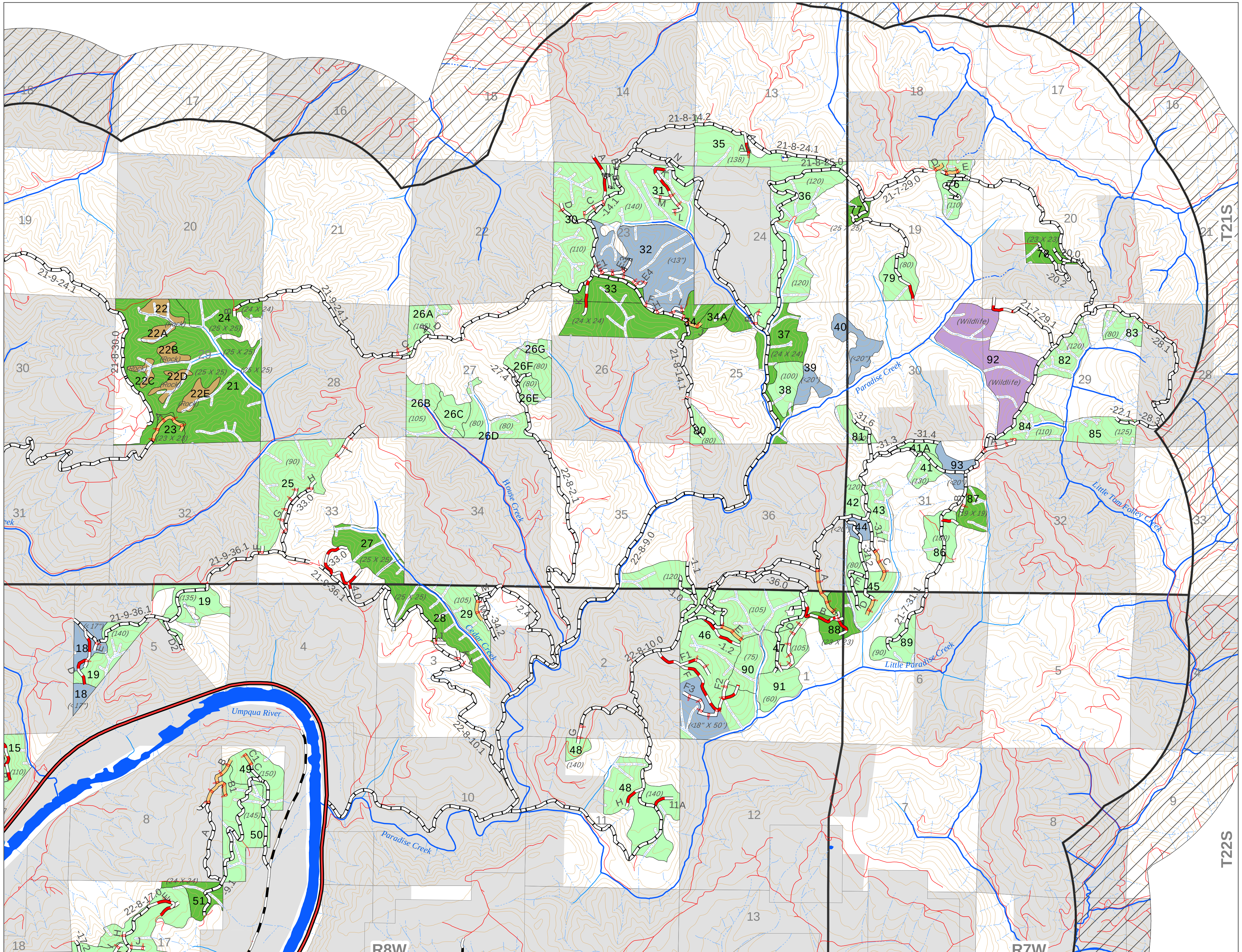
0 1 2 3 4 Miles

Umpqua River Sawyer Rapids EA Map B: Hardwood stands and proposed units.





Umpqua River Sawyer Rapids EA Map C-1 (of 3): Proposed unit locations, prescriptions, and road work.



Legend

Potential Units

(Rx detail in label)

- Alder Conversion
- Thinning (Basal Area Leave)
- Thinning (Diameter Limit)
- Thinning (Spacing)
- Special Mark (Wildlife)
- Unthinned
- Analysis Area Boundary
- Outside Analysis Area

Streams

- Intermittent, No Fish
- Intermittent, Fish-Bearing
- Perennial, No Fish
- Perennial, Fish-Bearing
- Intermittent Buffer (30')
- Perennial Buffer (60')

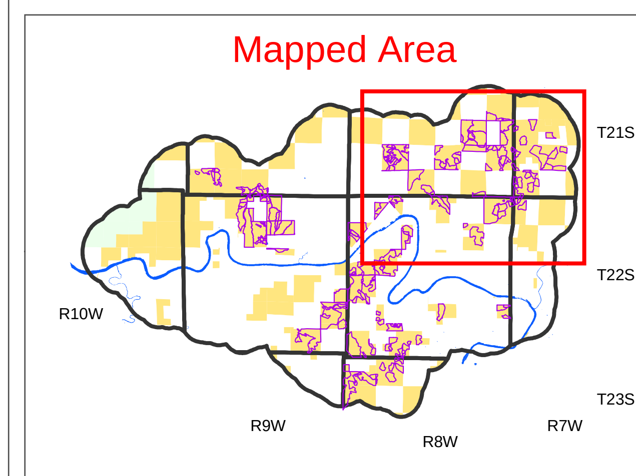
Roads

- Highway
- New Construction, Dirt
- New Construction, Rock
- Road Improvement
- Road Renovation
- Swing Road
- County Road
- Other Road

Land Administration

- BLM Administered Land
- Private or Other Land

(Not all features shown in the legend will be present in the mapped area.)



Umpqua River-Sawyer Rapids Analysis Area

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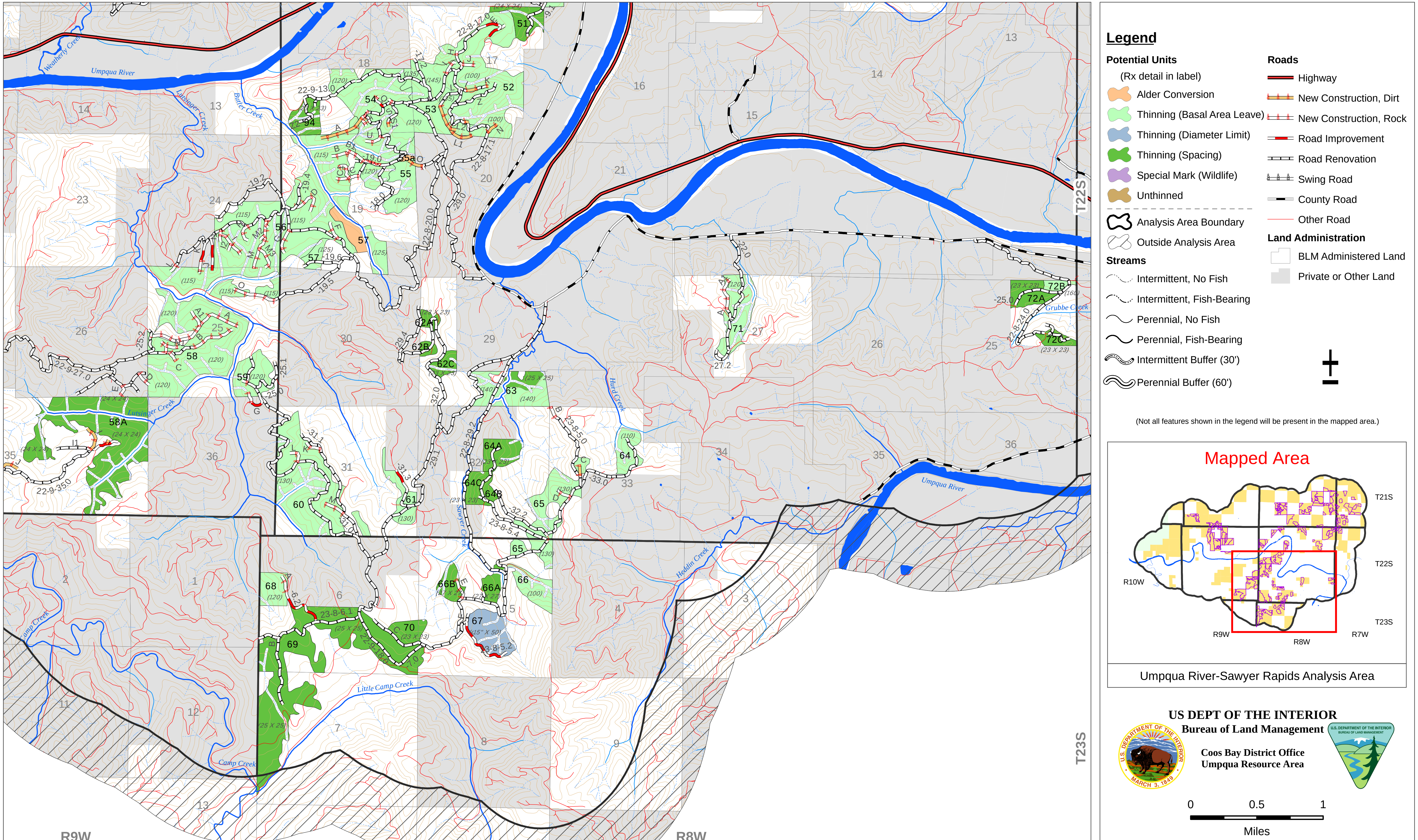
Coos Bay District Office
Umpqua Resource Area

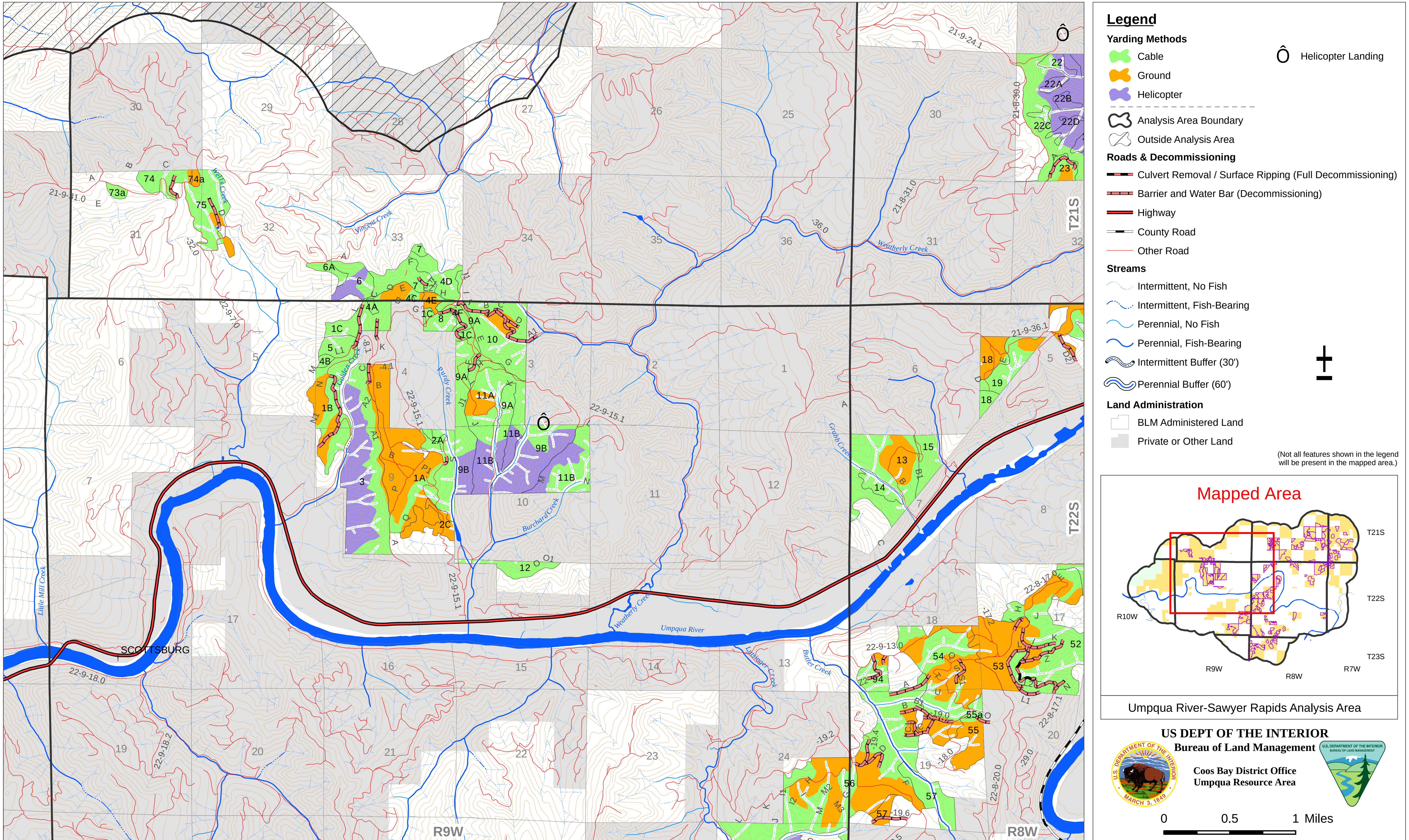
0 0.5 1

Miles

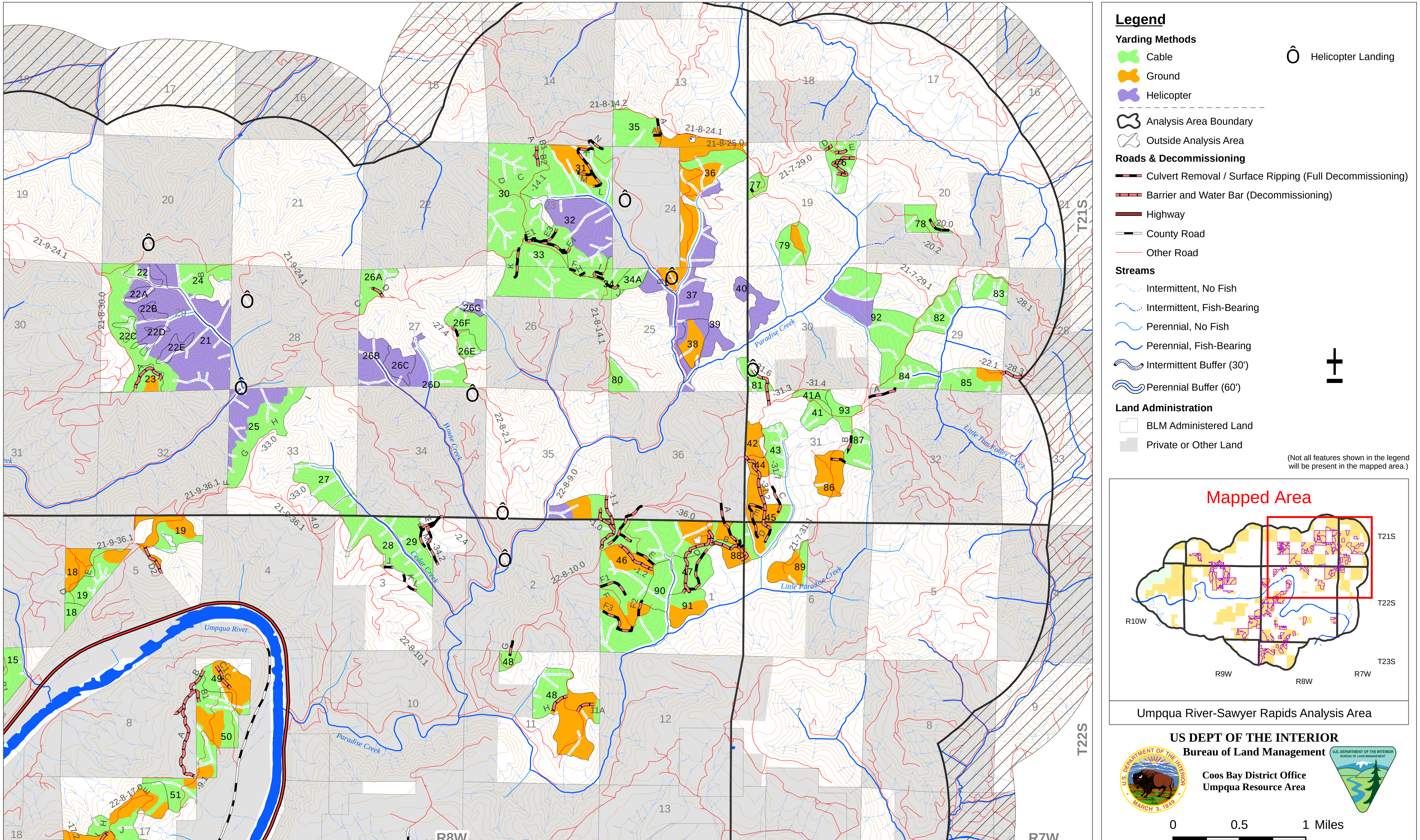
Umpqua River Sawyer Rapids EA Map C-2 (of 3): Proposed unit locations, prescriptions, and road work.



Umpqua River Sawyer Rapids EA Map C-3 (of 3): Proposed unit locations, prescriptions, and road work.



Umpqua River Sawyer Rapids EA Map D-1 (of 3): Yarding methods and road decommissioning.



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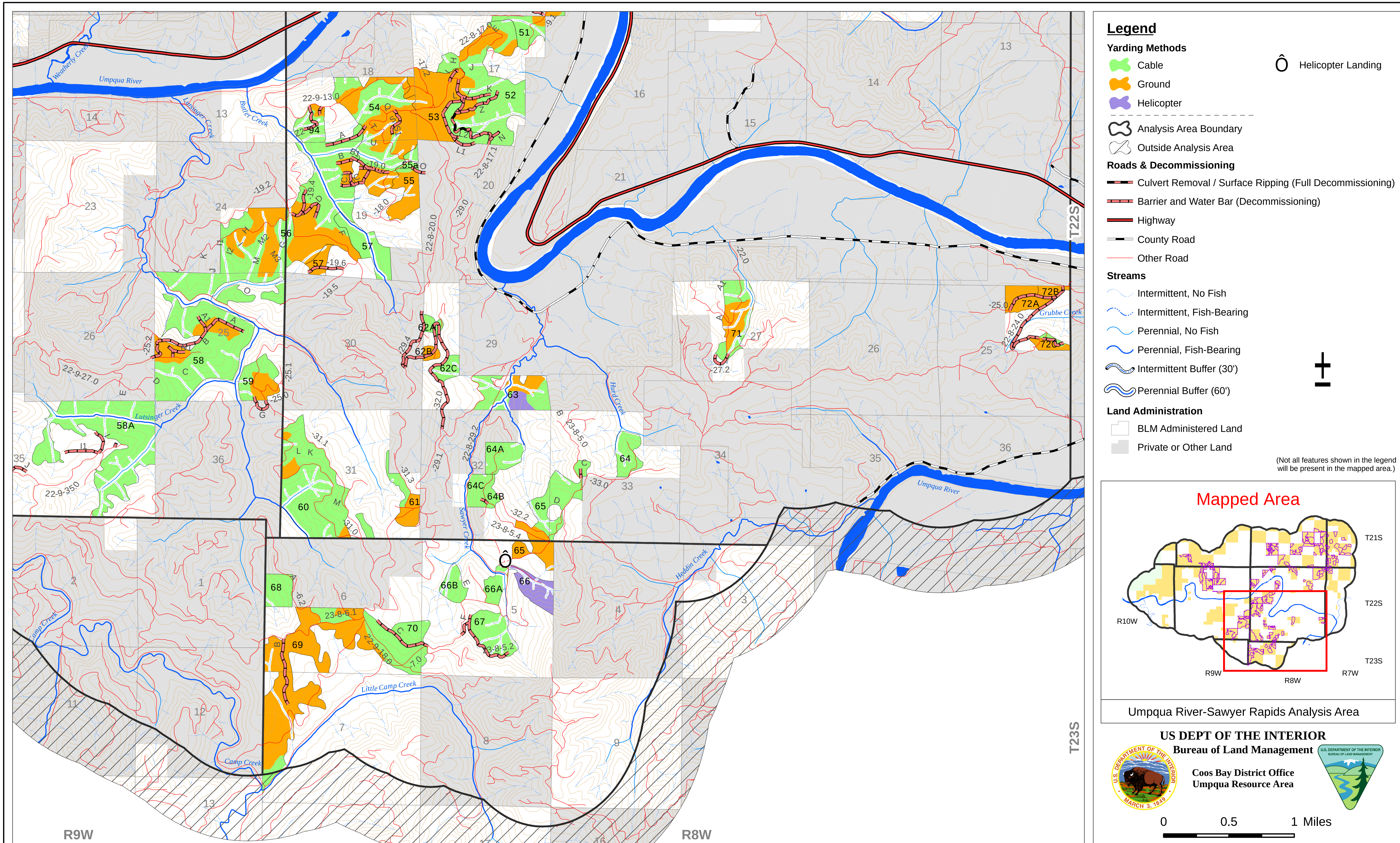
Umpqua River Sawyer Rapids EA Map D-2 (of 3): Yarding methods and road decommissioning.



Umpqua River Sawyer Rapids EA Map D-3 (of 3): Yarding methods and road decommissioning.

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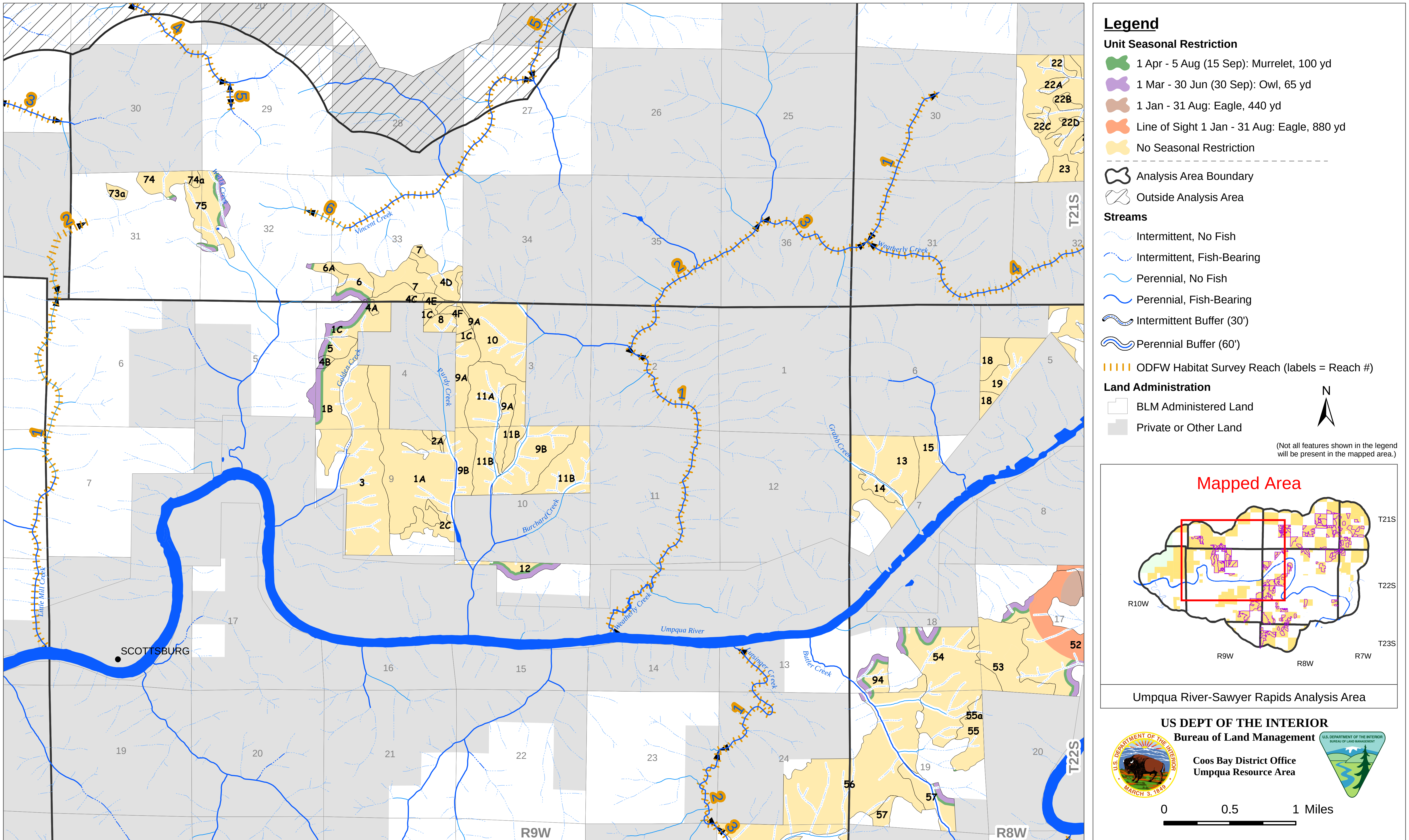
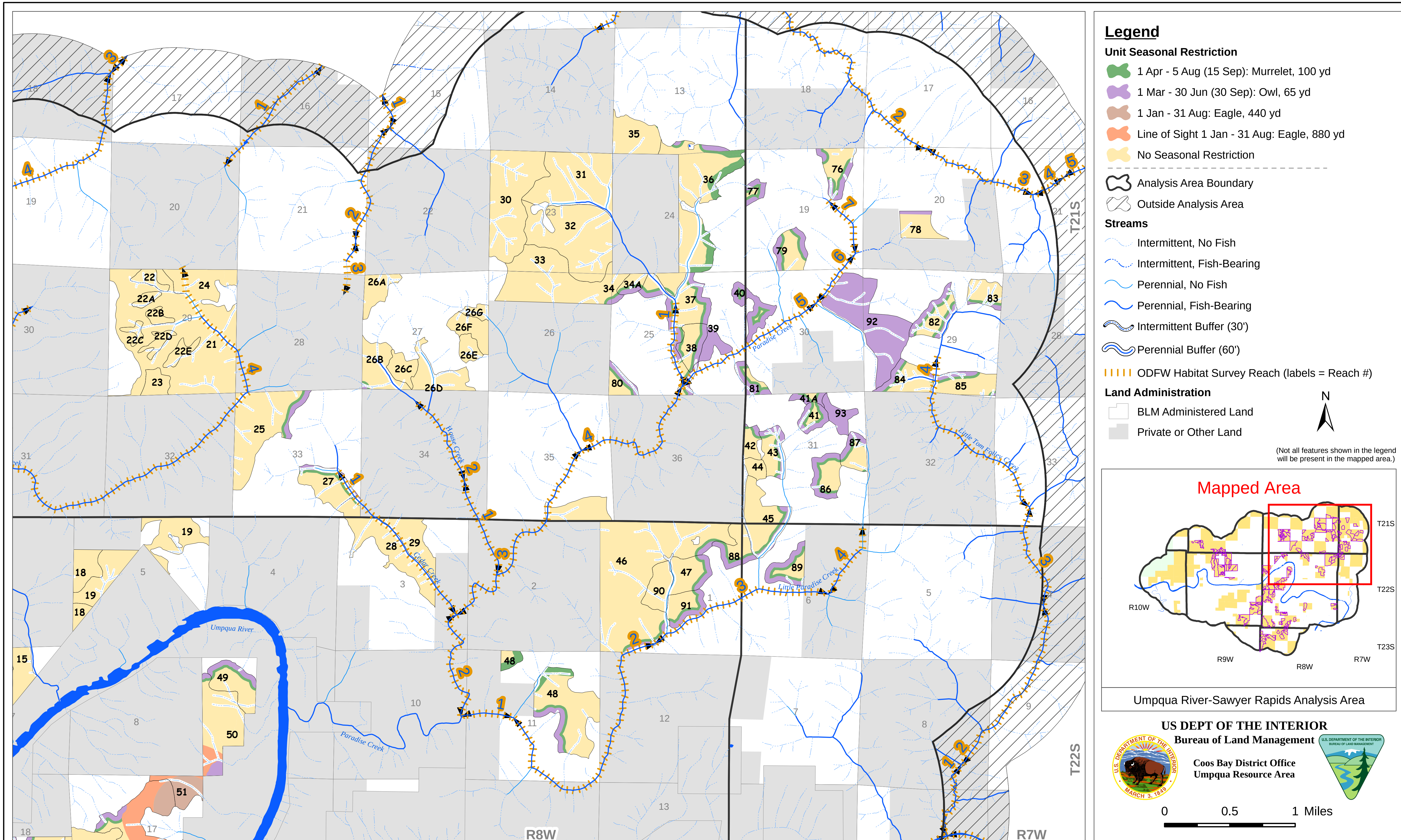
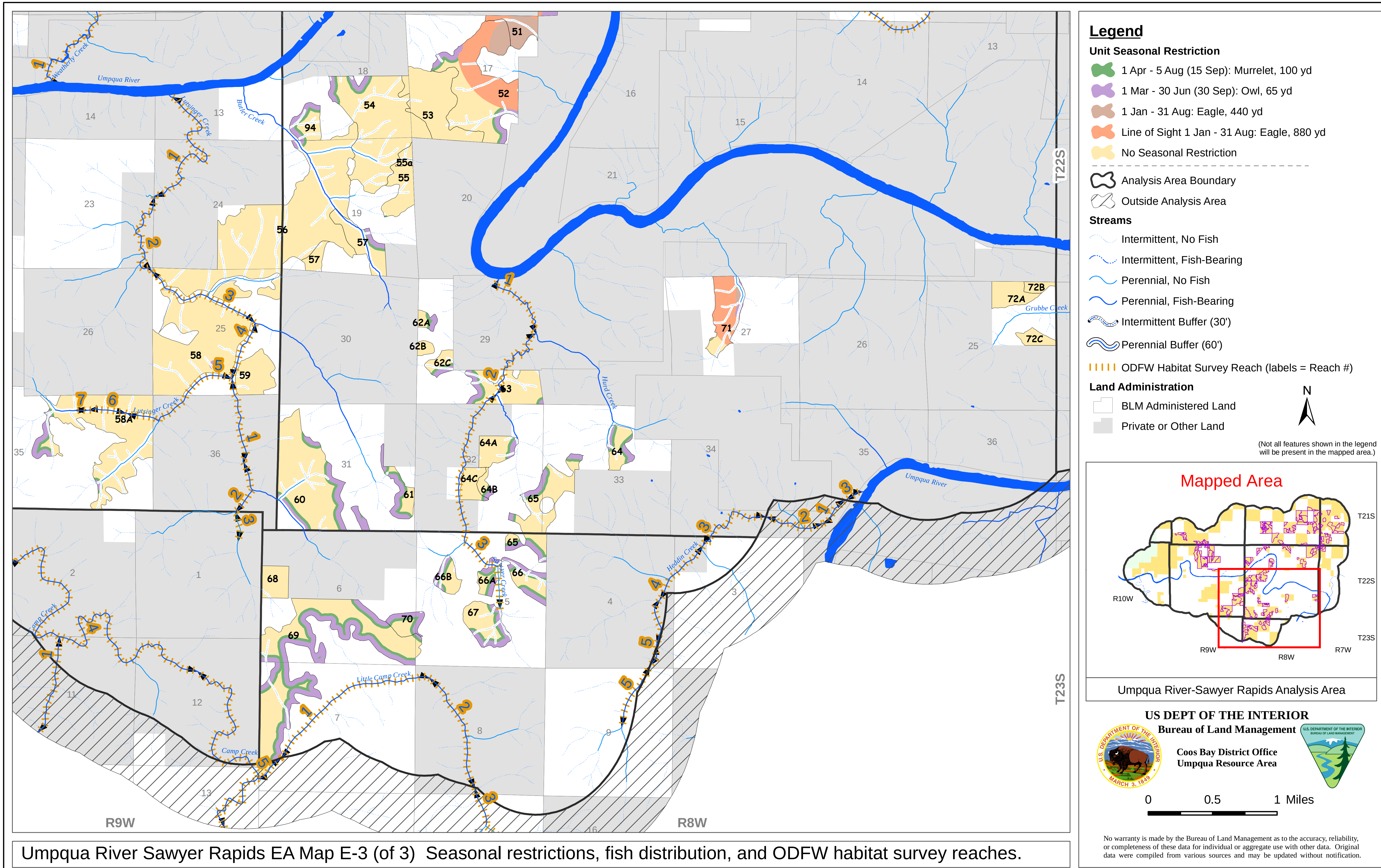


Umpqua River Sawyer Rapids EA Map E-1 (of 3) Seasonal restrictions, fish distribution, and ODFW habitat survey reaches.



Umpqua River Sawyer Rapids EA Map E-2 (of 3) Seasonal restrictions, fish distribution, and ODFW habitat survey reaches.



Umpqua River Sawyer Rapids EA Map E-3 (of 3) Seasonal restrictions, fish distribution, and ODFW habitat survey reaches.

APPENDIX B.: ROAD CONSTRUCTION AND CLOSURE SUMMARY

Appendix Table B–1: Road Construction and Closure Summary

EA Unit	Existing Surface Type	New Surface Type	Road or Spur Name/Number	Road Control	Construction Type	Present Closure Status	Road Length (Miles)	Post-Harvest Closure Status
1A	Natural	Rock	S	BLM	Improvement	Closed	0.08	Decommission
1A		Rock	T	BLM	New construction		0.21	Decommission
1A		Rock	B	BLM	New construction		0.27	Open
1A		Rock	P1	BLM	New construction		0.15	Open
1A		Rock	Q	BLM	New construction		0.36	Open
1A	Rock	Rock	22-9-15.1	Private	Renovation	Open	2.55	
1A	Rock	Rock	22-9-4.1	Private	Renovation	Open	0.20	
1B	Natural	Rock	N	BLM	Improvement	Closed	0.23	Open
1B	Natural	Rock	22-9-8.1	Private	Improvement	Closed	0.70	Open
1B		Natural	O1	BLM	New construction		0.24	Decommission
1B		Rock	N1	BLM	New construction		0.20	Open
1B	Natural	Natural	O	BLM	Renovation	Closed	0.21	Decommission
1B	Natural	Natural	22-9-8.1	Private	Renovation	Closed	0.40	Decom. from N down
1C	Natural	Rock	B	BLM	Improvement		0.15	Open
1C	Natural	Rock	C	BLM	Improvement		0.06	Open
1C		Natural	K	BLM	New construction		0.11	Decommission
1C		Rock	C	BLM	New construction		0.13	Open
1C		Rock	G	BLM	New construction		0.09	Open
1C		Natural	K	BLM	New construction		0.06	Decommission
1C		Natural	L	BLM	New construction		0.33	Decommission
1C	Rock	Rock	22-9-15.1	Private	Renovation	Open	0.72	
1C	Rock	Rock	22-9-4.1	Private	Renovation	Open	0.24	
3	Natural	Rock	A	BLM	Improvement	Closed	0.32	Open
3	Natural	Rock	P	BLM	Improvement	Closed	0.55	Open
3		Natural	C	BLM	New construction		0.17	Decommission
3		Rock	A1	BLM	New construction		0.92	Open
3		Rock	A2	BLM	New construction		0.08	Open
4B	Natural	Rock	L1	BLM	Improvement	Closed	0.17	Open
4B		Rock	M	BLM	New construction		0.13	Open
4D	Natural	Rock	F	BLM	Improvement	Closed	0.08	Open
4D		Rock	F	BLM	New construction		0.11	Open
4D		Rock	H	BLM	New construction		0.19	Open
4D		Natural	F1	BLM	New construction		0.10	Decommission
4F	Natural	Rock	J	BLM	Improvement		0.03	Open
4F	Natural	Natural	Golden Cr Rd		Renovation	Closed	0.45	Decommission
4F	Rock	Rock	22-9-15.1	Private	Renovation	Open	0.13	
6A	Paved	Paved	22-9-7	BLM	Renovation	Open	1.13	Open
7	Natural	Rock	I	BLM	Improvement	Closed	0.21	Open
7	Natural	Rock	D	BLM	Improvement	Closed	0.08	
7		Rock	E	BLM	New construction		0.33	Open
7		Rock	E1	BLM	New construction		0.03	Open
7		Rock	E2	BLM	New construction		0.03	Open
7		Rock	F	BLM	New construction		0.20	Open
7		Rock	I1	BLM	New construction		0.08	Open
7	Rock	Rock	22-9-15.1	Private	Renovation	Open	0.17	
7	Rock	Rock	22-9-4.2	Private	Renovation	Open	0.17	
9A	Natural	Rock	I	BLM	Improvement	Closed	0.24	Open
9A		Rock	J	BLM	New construction		0.29	Open
9A		Rock	J1	BLM	New construction		0.05	Open
9A		Natural	F	BLM	New construction		0.17	Decommission
9A	Rock	Rock	22-9-15.1	Private	Renovation	Open	0.08	

EA Unit	Existing Surface Type	New Surface Type	Road or Spur Name/Number	Road Control	Construction Type	Present Closure Status	Road Length (Miles)	Post-Harvest Closure Status
9B	Rock	Rock	Private Rd.	Private	Renovation	Open	0.48	
9B	Rock	Rock	22-9-15.1	Private	Renovation	Open	0.34	
10	Natural	Rock	G	BLM	Improvement	Closed	0.07	Open
10		Natural	B	BLM	New construction		0.04	Decommission
10		Natural	C	BLM	New construction		0.08	Decommission
10		Natural	D	BLM	New construction		0.12	Decommission
10		Rock	E	BLM	New construction		0.04	Open
10		Natural	A	BLM	New construction		0.10	Decommission
10	Rock	Rock	22-9-15.1	Private	Renovation	Open	0.47	
10	Natural	Natural	A1	BLM	Renovation	Closed	0.81	Decommission
10	Natural	Natural	Private Rd.	Private	Renovation	Closed	0.16	Decommission
11A	Natural	Rock	H	BLM	Improvement	Closed	0.55	Open
11A		Rock	K	BLM	New construction		0.28	Open
11A		Rock	K2	BLM	New construction		0.03	Open
11A		Rock	K1	BLM	New construction		0.03	Open
11A	Rock	Rock	22-9-15.1	Private	Renovation		0.26	
11B	Natural	Rock	M	BLM	Improvement	Closed	0.67	Open
11B		Rock	L	BLM	New construction		0.06	Open
11B		Rock	N	BLM	New construction		0.10	Open
11B	Natural	Natural	Private Rd.	Private	Renovation	Open	0.62	
11B	Rock	Rock	22-9-15.1	Private	Renovation	Open	1.11	
12		Rock	O	BLM	New construction		0.32	Open
12		Rock	O1	BLM	New construction		0.04	Open
13	Natural	Rock	B1	BLM	Improvement	Closed	0.11	Open
13	Natural	Rock	C	BLM	Improvement	Closed	0.96	Open
13	Natural	Rock	B	NKN	Improvement	Closed	1.10	Open
13	Natural	Rock	C	Private	Improvement	Closed	0.21	
13		Rock	A	BLM	New construction		0.44	Open
13	Natural	Natural	Private Rd.	Private	Renovation	Closed	3.44	Open
18	Natural	Rock	D	BLM	Improvement	Closed	0.42	Open
18	Natural	Rock	21-9-36.1	BLM	Renovation	Open	0.67	Open
18	Rock	Rock	21-9-36.1	BLM	Renovation	Open	0.18	Open
18	Natural	Rock	21-9-36.1	Private	Renovation	Open	0.22	
19		Rock	D1	BLM	New construction		0.05	Open
19		Rock	E	BLM	New construction		0.06	Open
19	Natural	Natural	D2	BLM	Renovation	Closed	0.25	Decommission
19	Natural	Natural	21-9-36.1	BLM	Renovation	Open	0.59	Open
19	Natural	Natural	21-9-36.1	Private	Renovation	Open	0.19	
23		Natural	A	BLM	New construction		0.35	Decommission
21	Rock	Rock	21-8-30	BLM	Renovation	Open	0.96	Open
21	Rock	Rock	21-9-24.1	BLM	Renovation	Open	1.71	Open
23		Natural	Private Rd.	Private	Renovation	Closed	1.09	
23		Natural	21-8-31	Private	Renovation	Open	1.42	
23		Natural	21-9-36	Private	Renovation	Open	0.81	
24		Rock	B	BLM	New construction		0.05	Open
24	Natural	Natural	21-9-24.1	BLM	Renovation	Open	0.41	Open
24	Natural	Natural	Private Rd.	Private	Renovation	Closed	0.07	Open
24	Rock	Rock	21-9-24.1	Private	Renovation	Open	1.03	Open
25		Rock	F	BLM	New construction		0.05	Open
25		Rock	G	BLM	New construction		0.32	Open
25		Rock	H	BLM	New construction		0.07	Open
25		Rock	I	BLM	New construction		0.16	Open
25	Natural	Natural	21-8-33	BLM	Renovation	Open	0.51	Open
25	Rock	Rock	21-9-36.1	BLM	Renovation	Open	0.19	Open
25	Rock	Rock	Private Rd.	Private	Renovation	Open	0.13	Open
26A		Rock	C	BLM	New construction		0.11	Open
26A	Rock	Rock	21-9-24.1	BLM	Renovation	Open	1.07	Open
26A	Rock	Rock	21-9-24.1	Private	Renovation	Open	0.48	Open
26A	Natural	Natural	D	BLM	Swing Road		0.11	Decommission

EA Unit	Existing Surface Type	New Surface Type	Road or Spur Name/Number	Road Control	Construction Type	Present Closure Status	Road Length (Miles)	Post-Harvest Closure Status
26E	Rock	Rock	22-8-2.1	BLM	Renovation	Open	2.13	Open
26F	Rock	Rock	21-8-27.4	BLM	Renovation		0.18	Open
26F	Rock	Rock	22-8-2.1	BLM	Renovation	Open	0.14	Open
26F	Natural	Natural	D	BLM	Renovation		0.09	Fully decommission
27	Natural	Rock	21-8-33	BLM	Improvement	Open	0.46	Open
27	Natural	Rock	22-8-4	BLM	Improvement	Open	0.26	Open
27	Rock	Rock	21-9-36.1	BLM	Renovation	Open	0.19	Open
27	Rock	Rock	22-8-10.1	BLM	Renovation	Open	0.20	Open
27	Rock	Rock	22-8-10.1	Private	Renovation	Open	0.16	Open
28		Rock	J	BLM	New construction		0.07	Fully decommission
28		Rock	K	BLM	New construction		0.06	Fully decommission
28		Rock	L	BLM	New construction		0.07	Fully decommission
28	Rock	Rock	22-8-10.1	BLM	Renovation	Open	2.47	Open
29		Natural	M1	BLM	New construction		0.14	Fully decommission
29	Natural	Natural	21-8-34.2	BLM	Renovation	Open	0.46	Fully decommission
29	Natural	Natural	M	BLM	Renovation	Closed	0.18	Fully decommission
29	Rock	Rock	22-8-2.4	Private	Renovation	Open	0.85	
30	Natural	Rock	A	BLM	Improvement	Closed	0.32	Open
30		Rock	C	BLM	New construction		0.16	Open
30		Rock	D	BLM	New construction		0.05	Open
30	Natural	Natural	Private Rd.	Private	Renovation	Open	0.23	
30	Natural	Natural	B	BLM	Renovation		0.03	Decommission
30	Natural	Natural	B1	BLM	Renovation		0.07	Decommission
30	Natural	Natural	B2	BLM	Renovation		0.09	Decommission
31	Natural	Rock	K	BLM	Improvement	Closed	0.33	Fully decommission
31		Rock	L	BLM	New construction		0.18	Fully decommission
31		Rock	M	BLM	New construction		0.12	Fully decommission
31	Natural	Natural	N	BLM	Renovation	Closed	0.14	Fully decommission
31	Paved	Paved	22-8-9	BLM	Renovation	Open	4.71	Open
31	Rock	Rock	21-8-14.1	BLM	Renovation	Open	0.50	Open
31	Rock	Rock	22-8-9	BLM	Renovation	Open	1.84	Open
32		Rock	E	BLM	New construction		0.36	Fully decommission
32		Rock	E1	BLM	New construction		0.04	Fully decommission
32		Rock	E2	BLM	New construction		0.09	Fully decommission
32		Rock	E4	BLM	New construction		0.09	Fully decommission
32		Rock	F	BLM	New construction		0.05	Fully decommission
32		Rock	H	BLM	New construction		0.05	Fully decommission
32		Rock	I	BLM	New construction		0.17	Fully decommission
32	Rock	Rock	21-8-14.1	BLM	Renovation	Open	0.54	Open
32	Natural	Natural	E3	BLM	Swing Road		0.08	Fully decommission
34	Natural	Rock	K	BLM	Improvement	Closed	0.24	Fully decommission
34	Rock	Rock	21-8-14.1	BLM	Renovation	Open	0.75	Open
34	Rock	Rock	21-9-24.1	BLM	Renovation	Open	0.08	Open
34a		Natural	J	BLM	New construction		0.12	Fully decommission
35	Natural	Rock	A	BLM	Improvement	Closed	0.13	Fully decommission
35		Rock	A1	BLM	New construction		0.06	Fully decommission
35	Rock	Rock	21-8-14.2	BLM	Renovation	Open	0.32	Open
35	Rock	Rock	22-8-9	BLM	Renovation	Open	0.09	Open
35	Rock	Rock	21-8-14.2	Private	Renovation	Open	0.42	Open
36		Rock	B	BLM	New construction		0.11	Fully decommission
36	Natural	Natural	Paradise Helipond	BLM	Renovation	Open	0.07	Open
36	Rock	Rock	21-8-14.2	BLM	Renovation	Open	0.23	Open
36	Rock	Rock	21-8-24.1	BLM	Renovation	Open	0.47	Open
36	Rock	Rock	21-8-25	BLM	Renovation	Open	1.92	Open
41A	Natural	Natural	21-7-31.3	Private	Renovation	Open	0.18	Open
41A	Natural	Natural	21-7-31.4	Private	Renovation	Open	0.26	Open
42	Paved	Paved	22-8-10	BLM	Renovation	Open	5.65	Open
42	Paved	Paved	22-8-9	BLM	Renovation	Open	1.63	Open
45		Natural	C	BLM	New construction		0.22	Fully decommission

EA Unit	Existing Surface Type	New Surface Type	Road or Spur Name/Number	Road Control	Construction Type	Present Closure Status	Road Length (Miles)	Post-Harvest Closure Status
45		Natural	D	BLM	New construction		0.12	Fully decommission
45	Natural	Natural	21-7-31.2	BLM	Renovation	Closed	0.65	Decommission
45	Natural	Natural	E	BLM	Renovation	Closed	0.39	Fully decommission
45	Rock	Rock	21-7-31.7	BLM	Renovation	Open	0.23	Open
46	Natural	Rock	22-8-1.2	BLM	Improvement	Closed	0.33	Open
46	Natural	Rock	F1	BLM	Improvement	Closed	0.11	Open
46	Natural	Rock	F	BLM	Improvement	Closed	0.67	Open
46	Natural	Rock	F	Private	Improvement	Closed	0.20	
46		Natural	E	BLM	New construction		0.17	Fully decommission
46		Rock	F1	BLM	New construction		0.14	Fully decommission
46		Rock	F2	BLM	New construction		0.13	Fully decommission
46		Rock	F3	BLM	New construction		0.36	Fully decommission
46		Natural	22-8-1	BLM	Renovation	Closed	0.41	Decommission
46		Natural	22-8-1.1	BLM	Renovation	Closed	0.28	Decommission
46	Natural	Natural	CAT ROAD	BLM	Renovation	Closed	0.53	Fully decommission
46	Rock	Rock	21-8-36	BLM	Renovation	Closed	0.81	Open
47	Natural	Rock	D	BLM	Improvement	Closed	0.02	Decommission
47		Rock	D	BLM	New construction		0.40	Fully decommission
47	Rock	Rock	21-8-36	BLM	Renovation	Closed	0.52	Decom. past waterhole
48	Natural	Rock	H	BLM	Improvement	Closed	0.18	Decommission
48	Natural	Rock	SPUR 11A	BLM	Improvement	Closed	0.15	Decommission
48		Rock	G	BLM	New construction		0.12	Fully decommission
48	Rock	Rock	Private Rd.	Private	Renovation	Open	0.51	Open
49		Natural	C1	BLM	New construction		0.08	Decommission
49	Natural	Natural	C	BLM	Renovation	Closed	0.13	Decommission
49	Rock	Rock	22-8-9.1	BLM	Renovation	Open	0.65	Open
50	Natural	Rock	22-8-9.1	BLM	Improvement	Open	1.07	Open
50	Natural	Natural	B	BLM	New construction		0.35	Decommission
50	Natural	Natural	B1	BLM	New construction		0.13	Decommission
50	Natural	Natural	A	Private	Renovation	Closed	0.71	Decommission
51	Natural	Rock	22-8-9.1	BLM	Improvement	Open	0.32	Open
52	Natural	Rock	22-8-17	BLM	Improvement	Closed	0.29	Open
52		Natural	K	BLM	New construction		0.12	Decommission
52		Natural	L1	BLM	New construction		0.39	Decommission
52		Natural	L2	BLM	New construction		0.05	Decommission
52		Natural	M	BLM	New construction		0.04	Decommission
52		Natural	N	BLM	New construction		0.10	Decommission
52		Rock	D	BLM	New construction		0.03	Open
52		Rock	E	BLM	New construction		0.02	Open
52		Rock	F	BLM	New construction		0.05	Open
52		Rock	H	BLM	New construction		0.03	Open
52		Rock	I	BLM	New construction		0.12	Open
52		Rock	J	BLM	New construction		0.10	Open
52	Natural	Natural	L	BLM	Renovation		0.22	Decommission
52	Natural	Natural	I	BLM	Renovation	Closed	0.05	Decommission
52	Natural	Natural	K1	BLM	Renovation	Closed	0.07	Decommission
52	Natural	Natural	Z	BLM	Renovation	Closed	0.40	Decommission
52	Natural	Natural	22-8-17.1	BLM	Renovation	Closed	1.34	Fully decom. Z to M
52	Paved	Paved	22-8-29	BLM	Renovation	Open	1.28	Open
52	Rock	Rock	22-8-17	BLM	Renovation	Open	0.85	Open
52	Rock	Rock	22-8-17.2	BLM	Renovation	Open	0.24	Open
52	Rock	Rock	22-8-29	BLM	Renovation	Open	0.83	Open
53	Rock	Rock	22-8-29	BLM	Renovation	Open	0.46	Open
54	Natural	Rock	Q	BLM	Improvement	Closed	0.09	Open
54		Natural	S1	BLM	New construction		0.04	Decommission
54		Rock	V	BLM	New construction		0.01	Decommission
54		Rock	W	BLM	New construction		0.01	Decommission
54		Rock	X	BLM	New construction		0.01	Decommission
54		Rock	Y	BLM	New construction		0.01	Decommission

EA Unit	Existing Surface Type	New Surface Type	Road or Spur Name/Number	Road Control	Construction Type	Present Closure Status	Road Length (Miles)	Post-Harvest Closure Status
54		Rock	P	BLM	New construction		0.03	Open
54		Rock	Q1	BLM	New construction		0.02	Open
54		Rock	R	BLM	New construction		0.02	Open
54		Rock	T	BLM	New construction		0.10	Open
54		Rock	U	BLM	New construction		0.13	Open
54	Rock	Rock	22-8-19	BLM	Renovation	Closed	0.24	Decommission
54	Rock	Rock	22-8-19.1	BLM	Renovation	Open	0.14	Decommission
54	Natural	Natural	S	BLM	Renovation	Open	0.20	Decommission
54	Rock	Rock	22-8-18	BLM	Renovation	Open	1.16	Open
54	Rock	Rock	22-8-29	BLM	Renovation	Open	0.14	Open
54	Rock	Rock	22-9-13	BLM	Renovation	Open	0.27	Open
55		Natural	O		New construction		0.12	Decommission
55	Natural	Natural	Private Rd.	Private	Renovation		0.22	Decommission
55	Rock	Rock	22-8-18	BLM	Renovation	Open	0.47	Open
56	Natural	Rock	J	Private	Improvement	Open	0.25	Open
56	Natural	Rock	K	Private	Improvement	Open	0.13	Open
56		Natural	A	BLM	New construction		0.36	Decommission
56		Rock	B	BLM	New construction		0.27	Decommission
56		Rock	B1	BLM	New construction		0.03	Decommission
56		Rock	C	BLM	New construction		0.18	Decommission
56		Rock	C1	BLM	New construction		0.16	Decommission
56		Rock	D	BLM	New construction		0.28	Decommission
56		Rock	I1	BLM	New construction		0.05	Open
56		Rock	I2	BLM	New construction		0.06	Open
56		Natural	O	BLM	New construction		0.32	Decommission
56		Rock	G	BLM	New construction		0.19	Open
56		Rock	H	BLM	New construction		0.15	Open
56		Rock	I	BLM	New construction		0.25	Open
56		Rock	K	BLM	New construction		0.10	Open
56		Rock	L	BLM	New construction		0.07	Open
56		Rock	M	BLM	New construction		0.39	Open
56		Rock	M1	BLM	New construction		0.05	Open
56		Rock	M2	BLM	New construction		0.03	Open
56		Rock	M3	BLM	New construction		0.18	Open
56	Rock	Rock	22-8-19.4	BLM	Renovation	Closed	0.27	Decommission
56	Rock	Rock	22-8-19.2	BLM	Renovation	Open	0.55	Open
56	Rock	Rock	22-8-19.5	BLM	Renovation	Open	0.73	Open
56	Rock	Rock	22-8-20	BLM	Renovation	Open	2.12	Open
56	Natural	Natural	22-8-20	Private	Renovation	Open	0.55	Open
56	Rock	Rock	22-8-19.2	Private	Renovation	Open	0.24	Open
56	Rock	Rock	22-8-20	Private	Renovation	Open	1.51	Open
57		Rock	F	BLM	New construction		0.14	Open
57	Natural	Natural	22-8-19.6	BLM	Renovation	Closed	0.29	Decommission
58		Rock	A	BLM	New construction		0.77	Decommission
58		Rock	A1	BLM	New construction		0.13	Decommission
58		Rock	B	BLM	New construction		0.33	Open
58		Rock	C	BLM	New construction		0.08	Open
58	Natural	Natural	22-9-25.2	BLM	Renovation	Closed	0.25	Decommission
58		Rock	D	BLM	New construction		0.12	Open
58		Rock	N	BLM	New construction		0.10	Decommission
58		Rock	N1	BLM	New construction		0.09	Decommission
58	Natural	Natural	22-9-27	BLM	Renovation	Closed	0.40	Open
58	Rock	Rock	22-9-18	Private	Renovation	Open	0.75	Open
58A	Natural	Rock	22-9-35	BLM	Improvement	Open	0.20	Open
58A		Natural	H	BLM	New construction		0.03	Decommission
58A		Natural	I	BLM	New construction		0.20	Decommission
58A		Natural	J	BLM	New construction		0.13	Decommission
58A		Rock	E	BLM	New construction		0.08	Open
58A	Natural	Natural	I1	BLM	Renovation	Closed	0.26	Decommission

EA Unit	Existing Surface Type	New Surface Type	Road or Spur Name/Number	Road Control	Construction Type	Present Closure Status	Road Length (Miles)	Post-Harvest Closure Status
58A	Rock	Rock	22-9-27	Private	Renovation	Closed	2.01	Decommission
58A	Rock	Rock	22-9-35	BLM	Renovation	Open	0.62	Open
58A	Rock	Rock	22-9-18.2	Private	Renovation	Open	7.58	Open
58A	Rock	Rock	22-9-19	Private	Renovation	Open	0.01	Open
58A	Rock	Rock	Private Rd.	Private	Renovation	Open	0.16	
58A	Rock	Rock	Private Rd.	Private	Renovation	Open	0.71	
64C	Rock	Rock	SPUR 5	BLM	Renovation	Closed	0.06	Decommission
59	Natural	Rock	G	Private	Improvement	Closed	0.14	Decommission
59		Rock	G	BLM	New construction		0.08	Decommission
59		Rock	F	BLM	New construction		0.04	Open
59	Rock	Rock	22-9-18	Private	Renovation	Open	0.47	Open
59	Rock	Rock	22-9-25	Private	Renovation	Open	0.24	Open
59	Rock	Rock	22-9-25.1	Private	Renovation	Open	0.14	Open
60		Rock	K	BLM	New construction		0.13	Open
60		Rock	L	BLM	New construction		0.13	Open
60		Rock	M	BLM	New construction		0.16	Open
60	Paved	Paved	22-8-29.1	BLM	Renovation	Open	0.85	Open
60	Rock	Rock	22-8-31	BLM	Renovation	Open	0.28	Open
60	Rock	Rock	22-8-31.1	BLM	Renovation	Open	0.70	Open
60	Rock	Rock	22-8-29.1	Private	Renovation	Open	2.17	Open
60	Rock	Rock	22-9-18	Private	Renovation	Open	2.43	Open
61	Natural	Rock	22-8-31.3	Private	Improvement	Open	0.17	Open
61	Rock	Rock	22-8-31.3	BLM	Renovation	Open	0.20	Open
62A	Natural	Natural	22-8-29.4	BLM	Renovation	Open	0.28	Decommission
62A	Natural	Natural	22-8-32	BLM	Renovation	Open	0.55	Decommission
62A	Rock	Rock	22-8-32	BLM	Renovation	Open	0.39	Decommission
62A	Natural	Natural	22-8-29.4	Private	Renovation	Open	0.83	Decommission
63		Rock	B	BLM	New construction		0.09	Open
63	Rock	Rock	23-8-5	BLM	Renovation	Open	0.57	Open
63	Rock	Rock	SPUR 1	BLM	Renovation	Closed	0.07	Open
64	Paved	Paved	22-8-29.2	BLM	Renovation	Open	1.93	Open
64	Rock	Rock	22-8-33	BLM	Renovation	Open	0.76	Open
64	Rock	Rock	23-8-5	BLM	Renovation	Open	0.99	Open
64A	Rock	Rock	23-8-5.4	BLM	Renovation	Open	1.07	Open
64B	Rock	Rock	22-8-32.2	BLM	Renovation	Open	0.56	Open
65		Rock	D	BLM	New construction		0.11	Open
65		Natural	C	BLM	New construction		0.08	Decommission
65	Rock	Rock	22-8-33	BLM	Renovation	Open	0.03	Open
65	Rock	Rock	23-8-5	BLM	Renovation	Open	0.01	Open
66A	Rock	Rock	23-8-5	BLM	Renovation	Open	0.06	Open
66A	Rock	Rock	23-8-5.7	BLM	Renovation	Open	0.08	Open
66B		Rock	E	BLM	New construction		0.15	Open
67	Natural	Rock	23-8-5.2	BLM	Improvement	Open	0.48	Decommission
67	Rock	Rock	23-8-5.2	BLM	Renovation	Open	0.12	Decommission
67	Rock	Rock	F	BLM	Renovation	Open	0.07	Decommission
68		Rock	A	BLM	New construction		0.13	Open
68	Natural	Rock	23-8-6.2	Private	Renovation	Open	0.39	
69	Natural	Natural	B	BLM	Renovation	Closed	0.53	Decommission
69	Natural	Natural	C	BLM	Renovation	Closed	0.47	Decommission
69	Paved	Natural	22-8-29.2	BLM	Renovation	Open	1.30	Open
69	Paved	Paved	23-8-7	BLM	Renovation	Open	0.25	Open
69	Rock	Rock	23-8-6.1	BLM	Renovation	Open	0.88	Open
69	Rock	Rock	22-9-18	Private	Renovation	Open	1.08	Open
71	Natural	Rock	A	BLM	Improvement	Closed	0.07	Open
71		Rock	A1	BLM	New construction		0.25	Open
71	Natural	Natural	22-8-27.2	BLM	Renovation	Open	0.20	Decommission
71	Rock	Rock	22-8-22	BLM	Renovation	Closed	0.99	Open
71	Rock	Rock	22-8-27	BLM	Renovation	Open	0.02	Open
72	Natural	Natural	22-8-25	BLM	Renovation	Open	0.42	Decommission

EA Unit	Existing Surface Type	New Surface Type	Road or Spur Name/Number	Road Control	Construction Type	Present Closure Status	Road Length (Miles)	Post-Harvest Closure Status
72	Rock	Rock	22-8-24	BLM	Renovation	Closed	1.81	Decommission
72B	Rock	Rock	22-8-24	BLM	Renovation	Closed	0.11	Decommission
74		Natural	C	BLM	New construction		0.21	Decommission
74		Rock	B	BLM	New construction		0.10	Open
74	Rock	Rock	21-9-31	BLM	Renovation	Open	1.31	Open
75		Natural	D	BLM	New construction		0.24	Decommission
75	Natural	Natural	21-9-32	BLM	Renovation	Open	0.84	Open
75	Paved	Paved	22-9-7	BLM	Renovation	Open	2.60	Open
76		Natural	D	BLM	New construction		0.07	Decommission
76		Natural	E	BLM	New construction		0.10	Decommission
76	Natural	Natural	SPUR 19	BLM	Renovation	Closed	0.40	Decommission
76	Rock	Rock	21-7-29	BLM	Renovation	Open	1.31	Open
77	Natural	Rock	C	NKN	Improvement	Closed	0.03	Fully decommission
77	Rock	Rock	21-7-29	BLM	Renovation	Open	0.56	Open
77	Rock	Rock	21-8-25	BLM	Renovation	Open	0.34	Open
78	Natural	Natural	21-7-20	BLM	Renovation	Open	0.19	Fully decommission
78	Rock	Rock	21-7-29	BLM	Renovation	Open	0.43	Open
78	Natural	Natural	21-7-20.1	Private	Renovation	Open	0.14	Open
78	Natural	Natural	21-7-20.2	Private	Renovation	Open	0.36	Open
79	Natural	Rock	21-8-25	Private	Improvement	Open	0.16	
79	Rock	Rock	21-8-25	BLM	Renovation	Open	0.79	Open
80	Rock	Rock	21-8-14.1	BLM	Renovation	Open	0.88	Open
81	Rock	Rock	21-7-31.6	BLM	Renovation	Closed	0.34	Decommission
83	Paved	Paved	22-8-10	BLM	Renovation	Open	2.61	Open
83	Rock	Rock	21-7-28.1	Private	Renovation	Open	0.41	Open
84		Rock	A	BLM	New construction		0.23	Fully decommission
85	Natural	Natural	21-7-28.3	Private	Renovation	Open	0.18	Decommission
85	Rock	Rock	22-7-22.1	BLM	Renovation	Open	0.14	Open
85	Rock	Rock	21-7-28.1	Private	Renovation	Open	0.49	Open
86	Rock	Rock	21-7-31.1	BLM	Renovation	Open	0.61	Open
87	Natural	Rock	SPUR 31	BLM	Improvement	Closed	0.12	Fully decommission
87		Rock	B	BLM	New construction		0.11	Fully decommission
88	Natural	Rock	B	BLM	Improvement	Closed	0.50	Decommission
88	Natural	Rock	22-8-1.3	BLM	Improvement	Closed	0.07	Fully decommission
88		Natural	A	BLM	New construction		0.32	Fully decommission
88		Rock	C	BLM	New construction		0.03	Fully decommission
89	Natural	Natural	21-7-31.1	BLM	Renovation	Open	0.54	Open
89	Natural	Natural	21-7-31.1	Private	Renovation	Open	0.32	Open
91	Natural	Rock	D1	BLM	Improvement	Closed	0.03	Decommission
91	Rock	Rock	21-8-36	BLM	Renovation	Closed	0.05	Decom. past waterhole
92	Natural	Rock	21-7-29.1	Private	Improvement	Open	0.22	Drop – wildlife unit
92	Rock	Rock	21-7-29.1	BLM	Renovation	Open		Drop – wildlife unit
94	Natural	Natural	Z1	BLM	Renovation	Closed	0.07	Decommission
94	Natural	Natural	Z2	BLM	Renovation	Closed	0.28	Decommission
94	Rock	Rock	22-9-13	BLM	Renovation	Open	0.17	Open

APPENDIX C.: SPECIAL STATUS SPECIES

Environmental Analysis File Coos Bay District: Umpqua Field Office
Project Name: Umpqua River/ Sawyer Rapids timber sale
Prepared By: Jennie Sperling
Project Type: Thinning and Hardwood Conversion
Date: March 28, 2007
Location: Douglas County, T21S, R9W, Sections 31,32, & 33, T22S, R9W, Sections 3, 4, 9, 10, 15, 25,25, & 35, T21S, R8W, Sections 23, 24, 25, 26, 27, 29, 33, & 35, T22S R 8W, 1, 3, 5, 7, 9, 11, 17, 18, 19, 25, 27, 29, 31, 32, & 33, T21S, R7W, 19, 20, 29, 30, & 31, T23S, R8W, Sections 5, 6, & 7, Willamette Meridian.

Project description:
The proposed project is primarily within the Umpqua River – Sawyer Rapids Fifth Field Watershed (92.5%) with small areas (7.5%) falling in the following subwatersheds of Vincent Creek, Big Creek-Lower Umpqua, Lower Elk Creek, and Lower Camp Creek. The elevation of the project units ranges from 500 to 1600 feet and is located approximately 20 to 32 miles inland from the Pacific Coast.

Proposed Alternative- the Umpqua Field Office (UFO) proposes to treat 31-80 year old stands of primarily Douglas-fir stands within LSR 263, 265, &266 RR's, and the adjacent General Forest Management Area (GFMA) land. The project would thin approximately 8938 acres of primarily conifer stands and convert about 218 acres of alder for a total of 9125 acres. Of the total acres; 6418 acres will consist of density management thinning in Riparian Reserve and Late-Successional Reserve, and approximately 2520 acres will consist of commercial thinning in the GFMA.

SPECIAL STATUS SPECIES

The BLM is warranted to conserve Special Status Species and ecosystems upon which they depend (USDI 2001). Special Status Species include Federally Proposed species, species listed as Threatened or Endangered (T&E), Candidate species, State listed species, and Sensitive species. Vascular plants, lichens, bryophytes, and fungi are included in some or all of these categories. Field Office Managers are ultimately responsible for implementation of the special status species program (USDI 2001). Special Status Species are those designated by a State Director as sensitive, usually in cooperation with the State agency responsible for managing the species and State Natural Heritage programs. Special Status Species are those that: (1) could become endangered in or extirpated from a State, or within a significant portion of its distribution; (2) are under status review by the Fish & Wildlife Service; (3) are undergoing significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution; (4) are undergoing significant current or predicted downward trends in population or density such that federal listed, proposed, candidate, or State listed status may be come necessary; (5) typically have small and widely dispersed populations; (6) inhabit ecological refugia or other specialized or unique habitats; or (7) are State listed but which may be better conserved through application of BLM sensitive species status (USDI 2001).

The Oregon Natural Heritage Information Center (ORNHIC) publishes lists of rare, threatened, and endangered plants and animals of Oregon every three years (ORNHIC 2007). Four ranks or lists are recognized by ORNHIC (ORNHIC 2007): (1) List 1: taxa that are threatened with extinction or presumed to be extinct throughout their entire range, (2) List 2: taxa that are threatened with extirpation or presumed to be extirpated from the state of

Oregon, (3) List 3: taxa for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range, and (4) List 4: taxa which are of concern, but are not currently threatened or endangered).

As of July 2007, the Interagency Special Status/Sensitive Species (ISSSS) Program staff developed a new criterion for two categories of Special Status Species: Sensitive and Strategic (IM OR-2007-072). Sensitive Species policies as described in the BLM National manual 6840 apply to just sensitive listed species. Sensitive species are those that: (1) corresponds to Oregon Heritage List 1 or List 2 (for Oregon); (2) are documented on at least one OR/WA BLM District or Region 6 Nation Forest; and (3) includes all documented or suspected Federal Candidates, State Listed Threatened & Endangered, or De-listed Federal species (IM OR-2007-072). To comply with Bureau policy to assess the effects of a proposed action on Sensitive species, the District may use one or more of the following techniques: (1) evaluation of species habitat association, (2) application of conservation strategies, plans, or other conservation tools, (3) review existing survey records, inventories, and spatial data, (4) use professional research and literature, (5) use professional judgment, and (6) complete pre-project surveys. Surveys are warranted if the project is within the range of these species, if there is potential habitat within the project area, or the project may cause significant negative effect as determined by environmental analysis on the species' habitat or persistence. Strategic species are not considered as Special Status Species for management purposes; however, if sites are located, field units are required to collect occurrence data on these species.

THREATENED AND ENDANGERED (T&E) PLANTS

One endangered plant occurs within the Umpqua Resource Area – *Lilium occidentale*. The Umpqua River/Sawyer Rapids project area is located outside the range of this species. However, even though the project area is outside its range, surveys conducted for other Special Status plants during the appropriate survey season would have detected and documented any the endangered plants if they were present in the project area.

SURVEY AND MANAGE (S&M)

At the time of the decision for the Umpqua River/Sawyer Rapids timber sale, regulations regarding Survey and Manage (S&M) Species can be summarized as follows:

- 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 was reinstated by a January 9, 2006 U.S. District Court order (Northwest Ecosystem Alliance et al. v. Rey et al.).
- The court modified this order on October 11, 2006, exempting certain activities including: a) thinning projects in stands younger than 80 years old; and 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.
- On July 25, 2007, the Under Secretary of the Department of Interior signed a new Survey and Manage Record of Decision that removed the survey and manage requirements from all of the BLM resource management plans (RMPs) within the range of the northern spotted owl. This decision may require review by the court in order to remove the injunctions associated with the 2004 ROD.

Survey and Manage (S&M) surveys had been completed for some of the units within the Umpqua River/Sawyer Rapids project area before the 2006 October order exempted thinning younger than 80 years. Surveys conducted in the Umpqua River/Sawyer Rapid project area had located six Survey and Manage with Categories A, B, D, and E but would not be protected in the proposed project area due to the removal of the Survey and Manage program as of July 25, 2007.

PRE-FIELD REVIEW

The Umpqua River/Sawyer project area potentially has habitat for several Special Status plant species than just the special habitat areas discussed above. Sites of Special Status Species have been located in other similar projects in similar habitat on district.

While old-growth forest is the optimal habitat in which some may flourish, many Special Status Species sites have been located in younger thinned stands long after the old growth stands have been removed. This could be attributed to a number of things including; presence of remnant trees, course woody debris retention, areas of vegetation different from congruent flow of tree stands, open grassy balds, landscapes aberrations with higher or lower moisture levels and green tree retention which potentially enable the continued presence of fungal species.

Pre-disturbance surveys are based on whether the proposed project overlaps the known or suspected range of a species as well as the likelihood that potential habitat is present. Potential habitat is determined by aerial photographic interpretation, ground work and review of information on each species habitat requirements. Surveys will not be conducted for species whose known or suspected habitats/ranges do not overlap with the project area. The data for known sites are located in both the GeoBob and the ORNHIC database generated from numerous botanical surveys completed throughout the Northwest Forest plan.

The Umpqua River/Sawyer Rapids timber sale has open areas along the roadsides which contain marginal potential habitat for two Sensitive species: California globe mallow (*Iliamna latibracteata*), and the wayside aster (*Eucephalus vialis*), also a Species of Concern and listed as threatened by US Fish and Wildlife Service; (ORNHIC 2007). California globe mallow occurs in two general areas near the towns of Powers and Remote. Wayside aster range extends into the northern portion of the district in dry upland Douglas-fir sites along trails and road systems.

There is a medium to high probability for potential habitat of two Sensitive liverworts: giant folded leaf *Diplophyllum plicatum* and *Porella bolanderi*. Several populations of the giant folded leaf liverwort are found both north and south of the project area on red cedar boles and moss-covered Douglas-fir logs. *Porella bolanderi* grows on outcrops and boulders, soil, and epiphytic on oaks, myrtle, bigleaf maple and Douglas-fir.

There is also potential habitat for four Sensitive lichens*: Bryoria subcana*, *Erioderma sorediatum*, *Hypotrachyna revolute,* and *Lobaria linita*. Two sites of *Bryoria subcana* have been located so far within the proposed project area. *Bryoria subcana* has also been located on Coos Bay District in younger stands on older trees located on ridge tops in western hemlock and Douglas-fir stands. Both *Erioderma sorediatum* and *Hypotrachyna revoluta* have been located on bark in the Coast Range. *Lobaria linita* is found in mature to old growth forests, oak forests with rock outcrops and late-mature tan-oak and madrone forests.

There is also potential habitat for moss: *Schistostega pennata, Tayloria serrata*, and *Tetraphis geniculata*. *Schistostega pennata* occurs on mineral soil in shaded pockets of overturned tree roots, often with shallow pools of standing water at the base of the root wad in Coast Range. *Tayloria serrata* grows on humus and animal dung. *Tetraphis geniculata* grows in moist coniferous forest on the ends of large down logs and class 3, 4 or 5 rotted logs or stumps in the Coast Range. Habitat for Special Status Species fungi is marginally present for most of the EA area with the exception of the patches of older larger remnant trees scattered through the proposed project area. Sensitive fungi species are considered impractical to survey.

SURVEY METHODS

Field surveys for Special Status Species plants are conducted by professional botanists and will be completed according to approved survey protocols. These typically involve using the intuitive controlled method where high likelihood habitats are surveyed more intensively than other areas within the project (Whiteaker et al., 1998; USDI 1998; USDA and USDI 1997; USDA and USDI 1999). This approach may be one of the more reliable methods for locating rare species and it relies on knowledge, experience, observation, and intuition of the surveyor. Surveys are focused on locating Threatened and Endangered and Sensitive plant species. Comprehensive species lists of vascular plants and lichen and bryophytes are also documented during plant surveys. Survey routes, dates of survey, and any suspected sites will be flagged in the field and recorded on data sheets and topographic maps.

Appendix Table C–1: Special Status Species sites located in the Umpqua River/Sawyer Rapids EA Units

Sensitive sp.	Group	Units	Sites total
Bryoria subcana	Lichen	37, 92	+4
Diplophyllum plicatum	Liverwort	56	1
Phaeocollybia californica	Fungi	37, 40, 50	3
Phaeocollybia dissiliens	Fungi	30, 76	+6
Phaeocollybia olivacea	Fungi	40, 76	+4
Phaeocollybia pseudofestiva	Fungi	50	1
Phaeocollybia sipei	Fungi	37, 38, 40, 50, 76	16
Phaeocollybia spadicea	Fungi	50, 76	2

+ Indicates that more is expected to be located in units due to presence of ideal habitat conditions in some areas of the Umpqua River/Sawyer Rapids timber sale.
Note: Botanical surveys are still ongoing which can potentially change site numbers.

PROTECTION MEASURES

Protection measures ensure that actions authorized, funded or carried out by the BLM do not contribute to the need to list any Sensitive plant species (BLM Manual 6840.02). Protection measures of Strategic species are not required.

Management recommendations would be followed to protect microclimate and maintain local persistence of any Special Status Species plants found in any of the proposed units (Castellano & O'Dell 1997, Brian et al. 2002). For some species, maintaining canopy cover and micro-site conditions is just as important as establishing buffers to ensure no disturbance of the plant site and its adjoining habitat. Other species and sites may not be negatively affected by and may even benefit in long term pro-active management such as thinning that would enhance habitat or reduce competition from brush, trees, or other herbaceous species. In those instances, a smaller buffer may be adequate. If any special status vascular or nonvascular plant species is encountered incidentally while surveying, the site would be protected using known site management recommendations developed by interdisciplinary team on the Coos Bay District (Brian et al. 2002) unless directed otherwise by management

SPECIAL STATUS VASCULAR (PART 1) AND NONVASCULAR (PART 2) PLANT SPECIES DOCUMENTED OR SUSPECTED TO OCCUR WITHIN THE UMPQUA RIVER/SAWYER RAPIDS PROJECT AREA.
(Last updated in 21 August 2007)
Alphabetical definition of terms, acronyms, and abbreviations:
BM = Blue Mountains Ecoregion.
CR = Coast Range Ecoregion.

D = Documented.
EC = East Cascades Ecoregion.
FE = Federally Endangered species.
FEO = Federally Endangered in Oregon
ft = feet (multiply by 0.3048 to get meters).
KM = Klamath Mountains Ecoregion.
M = Myrtlewood Field Office.
m = meters (multiply by 3.281 to obtain feet).
OR-SEN = Sensitive in OR only
OR-STR = Strategic Species in OR and WA
ORNHIC = Oregon Natural Heritage Information Center.
List 1 = taxa that are threatened with extinction or presumed to be extinct throughout their entire range.
List 2 = taxa that are threatened with extirpation or presumed to be extirpated from the state of Oregon.
List 3 = taxa that are rare, uncommon or threatened, but not immediately imperiled.
List 4 = taxa that are not rare and apparently secure, but with cause for long-term concern.
S = Suspected.
Sec = Section.
SC = State Candidate species.
SE = State Endangered, species Listed as endangered by the Oregon Department of Agriculture (ODA).
SEN = Bureau sensitive species in OR and WA. Heritage Ranks: G1-G3 or N1-N3 or T1-T3 or S1-S2 and Oregon Heritage List 1 or List 2 (for Oregon) and documented on at least one OR/WA BLM District.
SoC = Species of Concern, all former Candidate 2 species for which there is not enough information known to warrant Listing under the Endangered Species Act.
ST = State Threatened.
STR = Strategic Species in OR and WA. Heritage Ranks: G1-G3 or N1-N3 or T1-T3 or S1-S2 and Oregon Heritage List 3 and documented on at least one OR/WA BLM District.
T = Township.
U = Umpqua Field Office.
WC = West Cascades Ecoregion.
WV = Willamette Valley Ecoregion.

Sensitive or Strategic status have replaced previous Special Status Species Bureau Sensitive, B. Assessment and B. Tracking species status as of August 1, 2007. (IM OR-2007-072)

Management for Sensitive Species (IM OR-2007-072)

* Comply with BLM National Manual and OR/WA State Policy (BLM 6840)

- Consider in land use plans and analyze effects
- Decision must not contribute to the need to list
- Pre-project clearances, monitor, manage

Management for Strategic Species (IM OR-2007-072)

- Sensitive species policies as described in BLM 6840 do not apply
- Analysis in NEPA documents is not required
- Collection of information to remove uncertainties will be coordinated at the RO/SO level (ISSSSP) in coordination with the field.
- If sites are located, field units are required to collect occurrence data and enter into the respective agency corporate database (BLM-GeoBOB).

Note: Recommendations to field managers for pre-disturbance surveys may be made for Sensitive species. The BLM must ensure that actions are consistent with the conservation needs of these species and that the actions do not cause the species to be listed under the Endangered Species Act. Scientific and common name follows that of the Oregon Natural Heritage Information Center 2007 List.

Appendix Table C–2: Part – 1, Special Status Vascular Plants Known or Suspected to Occur in Umpqua River/Sawyer Rapids EA Project Area

Scientific name	D/S	Status	Notes
Adiantum jordanii California maidenhair fern	DMU	OR-SEN	Perennial herb, moist shaded seeps, hillsides, or moist woods and forests, <1,200 m. Bear Creek Recreation site T30S-R09W-9
Arabis koehleri var. koehleri Koehler's rockcress	SU	SoC, SEN, SC	Perennial subshrub, shrub, forb or herb, Umpqua River Valley, Douglas Co., cracks and crevices on rocky bluffs and cliffs between 225 and 280 m, grows with *Phacelia*, *Sedum*, mosses, *Selaginella*, and *Lycopodium*, known from Roseburg District BLM.
Arctostaphylos hispidula hairy manzanita	DM	SoC, OR-SEN	Perennial shrub, dry, rocky ridges and gravelly, serpentine soils, 300-600 m; Grizzly Mountain/Signal Buttes at T37S, R14W, Sections 1 and 4; Palmer Butte at T40S, R13W, Sections 1, 4, 9, 10; Bosley Butte at T39S, R13W, Sec 10; Brushy Bald Mountain at T35S, R14W, Sec 14; flowers late-March to August.
Aster vialis (=Eucephalus vialis) wayside aster	SU	SoC, OR-SEN, LT	Dry upland sites with Douglas-fir, golden chinquapin, and Oregon white oak, edges between forest and meadow, 500 to 3,150 feet in Lane, Douglas, and Linn Counties.
Baccharis douglasii marsh baccharis	SM	OR-STR	Perennial shrub;moist salt marches, coastal strands, stream edges, hillsides, railroads; 0 to 1200 m; California, Oregon, and Baja Mexico.
Bensoniella oregona bensonia	DM	OR-SEN, SoC, SC	Perennial forb or herb, seasonally moist meadows and stream sides in relatively deep soils, 2,500 to 4,500 ft; Kenyon Mountain at T30S, R9W, Sections 3 and 4 in Douglas Co., flowers late June through July.
Carex crawfordii Crawford's sedge	DM	OR-SEN	Rare weed in cranberry fields on district. **NOTE:** ORNHIC will soon delete Curry county from range as the species found in Curry county turned out to be non-native. 11-06
Carex gynodynama wonderwoman sedge	DMU	OR-SEN	Perennial, moist meadows and open forests, <600 m, Smith Pond off of Signal Tree road at T30S, R9W, Sec 3.
Castilleja mendocinensis Mendocino Coast paintbrush	SM	OR-SEN, SoC	Perennial subshrub or forb/herb, coastal strand, coastal prairie, northern coastal scrub, closed-cone pine forest in dune and coastal habitats, and <100 m.
Cicendia quadrangularis timwort	DM	OR-SEN	Annual forb or herb, coastal wetlands, valley grassland, northern oak woodland, foothill woodland, between 0-1,000 ft, along trail between Croft Lake bog and New River in low depression at T30S, R15W, Sec 10.
Cimicifuga elata var. elata tall bugbane	SU	SEN	Perennial forb or herb, coniferous forest, north of Umpqua River, and east side of district, flowers June to early August.
Ericameria arborescens golden fleece	DM	OR-SEN	Perennial shrub, foothill woodland, and chaparral, between 0 and 9,000 ft, Bosley Butte at T39S, R13W, Sec 15 & 16, blooms in September.
Erigeron cervinus Siskiyou daisy	SM	SoC, OR-SEN	Perennial forb or herb; open, rocky slopes and streamsides, seeps, crevices in walls, meadows, pine to fir woodlands, chaparral, sometimes over serpentine, (50-)900 to 2300 m; California and Oregon.
Eucephalus vialis (=Aster vialis) Wayside Aster	SU	SoC, OR-SEN, LT	Dry, open oak or coniferous woods with Douglas-fir, golden chinquapin and Oregon white oak, edges between forest and meadow, 200 to 500 m in Lane, Douglas, and Linn Counties.
Gentiana setigera Waldo gentian	DM	OR-SEN, SoC	Perennial herb, serpentine fens, 1,000 to 3,000 ft, Hunter Creek Bog ACEC, T37S, R14W, Section 13 and 24, flowers August into October, until the first frost.
Iliamna latibracteata California globe-mallow	DM SU	OR-SEN	Perennial forb or herb, moist ground and stream sides in coniferous forests; often on shady, disturbed ground at elevations between 200 and 2,000 feet, Big Sandy Tie road at T28S, R10W, Sec 31; blooms June and July; in 1999, a site at T31S, R12W, Sec 17 was extirpated during a culvert replacement.
Lilium kelloggii Kellogg's lily	SM	SoC, OR-SEN	Perennial forb or herb, gaps and roadsides in yellow pine and redwood forests, sandstone and sedimentary soil in dry wooded areas, 175 to 1300 m, blooms in June.

Scientific name	D/S	Status	Notes
Monardella purpurea Siskiyou monardella	DM	SoC, OR-STR	Perennial subshrub, forb, or herb, openings in shrubby, rocky serpentine slopes, Jeffrey pine or knobcone pine savanna, two populations near Rocky Peak at T34S, R14W, Sec 3, and observed at Bosley Butte and near No. Fork Hunter Creek, blooms from June to September.
Pellaea andromedifolia coffee fern	DMU	OR-SEN	Perennial forb or herb, fern, rocky outcrops up to 5900 ft, Cherry Creek Ridge at T27S, R10W, Sec 25, and Irwin Rocks.
Polystichum californicum California sword-fern	DMU	SEN	Perennial fern, woods, stream banks, shaded rocky outcrops, Pistol River at T38S, R14W, Sec 22 and Indian Creek Road at T29S, R12W, Sec 24.
Rhynchospora capitellata brownish beakrush	SM	OR-STR	Perennial rush, marshes and seeps < 2,000 m, collected from sphagnum bog north of Brookings.
Romanzoffia thompsonii Thompson mistmaiden	DM	OR-SEN	Annual herb, moss covered rock outcrops, 750 to 6,000 ft; Slater Ridge at T30S, R9W, Sec 33; flowers from March to early August.
Scirpus pendulus drooping bulrush	SM	OR-SEN	Marshes, wet meadows, and ditches, 800 to 1,000 m, KM Ecoregion.
Senecio triangularis var. angustifolius bog groundsel	DM	OR-STR	Perennial subshrub, shrub, or herb, wet meadows, stream banks in open, coniferous forests, coastal sphagnum peat bogs, 1,000 to 3,500 m, known from Harris Bog (north of Brookings) and Smith Pond, blooms July to September.
Sidalcea hendersonii Henderson's sidalcea	SU	SoC, OR-STR	Coastal tideland and marshes; historic collection from Reedsport in 1951; known from Cox Island in Siuslaw River.
Sidalcea malviflora ssp. patula coast checker bloom	DM	SoC, OR-SEN, SC,	Perennial herb, open coastal forest, prairie, mixed evergreen forest, grassy coastal headlands and meadows, often in serpentine soils; sea level to 2,600 ft; Edson Butte at T31S, R14W, Sec 22; Grizzly Mountain at T37S, R14W, Sec 4; flowers in May and June.
Streptanthus howellii Howell's streptanthus	SM	OR-SEN	Perennial herb, rocky serpentine areas in open conifer and hardwood forests, 600 to 1,500 m, known from near Vulcan Lake trailhead.
Trillium kurabayashii (=T. angustipetalum) Giant purple trillium	DM	OR-SEN	Perennial forb, moist forest, montane coniferous forest, foothill woodland, and chaparral at 100 to 2,000 m, known from Grizzly Mountain and Colebrook Butte.
Triteleia laxa Ithuriel's spear	SM	OR-STR	Perennial forb or herb, meadows in mixed evergreen, foothill woodland, and chaparral, up to 4,600 ft, blooms from June to August. Curry County.
Viola primulifolia ssp. occidentalis western bog violet	SM	OR-SEN, Soc, SC	Perennial forb or herb, California pitcher plant bogs and fens in serpentine soil, 100 to 500 m, blooms from April to occasionally June.

Appendix Table C–3: Part - 2, Special Status Nonvascular Plant Known or Suspected to Occur in Umpqua River/Sawyer Rapids EA Project Area

Scientific name	Group	D/S	Status	Notes
Albatrellus avellaneus	Fungi	SMU	SEN	Presumed mycorrhizal with pine trees, known from Shore Acres in Coos County, located in 1993 (collector unknown) in T26S, R14W, Sec. 17 SWNE along Cape Arago area.
Albatrellus caeruleoporus	Fungi	DM SU	OR-STR	Clac, Lane
Amanita novinupta	Fungi	SMU	OR-STR	Clac, Coos, Lane, Wash
Arcangeliella camphorata	Fungi	DM	OR-SEN	Associated with pines, especially Douglas-fir and western hemlock, 200 to 950 m, March through November; known from Oregon (Benton, Coos, Curry, and Polk Counties), Washington (Clallam, Grays Harbor, and Jefferson Counties), British Columbia, and Mexico (State of Queretaro, under oaks); CR & KM Ecoregions and Washington. 13 sites known on Coos Bay BLM.
Arcangeliella crassa	Fungi	DMU	OR-STR	Associated with pines, especially Douglas-fir and western hemlock, two known sites from South Fork Camas area and Wasson Lake road area; CR & WC Ecoregions.

Scientific name	Group	D/S	Status	Notes
Balsamia nigrescens (A.K.A. B. nigren)	Fungi	SMU	OR-STR	Subsoil, associated with conifers, especially Douglas-fir and Jeffrey pine; CR & KM Ecoregions.
Boletus pulcherrimus	Fungi	S	SEN	West side Cascades in Lane County, sporocarps usually solitary in association with mixed conifer (grand fir, Douglas-fir) and hardwoods (tanoak) in coastal forests. Located site at Blacklock point just north of Cape Blanco.
Bryoria subcana	Lichen	DM	OR-SEN	Bark and wood of Sitka spruce, western hemlock, Douglas-fir, and hardwoods along coastal bays, streams, and dune forests, within 30 miles of ocean and high-precipitation montane sites; known locally from Sandy Creek at T29S, R10W, Sec 9 at 1,720 ft and at Eel Creek in Oregon Dunes NRA; CR & WC Ecoregions.
Buxbaumia aphylla	Moss	SU	OR-STR	Has been found in Doug & Lane Cos.
Calicium adspersum	Lichen	SMU	OR-SEN	Highly textured bark on the boles of old growth conifer trees.
Caloplaca stantonii	Lichen	SMU	OR-STR	Known from Coos Co.?
Catathelasma ventricosum (=C. ventricosa)	Fungi	SMU	OR-STR	Solitary, scattered, rooting in deep humus under conifers (primarily fir and spruce), known from South Slough Estuarine Reserve; located within CB district but not on BLM lands: T27S, R14S, Sec. 13 SENW in Winchester Creek (C. Ardrey in 10/4/90); T19S, R12S, Sec. 34 NWSW north of Dunes City (T. Drieisbach in 10/27/97), T26S, R14W, Sec 13 SWNW in South Slough area (C. Ardrey in 1/1/00).
Cephaloziella spinigera	Liverwort	SU	OR-STR	Associated with *Sphagnum*, reach southern edge of range on the OR Coast.
Chamonixia caespitosa	Fungi	S	OR-SEN	Central Oregon coast, forms sporocarps beneath the soil surface associated with various Douglas-fir and western hemlock in coastal forests.
Cladidium bolanderi	Lichen	SM	OR-STR	Crustose microlichen known from rock outcrops in coastal prairies in the Bodega Bay, northern CA and Harris Beach State Parks in Curry County; CR Ecoregion.
Cladonia norvegica	Lichen	D	OR-STR	Doerner Fir, Coos and Douglas Co.; CR, EC, KM, and WC Ecoregions.
Clavulina castaneopes var. lignicola (=C. ornatipes)	Fungi	SMU	OR-STR	Coastal forests on wood, bark, or duff, known from the Cummins Creek Wilderness Area, Siuslaw National Forest and along the Siltcoos River. One site is locates within CB district but not on BLM lands: T19S, R12W, Sec. 34 NWSW north of Dunes City (T.Driesback in 1997).
Codriophorus ryszardii (Racomitrium aquaticum)	Moss	SMU	OR-STR	Known from the Cascade Range and Coast Range. Probably also in the Klamath Mountains. Grows streamside.
Cordyceps ophioglossoides	Fungi	S	OR-STR	Known throughout the range of the northern spotted owl and elsewhere, specializes on the truffle *Elaphomyces*; one site located within CB district but not on BLM lands: T20S, R12W, Sec 1 NENE Fiddle Creek, Douglas County (collector unknown in 10/30/80).
Cortinarius barlowensis (=C. azureus)	Fungi	S	OR-SEN	Coastal to montane mixed coniferous forests up to 4,000 feet elevation with western hemlock, Pacific Silver fir, Sitka spruce, and Douglas-fir.
Cortinarius depauperatus (=C. spilomeus)	Fungi	SMU	OR-STR	Moist to wet habitats with Sitka spruce, western red cedar, and western hemlock; clumped or gregarious, known from along the coast in Lincoln and Tillamook Counties.
Cortinarius valgus	Fungi	SMU	OR-STR	Under Abies amabilis, Picea sitchensis, Pseudotsuga menziesii, and Tsuga heterophylla. Site in coastal Douglas Co.
Cryptomitrium tenerum	Liverwort	SM	OR-SEN	KM Ecoregion.

Scientific name	Group	D/S	Status	Notes
Cudonia monticola	Fungi	DMU	OR-SEN	Grows on spruce needles and coniferous debris, several district sites in the Burnt Ridge area, fruits in late summer and autumn.
Dendrocollybia racemosa (=Collybia racemosa)	Fungi	DU	OR-STR	Rotting or mummified remnants of agarics or seldom in nutrient-rich leaf mulch, in forests, known from Tahkenitch Lake and at Upper Soup Creek area (Douglas Co.) under dense huckleberry in rotting leaf litter on steep, rocky slope.
Dermatocarpon meiophyllizum (=D. luridum)	Lichen	SMU	SEN	Occurs between 1,000-4,400 feet on rock and boulders in seepy terraces, slopes, and riparian edges with red alder, Douglas-fir and maple spp., and on granite rocks along stream edges; six sites in Oregon. Located in Douglas county.
Dermocybe humboldtensis	Fungi	SMU	OR-SEN	Stabilized dunes on roots of pine and huckleberry species and conglomerate rock and gravelly loam soil with Douglas-fir and ponderosa pine, known from Bushnell Irwin Rocks ACEC/RNA (Roseburg BLM); KM Ecoregion.
Diplophyllum plicatum	Liverwort	DMU	OR-SEN	Organic and inorganic substrates: decayed wood, down logs, trunks of Western red cedar, Douglas-fir, Pacific yew, and Sitka spruce, mineral soil, and rock; on moist north-facing slopes, especially in shaded fairly steep crevices along rivers and streams, and on soil of upturned roots; many sites on district (including North Spit); 85 known sites; CR Ecoregion.
Encalypta brevicollis (var. crumiana no longer valid)	Moss	SM	OR-SEN	Collections from Mt. Bolivar in Coos County, and nearby Saddle Peaks in Curry County.
Encalypta brevipes	Moss	SM	OR-SEN	Collections from Mt. Bolivar in Coos County
Endogone oregonensis	Fungi	SMU	OR-STR	Roots of Sitka spruce, Douglas-fir, and western hemlock, below 350 m elevation, known from Cascade Head, Lincoln County and on Roseburg BLM near Old Blue Lookout; one site located within CB district but not on BLM lands: T23S, R8W, Sec. 36 SWNW near Waggoner creek close to BLM road 23-7-31.0 (unknown collector in 2/4/84).
Entosthodon fascicularis	Moss	SMU	OR-SEN	Occurs as individual plants or forming small sods on seasonally wet, exposed soil in seeps or along intermittent streams. Usually hidden among grasses, other mosses, and litter. Found in grassland, oak savanna, grassy balds, and rock outcrops below 3,000 feet in elevation.
Erioderma sorediatum	Lichen	DU SM	OR-SEN	On pine trees, old dunes, and ericaceous shrubs, documented at North Spit ACEC, Bluebill Lake, Spinreel, and Eel Creek (Oregon Dunes NRA), in Oregon Coast Range, and in a young red alder riparian stand in WA; humid, oceanic localities in OR and WA, CR Ecoregion.
Glomus pubescens	Fungi	SMU	OR-STR	Hypogenous fungi in coniferous forests; CR Ecoregion.
Glomus radiatum	Fungi	SMU	OR-STR	Hypogenous fungi in coniferous forests, known from 3.3 km south of Smith River in coastal northern CA; WC Ecoregion.
Gomphus kauffmanii	Fungi	SMU	SEN	Known from South Slough.
Gymnomyces monosporus	Fungi	SMU	OR-STR	False truffle, probably under hardwoods, CR Ecoregion.
Helvella crassitunicata	Fungi	SU	OR-SEN	Scattered to gregarious on soil. Associated with conifers (Abies sp.)
Helvella elastica	Fungi	SMU	OR-STR	Duff in coniferous forests; CR & WC Ecoregions. Gregarious on soil under conifers in damp areas, fruits from May through December, located in T22S, R8W, Sec. 33 SESW in Sawyer Creek area (E.Morgan in 4/1/98).

Scientific name	Group	D/S	Status	Notes
Heterodermia leucomela (= H. leucomelos)	Lichen	DMU	OR-SEN	Sitka spruce and shore pine branches on forested headlands in the coastal fog zones, may also be found inland in riparian areas, moist valleys and fog-intercept ridges; known from Point Arena, CA to Cape Disappointment, WA; known from both North Spit ACEC and inland forests on district.
Hydropus marginella (=H. marginellus)	Fungi	DU SM	OR-STR	Class 4 and 5 Douglas-fir stumps and logs in coniferous forests; known from Coos and Tillamook Counties, OR and coastal locations in Del Norte and Humboldt Counties, CA.
Hypogymnia duplicata	Lichen	SU	OR-SEN	Mid-elevation moist western hemlock stands, old-growth Douglas-fir, mature western hemlock/Douglas-fir forest, moist Pacific silver fir or noble fir forests, Sitka spruce, riparian forest and later-successional forest along ridgetops in Oregon Coast Range, also occurs on red alder in sedge-spaghnum bogs in Oregon Coast Range, elevation ranges from 1,100 to 5,450 feet.
Iwatsukiella leucotircha	Moss	SU	SEN	Restricted to forests along maritime fog or cloud interception areas with high relative humidity, drenched coastal ridges that usually have older, true fir (Abies spp.) present.
Lecanora caesiorubella ssp. merrillii	Lichen	SMU	OR-STR	Trunks and branches of oak, alder, maple, and tan oak; CR & KM Ecoregions.
Leptogium cyanescens	Lichen	DU	SEN	Tree bark of deciduous trees, but also occurs on juniper and western red cedar, decaying logs, and mossy rocks in cool, moist microsites, widely scattered. One location in the North Fork of Coquille River by D. Donato.
Leptogium hirsutum	Lichen	SMU	SEN	Epiphytic, but also on decaying logs, mosses and rock.
Leptogium platynum	Lichen	DU	OR-STR	Located in Coos County on Williams pipeline survey by D. Stone.
Leptogium rivale	Lichen	SMU	OR-STR	Mid-elevation streams between 1,000-6,500 feet on rocks, boulders, and bedrock streams, rivers, or seeps, usually submerged or inundated for most of the year.
Leptogium teretiusculum	Lichen	SM	OR-STR	On hardwoods (poplar, cottonwood, and oak) and conifers; widespread, known from Coast Range, on hills in southern OR. Located in Douglas Co.
Leucogaster citrinus	Fungi	SMU	OR-SEN	Sub-surface soil. Roots of white fir, sub-alpine fir, shore pine, western white pine, Douglas-fir, and western hemlock, known from Wild Rogue Wilderness (Siskiyou NF) and North Fork Rock Creek (Siuslaw NF); CR, KM, & WC Ecoregions. Fruits from August through November, one site located within CB district but not on BLM lands: T33S, R10W, Sec. 17 NESE (collector unknown in 10/11/85).
Lobaria linita	Lichen	SMU	OR-SEN	Mature to old growth forests, oak forests with rock outcrops, late-mature tan-oak and madrone forests, 1,800 to 6,700 ft; CR & WC Ecoregions. Located in Douglas Co.
Lophozia laxa	Liverwort	SU	OR-SEN	Coastal sphagnum and peat bogs of northwestern Oregon coast down to Lane Co.; CR & WC Ecoregions.
Metzgeria violacea	Liverwort	SMU	OR-STR	Hyper-maritime, on tree trunks, usually shaded, near coast; growing in dense mats or mixed among other bryophytes. Two coastal sites in Coos Co.
Mycena quiniaultensis	Fungi	S	OR-STR	Gregarious, caespitose clusters on senescent conifer needles or uncommonly on decayed wood in conifer forests, Western Cascades throughout the state, fruits from late May through December.

Scientific name	Group	D/S	Status	Notes
Mycena tenax	Fungi	SMU	OR-STR	Densely gregarious in duff under fir, Douglas-fir, spruce, and redwood trees, known from several coastal sites in Douglas, Lane, and Lincoln Counties; fruits in spring and autumn; three sites are located within CB districts but not on BLM lands: T20S, R12W Sec. 1 & 27 at Siltcoos lake, and T20S, R12W, Sec. 3 NWNW at Tahkenitch Lake (all by A.H. Smith in 1935).
Otidea smithii	Fungi	SMU	SEN	Exposed soil, duff, or moss under black cottonwood, Douglas-fir, and western hemlock; solitary to gregarious, known from Roseburg and Salem BLM and near Crescent City, CA.
Pannaria rubiginosa	Lichen	SU	SEN	Wetlands and riparian areas on the immediate coast; mainly on hardwoods, Douglas-fir, western hemlock, Sitka spruce, western red cedar, and shrub thickets of Hooker's willow and ericaceous shrubs in dunes and deflation plain habitats, 50 to 1,600 ft, Northern CA, OR, and WA; CR Ecoregion. Located in Coos County.
Phaeocollybia californica	Fungi	DM	OR-SEN	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; seven sites on Coos Bay district, fruits October-December.
Phaeocollybia dissiliens	Fungi	DMU	OR-SEN	Mature and old-growth Douglas-fir forests, associated with the roots of Pacific silver fir, Sitka spruce, Douglas-fir, and western hemlock, several known sites on district (House Creek & Big Creek).
Phaeocollybia gregaria	Fungi	SMU	OR-SEN	Associated with the roots of Sitka spruce and Douglas-fir, found on the Siuslaw NF at Cascade Head.
Phaeocollybia olivacea	Fungi	DMU	OR-SEN	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; 24 sites on Coos Bay district, fruits October-December.
Phaeocollybia oregonensis	Fungi	DMU	SEN	Associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; one site on district in a >200 year old Douglas-fir forest.
Phaeocollybia pseudofestiva	Fungi	DMU	SEN	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; 19 sites on Coos Bay district, fruits October-December.
Phaeocollybia radicata	Fungi	DMU	OR-STR	40-year-old stands to >200-year- old old-growth coniferous, Douglas-fir forests, several sites on district; WV Ecoregion.
Phaeocollybia scatesiae	Fungi	DM	SEN	Mature and old-growth Douglas-fir forests, associated with the roots of spruce, Sitka spruce, and *Vaccinium* species, 0 to 1,250 m; several sites on district; fruits in spring and fall.
Phaeocollybia sipei	Fungi	DMU	OR-SEN	40 year old plantations to >400 year old-growth forests, associated with the roots of Pacific silver fir, Douglas-fir, and western hemlock; 29 sites on district, fruits October-December.
Phaeocollybia spadicea	Fungi	DM	SEN	40 year old plantations to >200 year old old-growth Douglas-fir forests and in mature Sitka spruce stands in coastal lowlands regions; solitary to scattered to closely gregarious, 34 sites on district, fruits October-December.
Platyhypnidium riparioides	Moss	DMU	OR-STR	On rock under or adjacent to waterfalls, several sites on district; CR & WC Ecoregions.
Plectania milleri	Fungi	S	OR-STR	Saprophytic fungi on conifer duff found during late spring. Located in Douglas & Lane Cos.
Podostroma alutaceum	Fungi	SMU	OR-STR	Coniferous forests in litter, in association with dead wood, and possibly with the roots of trees; solitary to clustered, known from coastal site at Siltcoos Stump (Lane Co); another *Podostroma* species was found in a 40 year old Douglas-fir plantation on district; fruits in autumn, one site at T19S, R12W, Sec. 34 by Siltcoos Lake (T. Dreisbach in 10/27/97).

Scientific name	Group	D/S	Status	Notes
Porella bolanderi	Liverwort	S	OR-SEN	On outcrops and boulders (limestone, silica, serpentine, or sandstone), soil, and epiphytic on oaks, myrtle, bigleaf maple, Douglas-fir, Shasta red fir, redwood, and ponderosa pine; commonly at 100-750 m but known from 0 to 2,000 m; KM & WV Ecoregion.
Pseudaleuria quinaultiana	Fungi	SU	OR-STR	Occurs on disturbed microsites such as trail sides and recently wind thrown mounds in low elevation old-growth forest with Sitka spruce, Douglas-fir, and western hemlock; known from Drift Creek Wilderness (Siuslaw NF).
Ramaria abietina	Fungi	SM	OR-STR	On conifer debris, rare but scattered through coniferous forests; fruits in May, and September through November. **Located in Douglas Co.**
Ramaria conjunctipes var. sparsiramosa	Fungi	DMU	OR-STR	Mature and old-growth Douglas-fir stands, mycorrhizal species that depends on tree host, endemic to the Pacific NW, a few sites on district.
Ramaria gelatiniaurantia	Fungi	DMU	SEN	Mature and old-growth Douglas-fir stands, mycorrhizal species that depends on tree host, endemic to the Pacific NW, a few sites on district.
Ramaria gracilis	Fungi	SU	OR-STR	On dead wood or soil in conifer forests, especially spruce forest habitat; associated with Douglas-fir and western hemlock; fruits in October and November.
Ramaria largentii	Fungi	DM	SEN	Associated with spruce, western white pine, Douglas-fir, and western hemlock, one site on district in a mature (>120 yr. old) Douglas-fir stand; fruits in October.
Ramaria rainierensis	Fungi	DM	OR-STR	Mature and old-growth Douglas-fir stands, coastal forests, mycorrhizal species that depends on tree host, endemic to the Pacific NW, one site in Big Creek; fruits in December and March.
Ramaria rubribrunnescens	Fungi	DM	OR-STR	Associated with pine trees species, one site on district in a 40 year-old Douglas-fir plantation; fruits in October and November.
Ramaria spinulosa var. diminutiva	Fungi	SMU	OR-SEN	Associated with spruce, western white pine, Douglas-fir, and western hemlock.
Rhizomnium nudum	Moss	SU	OR-SEN	Moist conifer forest from mid to high elevation on moist conifer forests, humus soils and mineral soils in seepages, on soil over rock in the splash zone of a stream and in vernally wet areas associated with forest depressions or ephemeral low gradient channels. Light intensity varies from full sun to full shade in dense forest stands.
Rhizopogon brunneiniger	Fungi	SMU	OR-STR	Hypogenous fungi in coniferous forests; CR & WC Ecoregions; fruits in September and October.
Rhizopogon exiguus	Fungi	SMU	OR-SEN	Coastal, known site at Mapleton, hypogeous fungi in coniferous forest; CR & KM Ecoregion. Fruits in March, August, September, and November.
Rhizopogon flavofibrillossus	Fungi	SM	OR-STR	Known from the Siskiyou Mountains; EC, KM, & WC Ecoregions; associated with Pinaceae spp.; fruits from July through November; two sites locate within CB district but not on BLM lands: around Pistol River area T37S, R13W, Sec 9 (collector unknown in 1992).
Rhytidium rugosum	Moss	DU	OR-SEN	Forming loose mats over dry, exposed rocks or soil, usually on the sloping sides and tops of bluffs and cliffs, at middle to higher elevations west of the Cascades Range. On calcareous and basic substrates (Rohrer 1999), and in the Pacific Northwest known from basalt.
Rickenella swartzii (=R. setipes)	Fungi	DU	OR-STR	On or among mosses under hardwoods, locally abundant in small groups, and typically found on rotting moss-covered logs; three known sites on district; fruits in late summer and autumn.

Scientific name	Group	D/S	Status	Notes
Sarcodon fuscoindicus	Fungi	SMU	OR-STR	Scattered to gregarious on soil, found in the north Myrtle Creek area near Reedsport off BLM lands (T21S, R12W, Sec. 34 NESW) in 1946; fruits in autumn and winter.
Schistostega pennata	Moss	SU	SEN	Mineral soil in shaded pockets of overturned tree roots, often with shallow pools of standing water at the base of the root wad; attached to rock or mineral soil around the entrance to caves, old cellars, and animal burrows; CR & WC Ecoregions.
Scouleria marginata	Moss	SM	OR-STR	Semi-aquatic on rocks along the edge of perennial streams; known from British Columbia, WA, OR, ID, and CA; Farewell Bend on the Rogue River (near Union Creek in Jackson Co.), (**Douglas county**); and historic locations at Spokane Falls and the Columbia River.
Sowerbyella rhenana (= Aleuria rhenana)	Fungi	DM	SEN	Groups in duff of moist, undisturbed mature conifer forests, one collection from a tan oak stand in Curry County on Coos Bay BLM; CR & WC Ecoregions. Fruits October through December. One known site on Coos Bay BLM likely destroyed during hardwood conversion and subsequent burning operations.
Stropharia (Pholiota) albovelata	Fungi	SMU	OR-STR	Restricted to conifer forests and usually found as scattered, single sporocarps on fallen branches or other conifer debris, known from Beaver Hill on Coos County Forest; fruits from late April through early January; one site within CB district but not on BLM land: T27S, R14W, Sec. 24 SESE (collector unknown).
Tayloria serrata	Moss	SU	OR-SEN	Grows on humus and animal dung; KM, WV, & WC Ecoregions.
Tetraphis geniculata	Moss	SMU	OR-SEN	Moist coniferous forest with large down logs; on the cut, broken ends, or lower sides of decay class 3, 4, and 5 rotted logs or stumps; and occasionally on peaty banks, from sea level to subalpine; CR and WC Ecoregions.
Thaxterogaster pavelekii	Fungi	SMU	OR-SEN	Endemic to mature to old-growth coastal forests or forests with an old-growth legacy of coarse woody debris, usually in mossy places from sea level to 250 m elevation in OR and WA., hypogeous under mature Sitka spruce and shore pine, occurring in pure stands of each or mixed stands of both, fruits in March, April, June, July, and November; CR Ecoregion.
Triquetrella californica	Moss	SMU	OR-STR	Reported from trails, roadsides, picnic areas, and rock outcrops on exposed to shaded soil, rocks, sand, coastal shore pine, and Sitka spruce; Located at Humbug Mt. Park on steep slope along Hwy 101. CR Ecoregion.
Tuber asa	Fungi	SMU	OR-STR	Found in association with the roots of Douglas-fir and western hemlock, at 170 to 500 meter elevation, known from Woods Creek Road (Siuslaw NF); fruits in July and October.
Tuber pacificum	Fungi	SMU	OR-STR	Roots of Douglas-fir and western hemlock at 235 m, found south of Bandon and in the Cummins Creek Wilderness, Lane Co.; fruits in February, June, and July. Located in Coos Co.
Usnea rubicunda	Lichen	DM	OR-STR	Old-growth forest on hardwoods, immediate coast, one site on district in Rock Creek, CR Ecoregion.

Appendix Table C–4: Recommended Survey Periods for Certain Special Status Species

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Arabis koehleri var. koehleri				■	■	■						
Bryoria subcana	■	■	■	■	■					■	■	■
Carex gynodynama						■	■	■	■			
Cimicifuga elata						■	■	■	■			
Diplophyllum plicatum	■	■	■	■	■					■	■	■
Heterodermia leucomelos	■	■	■	■	■					■	■	■
Hypogymnia subphysoides	■	■	■	■	■					■	■	■
Iliamna latibracteata						■	■	■	■			
Lobaria linata	■	■	■	■	■					■	■	■
Pellaea andromedifolia						■	■	■	■			
Romanzoffia thompsonii				■	■							
Tetraphis geniculata	■	■	■	■	■					■	■	■

APPENDIX D.: GEOLOGY & SOILS

1.0 INTRODUCTION

The Umpqua River/Sawyer Rapids Density Management/Commercial Thinning consists of density management within Late Successional and Riparian Reserves and commercial thinning within Matrix Land Use within the Umpqua River-Sawyer Rapids watershed. The total project would include up to approximately 9,200 acres of 31 to 80-year-old timber.

The watershed analysis covering these areas is the Middle Umpqua River Watershed Analysis, Version 2.1, completed September 30, 2003 and revised September 30, 2004.

The purpose of this report is to detail the existing geology and soils conditions and to make an interpretation of the impacts of the proposed timber harvest and road building operations.

During the completion of this review, the following sources have been used:

- **Historic aerial photography from 1960 to present.**
- **Soil Survey of Douglas County, Oregon.**
- **Middle Umpqua River Watershed Analysis, September 30, 2003, revised September 30, 2004.**
- **Numerous professional publications.**
- **Review of geologic map of the project areas.**
- **Review of maps and information gathered in the project files.**
- **Site visits to the project sites, with emphasis on road renovations, stream crossing, and new road construction localities.**

1.1 WATERSHED ANALYSIS RECOMMENDATIONS

The Middle Umpqua River Watershed Analysis, dated September 30, 2003 and revised September 30, 2004 (USDI-BLM, 2004), makes the following specific site recommendations concerning soil and/or geology within this action. General cautions address the mass movement of the geologic formations, being debris torrents (Tyee and Bateman Formations) and slumping (Elkton Formations), and that failure hazards are greater on the north-facing slopes and on slopes that are concurrent with stratigraphy dip.

- *Use the Oregon Department of forestry Debris Flow Hazard GID Maps (Map EROD 4) (BLM, 2004) to indicate debris flow hazards in management decisions.*

- *Pursue revisiting the State of Oregon policy preventing material captured by roads from debris flow being artificially delivered to the probable receiving stream system.*

- *Review forest management activity timing compared to short-term intense sediment delivery versus long-term chronic sediment delivery.*

- *Use Best Management Practices, as suggested by Stewart (2001), in locating and management of waste sites. These include the following:*
  1. *The soils specialist is to be contacted for review if more than 500 cubic yards are expected to be placed on any one site over time.*
  2. *Wildlife biologists should be contacted for any type of restrictions.*
  3. *Where possible, utilize abandoned and/or decommissioned landings and road systems.*
  4. *The native topography should have no more than 5% grade.*
  5. *The site should be free of growing vegetation and scarified before drifting or piling materials on the area.*
  6. *Any waste area locations within Riparian Reserves should be reviewed by a fisheries biologist.*
  7. *Where possible, compact the waste materials in lifts of 8-12 inches as practical. The final shape of the material should be slightly crowned or sloped to allow water to run to the sides of the pile.*
  8. *The outer sides of the waste pile should be sloped to a 1.5:1 ratio.*
  9. *Mineral soil should be seeded and mulched.*
  10. *Manage water in ditch lines or roadways away from the site.*
  11. *Provide a means to prevent traffic from entering into the area.*

- *Review roads in the following areas, as management activities allow, for slump activation impacts:*
  1. *T. 22 S., R. 9 W., Section 9 SE¼*
  2. *T. 23 S., R. 8 W., Section 5, Center of Section*
  3. *T. 21 S., R. 8 W., Sections 23, 24, and 25.*
  4. *T. 22 S., R. 9 W., Sections 24, 25, and 36 (Private Lands)*

- *Remove gravel from roads to be subsoiled.*

- *As management activities allow, review, and where necessary, upgrade, storm proof, and/or decommission natural surface and dirt roads located within 75 feet of stream systems as identified on Map EROD 5.*

- *Consider management actions that purposely provide material to stream systems from the sandstone formations and gravel-dominated soils, as detailed in Table Erod-5 and Table Erod-6.*

1.1.1 Western Oregon Debris Flow Hazard Maps

In response to the 1996 Storm and related debris flows, the State of Oregon Department of Forestry created Debris Flow Hazard Maps that include the project area. The maps, which are based on wide-scale and limited geologic review and Digital Elevation Model (DEM) at 30-meter resolution, include locations subject to naturally occurring debris flows and include the initiation sites and locations along the paths of potential debris flows, confined stream channels and locations below steep slopes (ODF, 1999). These maps **do not** provide information on slumps and other landslide forms other than debris flows. The maps depict distinct hazard categories and guidelines. They are as follows (ODF, 1999):

Low Debris Flow Hazard

Characteristics: Unless altered by excavation or filling, such slopes have between zero and low hazard of rapidly moving landslides. These areas may be subject to deep-seated slower moving landslides and migrating organic dams, slower moving debris jams moving down larger stream channels. In addition, where low hazard areas are very close to high hazard areas, unusually large debris flows may very rarely enter low hazard areas. Large fills and excavations can increase the hazard rating to moderate in these areas.

Hazard and Risk Evaluation: Investigation of rapidly moving landslides is usually unnecessary. Investigation for other landslides may be appropriate and should be based upon mapping for these other hazards…"

Moderate Debris Flow Hazard

Characteristics: Areas containing moderate to steep slopes (50 to 70 percent) where rapidly moving landslides may occur infrequently and typically do **[sic** no travel at high velocity for great distances.

Hazard and Risk Evaluation: Evaluation of upslope hazard and downslope risk is appropriate when homes are constructed in confined valleys or at the base of hillslopes (within 100 feet of the slope). Hazard and risk evaluation is also appropriate when grading any slopes over 40 percent is being considered

High Debris Flow Hazard

Characteristics: Areas containing steep to very steep slopes with steep, confined stream channels (containing sites with slopes of greater than 70 percent or 65 percent in the Tyee geology). Lands where debris flows can be common after major storms and sometimes after moderate storms. Note that this classification includes some steep slopes where landslide occurrence may be infrequent (portions of the Cascade and Siskiyou mountains), but when landslides do occur in these areas they will likely move rapidly over long distances, and may be larger that the debris flows common in the Coast Range.

Hazard and Risk Evaluation: Proposed dwelling sites in high hazard areas should receive on-site evaluation of hazard and risk. Existing residents should evaluate the safety of their setting, and have evacuation plans if their dwelling is located within 150 feet of the base of a steep hillslope, on a debris fan, or in a confined stream valley. Those living in homes that are not in these locations should avoid driving to and from home during major storms if the have to pass through these areas, especially if a debris flow warning is issued.

Extreme Debris Flow Hazard

Characteristics: Lands that have experienced multiple, very rapidly moving debris flows during major storms and have also experienced repeated debris flows during moderate intensity storms. Areas with very steep slopes (contain many slopes over 80 percent) with confined valleys. Large, colluvial deposits and jams common in channels and at mouths of canyons. During major storms, these are very dangerous locations.

Hazard and Risk Evaluation: Extreme hazard areas include many locations that are very dangerous during periods of intense rainfall. Future permanent dwellings in these locations should be avoided. Existing residents should evaluate the safety of their setting, and have evacuation plans if their swelling is located within 150 feet of the base of a steep hillslope, on a debris fan, or in a confined stream valley. Those living in homes that are not in these locations should avoid driving to and from home during major storms if they have to pass through these areas, especially if a debris flow warning is issued. Emergency managers should be prepared to respond to debris flow emergencies in these locations. Persons driving through these locations can be at significant risk of serous **[sic]** injury during major storms…"

Review of the project units with the Western Oregon Debris Flow Hazard Map for Douglas County (ODF, 1999) indicates that there are no units mapped within the Extreme Debris Flow Hazard category. Units northeast of the Umpqua River contain a majority of High Hazard, while the remaining units are mapped as Moderate or Low Hazard for debris flows.

1.1.2 Slump Activation Review

Some of the project units are included within areas of site-specific reviews recommended by the watershed analysis. The watershed recommends a review of roads, as management activities allow, for slump activation impacts. The units include:

- T. 22 S., R. 9 W., Section 9 SE¼- Units 1A; 2C; and 2D.
- T. 23 S., R. 8 W., Section 5, Center of Section- Units 66; 66A; 66B; and 67.

- T. 21 S., R. 8 W., Sections 23, 24, and 25- Units 30, 31, 32, 33, 34A, 36, 37, 38, 39, 40, and 80.

The units with road building activities were reviewed in the field. None of the proposed road construction should activate major slumping, as most are ridgetop and placed on historic road systems. Units not field reviewed were reviewed by aerial photography, topography, and geology. Proposed management activities of thinning should not have impacts on slump activation.

2.0 FIELD REVIEW

Appendix Table D–1 provides descriptions of the mapped geology, geologic structure, and soil types of each of unit. The geology is based on Niem and Niem (1990). Soil interpretations are based on Johnson and coauthors (2003).

Field reviews of the project sites were conducted in May 2007. Priority units for field review were determined by completion of a matrix that included impacts of compaction, road building, ground-based harvest, geology, alder conversion, and watershed analysis recommendation. A copy of that matrix is presented in Appendix Table D–2. Specific field reviews indicated by the matrix included units 1A, 2C, 4B, 26, 30, 31, 32, 35, 36, and 75

There appears to be an extensive historic skid trail system through much of the proposed harvest area that can be used in the proposed logging operations and road construction, as dictated in the Best Management Practices (BMP) (USDI-BLM, 1995). Older skid trail systems showed various degrees of decompaction and were sufficiently decompacted to allow for infiltration of water.

If the harvesting is completed as described in the preferred alternative, there should be little additional compaction damage. The main requirements would be that forwarder trails use previously compacted surfaces to the greatest extent possible, that ground-based yarding occur during dry soil moisture conditions, and that equipment travel on a slash covered ground surface.

Proposed yarding corridors would be crossing small tributary creek banks and inner gorges. It was discussed that, where possible, one-end suspension and full suspension over the inner gorges be applied. All mineral soil exposed by yarding corridors within 50 feet of an active stream will be covered with slash to prevent erosion and sediment migration.

Specific inquiry was made in the field regarding mass movement, as determined by ODF Hazard Maps, watershed assessment, and geologic interpretation. Proposed new road locations avoided area of potential mass movement. There were no field indications that management practices of thinning and alder conversion would activate mass movement. It was recommended that the harvest boundary adjacent to an active slide in Unit 26 be expanded by 20-30 feet.

Review of proposed spur and new road construction did not indicate any concerns. The majority of the spur and new road placements are at ridge top. There was no indication of impacts to surface drainage or groundwater flow. Most of the spur development would be on pre-existing compacted surfaces, skid trails identified in historic photography and confirmed in the field, including areas identified as “new construction.” Some existing roads and compacted surfaces within field-reviewed units show signs of erosion. These would be renovated by both action alternatives and decommissioned according to Best Management Practices, including the proper placement of waterbars. It was identified a proposed new road be realigned in Unit 32 to incorporate an existing roadbed. This will be addressed during the engineering phase of the project.

Appendix Table D–1: Unit Geology and Soils

EA Unit	Geology	Structure	Soil-Percent Slope	Percent of Unit
1A	Tee	Strike N-NE, 5º-7º E	Preacher-Bohannon-Xanadu Complex, 30-60	18%
			Absaquil-Honeygrove-McDuff Complex, 3-30	69%
			Digger-Bohannon-Umpcoos Complex, 60-90	8%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	5%
1B	Tee	Strike N-NE, 9º E	McDuff-Absaquil-Honeygrove Complex, 30-60	37%
			Absaquil-Honeygrove-McDuff Complex, 3-30	57%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	1%
			Honeygrove Gravelly Clay Loam, 3-30	5%
1C	Tee	Strike N-NE, 9º E; N-S syncline east	Preacher-Bohannon-Xanadu Complex, 30-60	32%
			Damewood-Bohannon-Umpcoos Complex, 60-90	1%
			Digger-Bohannon-Umpcoos Complex, 60-90	50%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	1%
			Fernhaven-Digger Complex, 30-60	16%
2A	Tee	Strike N-NE, 5º-7º E	Preacher-Bohannon-Xanadu Complex, 30-60	99%
			Absaquil-Honeygrove-McDuff Complex, 3-30	1%
2B	Tee	Strike N-NE, 5ºE		
2C	Tee	Strike N-NE, 5º E	Preacher-Bohannon-Xanadu Complex, 30-60	36%
			Absaquil-Honeygrove-McDuff Complex, 3-30	60%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	2%
2D	Tee	Strike N-NE, 5º E		
3	Tee	Strike N-NE, 5º-7ºE	McDuff-Absaquil-Honeygrove Complex, 30-60	1%
			Absaquil-Honeygrove-McDuff Complex, 3-30	7%
			Digger-Bohannon-Umpcoos Complex, 60-90	7%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	84%
				1%
4A	Tee	Strike N-NE, 9º E	Preacher-Bohannon-Xanadu Complex, 30-60	1%
			Digger-Bohannon-Umpcoos Complex, 60-90	99%
4B	Tee	Strike N-NE, 9º E	McDuff-Absaquil-Honeygrove Complex, 30-60	23%
			Absaquil-Honeygrove-McDuff Complex, 3-30	11%
			Digger-Bohannon-Umpcoos Complex, 60-90	66%
4C	Tee	Strike N-NE, 9º E	Digger-Bohannon-Umpcoos Complex, 60-90	90%
			Fernhaven-Digger Complex, 30-60	10%
4D	Tee	Strike N-NE, 9º E, N-S Syncline east section; Strike N-NW, 10º W	Preacher-Bohannon-Xanadu Complex, 30-60	28%
			Umpcoos-Rock Outcrop-Damewood Complex, 60-90	12%
			Damewood-Bohannon-Umpcoos Complex, 60-90	34%
			Digger-Bohannon-Umpcoos Complex, 60-90	15%
			Fernhaven-Digger Complex, 30-60	11%
4E	Tee	Strike N-NE, 9º E	Fernhaven-Digger Complex, 30-60	100%
4F	Tee	W-Strike N-NE, 9º E; E-Strike N-NW, 10º W; N-S Syncline through middle	Preacher-Bohannon-Xanadu Complex, 30-60	8%
			Damewood-Bohannon-Umpcoos Complex, 60-90	2%
			Digger-Bohannon-Umpcoos Complex, 60-90	67%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	9%
			Fernhaven-Digger Complex, 30-60	15%
5	Tee	Strike N-NE, 9º E	Preacher-Bohannon-Xanadu Complex, 30-60	3%
			Digger-Bohannon-Umpcoos Complex, 60-90	93%
			Honeygrove Gravelly Clay Loam, 3-30	3%
6	Tee	Strike N-NE, 9º E	Damewood-Bohannon-Umpcoos Complex, 60-90	7%
			Digger-Bohannon-Umpcoos Complex, 60-90	45%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	47%
6A	Tee	Strike N-NE, 9º E	Damewood-Bohannon-Umpcoos Complex, 60-90	1%
			Digger-Bohannon-Umpcoos Complex, 60-90	31%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	68%
7	Tee	Strike N-NE, 9º E, N-S Syncline East; Strike N-NW, 10º W	Preacher-Bohannon-Xanadu Complex, 30-60	15%
			Damewood-Bohannon-Umpcoos Complex, 60-90	44%
			Digger-Bohannon-Umpcoos Complex, 60-90	8%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	6%
			Fernhaven-Digger Complex, 30-60	27%
8	Tee	Strike N-NE, 9º E, east near N-S syncline	Digger-Bohannon-Umpcoos Complex, 60-90	3%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	96%

EA Unit	Geology	Structure	Soil-Percent Slope	Percent of Unit
			Fernhaven-Digger Complex, 30-60	1%
9A	Tee	Strike N-NW, 10º W, near N-S syncline, lower unit on syncline (east-Strike N-NE, 9º E)	Preacher-Bohannon-Xanadu Complex, 30-60	10%
			Damewood-Bohannon-Umpcoos Complex, 60-90	1%
			Digger-Bohannon-Umpcoos Complex, 60-90	64%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	24%
9B	Tee	W-Strike N-NE, 5º E; E-Strike N-NW, 4º W. Unit on either side of syncline	McDuff-Absaquil-Honeygrove Complex, 30-60	7%
			Preacher-Bohannon-Xanadu Complex, 30-60	7%
			Digger-Bohannon-Umpcoos Complex, 60-90	45%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	40%
10	Tee	Strike N-NW, 10º W	Preacher-Bohannon-Xanadu Complex, 30-60	22%
			Digger-Bohannon-Umpcoos Complex, 60-90	76%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	1%
11A	Tee	Strike E-W, 4º S, along plunging syncline	McDuff-Absaquil-Honeygrove Complex, 30-60	2%
			Preacher-Bohannon-Xanadu Complex, 30-60	51%
			Digger-Bohannon-Umpcoos Complex, 60-90	47%
11B	Tee	W- syncline through middle (W- Strike N-NE, 5º E; E-Strike N-NW, 4º W)	McDuff-Absaquil-Honeygrove Complex, 30-60	5%
			Absaquil-Honeygrove-McDuff Complex, 3-30	16%
			Digger-Bohannon-Umpcoos Complex, 60-90	78%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	1%
12	Tee	N-S Syncline through middle; W-Strike N-NE, 5ºE; E-Strike N-NW, 4º W	Atring-Larmine-Rock Outcrop Complex, 60-90	7%
			McDuff-Absaquil-Honeygrove Complex, 30-60	29%
			Preacher-Bohannon Complex, 3-30	9%
			Preacher-Bohannon-Xanadu Complex, 30-60	2%
			Digger-Bohannon-Umpcoos Complex, 60-90	20%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	33%
13	Tet_b	Strike N-NW, 12º W	Atring-Larmine Complex, 60-90	3%
			Orford Gravelly Silt Loam, 3-30	54%
			Orford Gravelly Silt Loam, 30-60	20%
			Digger-Bohannon-Umpcoos Complex, 60-90	24%
14	Tet_b	Strike N-NW, 12º W	Orford Gravelly Silt Loam, 3-30	6%
			Orford Gravelly Silt Loam, 30-60	2%
			Digger-Bohannon-Umpcoos Complex, 60-90	92%
15	Tet_b	Strike N-NW, 12º W	Atring-Larmine-Rock Outcrop Complex, 60-90	10%
			Orford Gravelly Silt Loam, 3-30	28%
			Digger-Preacher Complex, 60-90	1%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	61%
16	Tet_b	Strike N-NW, 12º W		
17	Tet_b	Strike N-NW, 12º W		
18	Tet_b	Strike N-NW, 12º W	Atring-Larmine Complex, 60-90	19%
			Orford Gravelly Silt Loam, 3-30	8%
			Preacher-Bohannon Complex, 3-30	42%
			Xanadu Gravelly Loam, 3-30	26%
			Digger-Bohannon-Umpcoos Complex, 60-90	4%
19	Tet_b	Strike N-NW, 12º W	Atring-Larmine Complex, 60-90	39%
			Orford Gravelly Silt Loam, 3-30	35%
			Preacher-Bohannon Complex, 3-30	4%
			Xanadu Gravelly Loam, 3-30	10%
			Digger-Preacher Complex, 60-90	1%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	1%
			Fernhaven-Digger Complex, 30-60	9%
20	Tet_b	Strike N-NW, 12º W		
21	Tet_b	Strike N-NW, 10º W	Rock Outcrop-Umpcoos Complex, 60-110	17%
			Xanadu Gravelly Loam, 3-30	4%
			Digger-Preacher Complex, 60-90	2%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	76%
22	Tet_b	Strike N-NW, 10º W	Rock Outcrop-Umpcoos Complex, 60-110	82%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	18%
22A	Tet_b	Strike N-NW, 10º W	Digger-Umpcoos-Rock Outcrop Complex, 60-90	100%
22B	Tet_b	Strike N-NW, 10º W	Digger-Umpcoos-Rock Outcrop Complex, 60-90	100%
22C	Tet_b	Strike N-NW, 10º W	Digger-Umpcoos-Rock Outcrop Complex, 60-90	100%
22D	Tet_b	Strike N-NW, 10º W	Digger-Umpcoos-Rock Outcrop Complex, 60-90	100%

EA Unit	Geology	Structure	Soil-Percent Slope	Percent of Unit
22E	Tet_b	Strike N-NW, 10º W	Rock Outcrop-Umpcoos Complex, 60-110	89%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	11%
23	Tet_b	Strike N-NW, 10º W	Orford Gravelly Silt Loam, 3-30	47%
			Rock Outcrop-Umpcoos Complex, 60-110	2%
			Digger-Preacher Complex, 60-90	46%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	5%
24	Tet_b	Strike N-NW, 10º W	Preacher-Bohannon-Xanadu Complex, 30-60	1%
			Rock Outcrop-Umpcoos Complex, 60-110	9%
			Digger-Bohannon-Umpcoos Complex, 60-90	5%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	85%
25	Tet_b	Strike N-NW, 10º W	Meda Loam, 2-20	1%
			Xanadu Gravelly Loam, 3-30	10%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	89%
			Fernhaven-Digger Complex, 30-60	1%
26A	Tet_b	Strike W, 10º S	Digger-Bohannon-Umpcoos Complex, 60-90	10%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	90%
26B	Tet_b	Strike W, 10º S	Orford Gravelly Silt Loam, 3-30	8%
			Preacher-Bohannon Complex, 3-30	3%
			Preacher-Bohannon-Xanadu Complex, 30-60	10%
			Digger-Bohannon-Umpcoos Complex, 60-90	27%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	51%
26C	Tet_b	Strike W, 10º S	Preacher-Bohannon Complex, 3-30	62%
			Digger-Bohannon-Umpcoos Complex, 60-90	38%
26D	Tet_b	Strike W, 10º S	Preacher Loam, 0-30	24%
			Preacher-Bohannon Complex, 3-30	5%
			Digger-Bohannon-Umpcoos Complex, 60-90	20%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	46%
			Honeygrove Gravelly Clay Loam, 3-30	6%
26E	Tet_b	Strike W, 10º S	Preacher-Bohannon-Xanadu Complex, 30-60	19%
			Digger-Bohannon-Umpcoos Complex, 60-90	81%
26F	Tet_b	Strike W, 10º S	Preacher-Bohannon-Xanadu Complex, 30-60	18%
			Digger-Bohannon-Umpcoos Complex, 60-90	82%
26G	Tet_b	Strike W, 10º S	Preacher-Bohannon-Xanadu Complex, 30-60	58%
			Digger-Bohannon-Umpcoos Complex, 60-90	42%
27	Tet_b	Strike W-NW, 10º S	Preacher Loam, 0-30	1%
			Preacher-Bohannon Complex, 3-30	3%
			Digger-Bohannon-Umpcoos Complex, 60-90	3%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	93%
28	Tet_b	Strike W-NW, 10º S	Preacher-Bohannon Complex, 3-30	4%
			Preacher-Bohannon-Xanadu Complex, 30-60	5%
			Xanadu Gravelly Loam, 3-30	5%
			Digger-Bohannon-Umpcoos Complex, 60-90	3%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	83%
29	Tet_b	Strike W-NW, 10º S	Preacher-Bohannon Complex, 3-30	21%
			Digger-Bohannon-Umpcoos Complex, 60-90	78%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	1%
30	Tet_b	Strike W, 9º S	Orford Gravelly Silt Loam, 3-30	5%
			Preacher-Bohannon-Xanadu Complex, 30-60	16%
			Digger-Bohannon-Umpcoos Complex, 60-90	14%
			Digger-Preacher Complex, 60-90	3%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	62%
31	W-edge- Tet_b; E-Qls	Tetb-Strike W, 9º S; Qls-Ancient ls, flow-the S	Orford Gravelly Silt Loam, 3-30	32%
			Preacher-Bohannon Complex, 3-30	7%
			Preacher-Bohannon-Xanadu Complex, 30-60	26%
			Xanadu Gravelly Loam, 3-30	10%
			Digger-Bohannon-Umpcoos Complex, 60-90	5%
			Digger-Preacher Complex, 60-90	15%
			Honeygrove-Peavine Complex, 3-30	6%
32	Tet_b; NE-Qls	Strike W, 9º S, Qls-toe edge of ls from N, flow S	Preacher Loam, 0-30	11%
			Preacher-Bohannon-Xanadu Complex, 30-60	7%
			Digger-Bohannon-Umpcoos Complex, 60-90	17%

EA Unit	Geology	Structure	Soil-Percent Slope	Percent of Unit
			Digger-Preacher Complex, 60-90	12%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	52%
33	Tet_b	Strike W, 9º S	Orford Gravelly Silt Loam, 3-30	9%
			Digger-Bohannon-Umpcoos Complex, 60-90	36%
			Digger-Preacher Complex, 60-90	49%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	7%
34	Tet_b	Strike W, 9º S	Orford Gravelly Silt Loam, 3-30	12%
			Preacher-Bohannon Complex, 3-30	9%
			Rock Outcrop-Umpcoos Complex, 60-110	10%
			Digger-Bohannon-Umpcoos Complex, 60-90	50%
			Digger-Preacher Complex, 60-90	19%
34A	Tet_b	Strike W, 9º S; NE corner at toe of Qls, flow S	Rock Outcrop-Umpcoos Complex, 60-110	3%
			Digger-Bohannon-Umpcoos Complex, 60-90	97%
35	Tetb; S edge Qls	Tetb-Strike W-NW, 11º S; Qls-SW edge at scarp crown of S flow ls	Orford Gravelly Silt Loam, 3-30	1%
			Preacher-Bohannon Complex, 3-30	21%
			Xanadu Gravelly Loam, 3-30	49%
			Digger-Bohannon-Umpcoos Complex, 60-90	18%
			Digger-Preacher Complex, 60-90	12%
36	N, SE- Tet_b; S, W (main body)-Qls	Tetb-Strike W-NW, 11º S; Qls-Body and toe of ancient ls, flow-the S	Orford Gravelly Silt Loam, 3-30	3%
			Preacher-Bohannon Complex, 3-30	47%
			Preacher-Bohannon-Xanadu Complex, 30-60	9%
			Xanadu Gravelly Loam, 3-30	20%
			Digger-Preacher Complex, 60-90	21%
37	Tet_b	Strike W-NW, 13º S; N edge bound by Qls toe	Orford Gravelly Silt Loam, 3-30	1%
			Preacher-Bohannon Complex, 3-30	4%
			Preacher-Bohannon-Xanadu Complex, 30-60	1%
			Digger-Bohannon-Umpcoos Complex, 60-90	87%
			Digger-Preacher Complex, 60-90	6%
38	Tet_b	Strike W-NW, 13º S	Orford Gravelly Silt Loam, 3-30	64%
			Digger-Bohannon-Umpcoos Complex, 60-90	34%
			Digger-Preacher Complex, 60-90	2%
39	Tet_b	Strike W-NW, 13º S	Orford Gravelly Silt Loam, 3-30	17%
			Digger-Preacher Complex, 60-90	83%
40	Tet_b	Strike W-NW, 11º S	Orford Gravelly Silt Loam, 3-30	17%
			Preacher-Bohannon-Xanadu Complex, 30-60	43%
			Digger-Preacher Complex, 60-90	40%
41	Tet_b	Strike W-NW, 11º S	Orford Gravelly Silt Loam, 3-30	23%
			Fernhaven-Digger Complex, 30-60	57%
			Honeygrove Gravelly Clay Loam, 3-30	20%
41A	Tet_b	Strike W-NW, 11º S	Digger-Bohannon-Umpcoos Complex, 60-90	5%
			Fernhaven-Digger Complex, 30-60	17%
			Honeygrove Gravelly Clay Loam, 3-30	79%
42	Tet_b	Strike W-NW, 10º S	Digger-Bohannon-Umpcoos Complex, 60-90	18%
			Fernhaven-Digger Complex, 30-60	4%
			Honeygrove Gravelly Clay Loam, 3-30	78%
43	Tet_b	Strike W-NW, 10º S	Orford Gravelly Silt Loam, 3-30	1%
			Digger-Bohannon-Umpcoos Complex, 60-90	66%
			Fernhaven-Digger Complex, 30-60	32%
			Honeygrove Gravelly Clay Loam, 3-30	1%
44	Tet_b	Strike W-NW, 10º S	Honeygrove Gravelly Clay Loam, 3-30	100%
45	Tet_b	Strike W-SW, 7º S, near (W of) plunging SW syncline	Preacher-Bohannon-Digger Complex, 60-90	1%
			Digger-Bohannon-Umpcoos Complex, 60-90	16%
			Fernhaven-Digger Complex, 30-60	17%
			Honeygrove Gravelly Clay Loam, 3-30	66%
46	Tet_b	Strike W-SW, 7º S—W-NW, 9º S (SW edge)	Orford Gravelly Silt Loam, 3-30	8%
			Preacher-Bohannon-Digger Complex, 60-90	6%
			Preacher-Bohannon-Xanadu Complex, 30-60	45%
			Digger-Bohannon-Umpcoos Complex, 60-90	0%
			Digger-Preacher Complex, 60-90	13%
			Honeygrove Gravelly Clay Loam, 3-30	28%
47	Tet_b	Strike W-SW, 7º S	Preacher-Bohannon-Xanadu Complex, 30-60	100%

EA Unit	Geology	Structure	Soil-Percent Slope	Percent of Unit
48	Tet_b	Strike W-NW, 9º S—W-SW, 5º S	McDuff-Absaquil-Honeygrove Complex, 30-60	14%
			Preacher-Bohannon-Digger Complex, 60-90	21%
			Honeygrove Gravelly Clay Loam, 3-30	65%
49	Tet_b	Strike SW, 8º SE, on SE limb of a NE anticline	McDuff-Absaquil-Honeygrove Complex, 30-60	34%
			Absaquil-Honeygrove-McDuff Complex, 3-30	63%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	2%
50	Tet_b	Strike SW, 8º SE, on SE limb of a NE anticline	McDuff-Absaquil-Honeygrove Complex, 30-60	55%
			Absaquil-Honeygrove-McDuff Complex, 3-30	45%
51	Tet_b	Strike SW, 8º SE, on SE limb of a NE anticline	McDuff-Absaquil-Honeygrove Complex, 30-60	28%
			Preacher Loam, 50-75	44%
			Absaquil-Honeygrove-McDuff Complex, 3-30	28%
52	Tet_b	Strike SW, 8º SE, on SE limb of a NE anticline	McDuff-Absaquil-Honeygrove Complex, 30-60	41%
			Preacher Loam, 50-75	35%
			Absaquil-Honeygrove-McDuff Complex, 3-30	5%
			Digger-Bohannon-Umpcoos Complex, 60-90	16%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	4%
53	Tet_b -NE; Tee-SE	Strike SW, 7º SE, on SE limb of NE anticline	McDuff-Absaquil-Honeygrove Complex, 30-60	31%
			Preacher Loam, 50-75	14%
			Absaquil-Honeygrove-McDuff Complex, 3-30	55%
54	Tee	NE Anticline through unit; NW Strike N-NE, 7º W; SE Strike N-NE, 8º E	McDuff-Absaquil-Honeygrove Complex, 30-60	16%
			Absaquil-Honeygrove-McDuff Complex, 3-30	62%
			Digger-Bohannon-Umpcoos Complex, 60-90	17%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	5%
55	Tee	Strike N-NE, 8º E	McDuff-Absaquil-Honeygrove Complex, 30-60	14%
			Absaquil-Honeygrove-McDuff Complex, 3-30	86%
55a	Tee	Strike N-NE, 8º E	McDuff-Absaquil-Honeygrove Complex, 30-60	99%
			Absaquil-Honeygrove-McDuff Complex, 3-30	1%
56	Tee	NE Anticline through SE par of unit; W Strike N-NE, 7º W, E-NE, 10º N; E Strike N-NE 8º E	McDuff-Absaquil-Honeygrove Complex, 30-60	26%
			Absaquil-Honeygrove-McDuff Complex, 3-30	56%
			Digger-Bohannon-Umpcoos Complex, 60-90	13%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	5%
57	Tee	Strike N-NE, 8ºE (SE limb of NE Anticline)	McDuff-Absaquil-Honeygrove Complex, 30-60	39%
			Absaquil-Honeygrove-McDuff Complex, 3-30	51%
			Digger-Bohannon-Umpcoos Complex, 60-90	8%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	3%
58	Tee	Strike N-NE, 7º W (NW limb of NE Anticline)	McDuff-Absaquil-Honeygrove Complex, 30-60	22%
			Wintley Silt Loam, 0-12	2%
			Absaquil-Honeygrove-McDuff Complex, 3-30	36%
			Digger-Bohannon-Umpcoos Complex, 60-90	39%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	2%
58A	Tee	Strike NE, 5º-10º NW	Atring-Larmine-Rock Outcrop Complex, 60-90	16%
			Preacher-Bohannon-Xanadu Complex, 30-60	33%
			Absaquil-Honeygrove-McDuff Complex, 3-30	9%
			Digger-Bohannon Complex, 30-60	9%
			Digger-Bohannon-Umpcoos Complex, 60-90	21%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	11%
59	Tee	Strike N, 10º E (SE limb of NE Anticline)	Digger-Bohannon-Umpcoos Complex, 60-90	16%
			Honeygrove-Peavine Complex, 3-30	84%
60	Tee	Strike NE, 10º SE	Atring-Larmine Complex, 60-90	25%
			McDuff-Absaquil-Honeygrove Complex, 30-60	4%
			Preacher-Bohannon-Xanadu Complex, 30-60	46%
			Absaquil-Honeygrove-McDuff Complex, 3-30	19%
			Digger-Bohannon-Umpcoos Complex, 60-90	7%
61	Tee	Strike E-NE, 12º S	Atring-Larmine Complex, 60-90	2%
			Preacher-Bohannon-Xanadu Complex, 30-60	18%
			Absaquil-Honeygrove-McDuff Complex, 3-30	80%
62A	Tee	Strike N-NE, 8º E	McDuff-Absaquil-Honeygrove Complex, 30-60	42%
			Digger-Bohannon-Umpcoos Complex, 60-90	58%
62B	Tee	Strike N-NE, 8º E	McDuff-Absaquil-Honeygrove Complex, 30-60	100%
62C	Tee	Strike N-NE, 8º E (eastern edge at Qal)	McDuff-Absaquil-Honeygrove Complex, 30-60	77%
			Preacher-Bohannon-Xanadu Complex, 30-60	22%

EA Unit	Geology	Structure	Soil-Percent Slope	Percent of Unit
			Absaquil-Honeygrove-McDuff Complex, 3-30	1%
63	Tee-SE corner; Qal-rest unit	Tee-Strike NE-E, 5º S. Most unit in Qal	McDuff-Absaquil-Honeygrove Complex, 30-60	26%
			Orford Gravelly Silt Loam, 3-30	15%
			Sibold Fine Sandy Loam, 0-5	15%
			Absaquil-Honeygrove-McDuff Complex, 3-30	1%
			Digger-Preacher Complex, 60-90	13%
			Fernhaven-Digger Complex, 30-60	30%
64	Tee	Strike NE, 5º SE	Bateman Silt Loam, 12-30	5%
			Bateman Silt Loam, 30-60	33%
			Preacher-Bohannon-Xanadu Complex, 30-60	36%
			Digger-Preacher Complex, 60-90	25%
64A	Tee	Strike NE-E, 12º SE	Atring-Larmine Complex, 60-90	2%
			McDuff-Absaquil-Honeygrove Complex, 30-60	50%
			Digger-Bohannon Complex, 30-60	15%
			Digger-Preacher Complex, 60-90	6%
			Atring Gravelly Loam, 60-90	27%
64B	Tee	Strike NE-E, 12º SE	Absaquil-Honeygrove-McDuff Complex, 3-30	75%
			Digger-Preacher Complex, 60-90	3%
			Atring Gravelly Loam, 60-90	22%
64C	Tee	Strike NE-E, 12º SE	McDuff-Absaquil-Honeygrove Complex, 30-60	4%
			Absaquil-Honeygrove-McDuff Complex, 3-30	20%
			Atring Gravelly Loam, 60-90	76%
65	Tee	Strike NE-E, 12º SE	Atring-Larmine Complex, 60-90	2%
			Bateman Silt Loam, 12-30	15%
			Bateman Silt Loam, 30-60	9%
			Absaquil-Honeygrove-McDuff Complex, 3-30	52%
			Digger-Bohannon-Umpcoos Complex, 60-90	9%
			Digger-Preacher Complex, 60-90	3%
			Atring Gravelly Loam, 60-90	9%
66	Tee	Strike NE-E, 12º SE	Absaquil-Honeygrove-McDuff Complex, 3-30	33%
			Digger-Bohannon-Umpcoos Complex, 60-90	67%
66A	Tee	Strike NE-E, 12º SE	McDuff-Absaquil-Honeygrove Complex, 30-60	61%
			Preacher-Bohannon-Xanadu Complex, 30-60	1%
			Absaquil-Honeygrove-McDuff Complex, 3-30	39%
66B	Tee	Strike NE-E, 12º SE	McDuff-Absaquil-Honeygrove Complex, 30-60	7%
			Absaquil-Honeygrove-McDuff Complex, 3-30	25%
			Digger-Preacher Complex, 60-90	68%
67	Tee	Strike NE-E, 9º SE	McDuff-Absaquil-Honeygrove Complex, 30-60	70%
			Digger-Bohannon-Umpcoos Complex, 60-90	17%
			Digger-Preacher Complex, 60-90	13%
68	Tee	Strike NE-E, 10º SE	Atring-Larmine-Rock Outcrop Complex, 60-90	7%
			Digger-Bohannon-Umpcoos Complex, 60-90	11%
			Digger-Umpcoos-Rock Outcrop Complex, 60-90	4%
			Fernhaven-Digger Complex, 30-60	79%
69	Tee	Strike NE-E, 9º SE	McDuff-Absaquil-Honeygrove Complex, 30-60	13%
			Orford Gravelly Silt Loam, 30-60	1%
			Preacher-Bohannon-Xanadu Complex, 30-60	3%
			Absaquil-Honeygrove-McDuff Complex, 3-30	77%
			Digger-Bohannon-Umpcoos Complex, 60-90	3%
			Digger-Preacher Complex, 60-90	2%
70	Tee	Strike NE-E, 9º SE	McDuff-Absaquil-Honeygrove Complex, 30-60	18%
			Absaquil-Honeygrove-McDuff Complex, 3-30	37%
			Digger-Preacher Complex, 60-90	45%
71	Tee	Strike NE-E, 5º SE	McDuff-Absaquil-Honeygrove Complex, 30-60	69%
			Orford Gravelly Silt Loam, 3-30	26%
			Preacher Loam, 50-75	5%
72A	Tee-SW; Qal-NE	Tee-Strike NW, 6º SW	McDuff-Absaquil-Honeygrove Complex, 30-60	17%
			Bateman Silt Loam, 30-60	21%
			Honeygrove Gravelly Clay Loam, 3-30	61%
72B	Qal	No surface strike, underlying NW, 6º SW	McDuff-Absaquil-Honeygrove Complex, 30-60	16%
			Honeygrove Gravelly Clay Loam, 3-30	84%

EA Unit	Geology	Structure	Soil-Percent Slope	Percent of Unit
72C	Tee	Strike NW, 6º SW	McDuff-Absaquil-Honeygrove Complex, 30-60	15%
			Honeygrove Gravelly Clay Loam, 3-30	85%
73	W- Tet_b, E-Tee	Strike N-NE, 13º-15ºE		
73a	W- Tet_b, E-Tee	Strike N-NE, 13º-15ºE	Preacher-Bohannon-Xanadu Complex, 30-60	100%
74	Tee	Strike N-NE, 13º-15ºE	Preacher-Bohannon-Xanadu Complex, 30-60	44%
			Xanadu Gravelly Loam, 30-60	22%
			Absaquil-Honeygrove-McDuff Complex, 3-30	31%
			Fernhaven-Digger Complex, 30-60	3%
74a	Tee	Strike N-NE, 13º-15ºE	Preacher-Bohannon-Xanadu Complex, 30-60	69%
			Absaquil-Honeygrove-McDuff Complex, 3-30	31%
75	Tee	Strike N-NE, 13º-15ºE	Preacher-Bohannon Complex, 3-30	9%
			Preacher-Bohannon-Xanadu Complex, 30-60	50%
			Absaquil-Honeygrove-McDuff Complex, 3-30	3%
			Digger-Bohannon-Umpcoos Complex, 60-90	1%
			Fernhaven-Digger Complex, 30-60	37%
76	Tet_b	Strike W-NW, 8º S	Preacher-Bohannon-Xanadu Complex, 30-60	76%
			Digger-Preacher Complex, 60-90	24%
77	Tet_b	Strike W-NW, 8º S	Preacher-Bohannon-Xanadu Complex, 30-60	8%
			Digger-Preacher Complex, 60-90	92%
78	Tet_b	Strike W-NW, 8º S	Preacher-Bohannon-Xanadu Complex, 30-60	84%
			Xanadu Gravelly Loam, 3-30	15%
			Digger-Preacher Complex, 60-90	1%
79	Tet_b	Strike W-NW, 8º S	Preacher Loam, 0-30	1%
			Preacher-Bohannon-Xanadu Complex, 30-60	62%
			Digger-Preacher Complex, 60-90	37%
80	Tet_b	Strike W-NW, 10º S	Preacher-Bohannon-Xanadu Complex, 30-60	24%
			Digger-Bohannon-Umpcoos Complex, 60-90	76%
81	Tet_b	Strike W-NW, 11º S	Digger-Bohannon-Umpcoos Complex, 60-90	100%
82	Tet_b	Strike NW, 9º SW, NE Syncline trough along NW edge	Orford Gravelly Silt Loam, 3-30	1%
			Preacher-Bohannon-Xanadu Complex, 30-60	15%
			Digger-Preacher Complex, 60-90	84%
83	Tet_b	Strike NW, 9º SW	Orford Gravelly Silt Loam, 3-30	35%
			Preacher-Bohannon-Xanadu Complex, 30-60	2%
			Digger-Preacher Complex, 60-90	62%
84	Tet_b	Strike NW, 9º SW, NE Syncline trough along W-NW edge	Digger-Preacher Complex, 60-90	94%
			Fernhaven-Digger Complex, 30-60	6%
85	Tet_b	Strike NW, 9º SW	Orford Gravelly Silt Loam, 3-30	5%
			Preacher-Bohannon-Xanadu Complex, 30-60	57%
			Digger-Preacher Complex, 60-90	31%
			Fernhaven-Digger Complex, 30-60	7%
86	Tet_b	NE Syncline trough through middle of unit; NW Strike NE, 7º SE; SW Strike NW, 10º SW	Digger-Bohannon-Umpcoos Complex, 60-90	8%
			Honeygrove Gravelly Clay Loam, 3-30	92%
87	Tet_b	Strike NW, 10º SW, NE Syncline trough along NW edge	Digger-Bohannon-Umpcoos Complex, 60-90	92%
			Fernhaven-Digger Complex, 30-60	8%
88	Tet_b	Strike NE-E, 7º SE	Orford Gravelly Silt Loam, 3-30	36%
			Preacher-Bohannon-Digger Complex, 60-90	29%
			Preacher-Bohannon-Xanadu Complex, 30-60	35%
89	Tet_b	Strike NW, 10º SW, NE Syncline trough along W-NW edge	Fernhaven-Digger Complex, 30-60	9%
			Honeygrove Gravelly Clay Loam, 3-30	91%
90	Tet_b	Strike NE-E, 7º SE	Preacher-Bohannon-Xanadu Complex, 30-60	9%
			Digger-Preacher Complex, 60-90	91%
91	Tet_b	Strike NE-E, 7º SE	Preacher-Bohannon-Xanadu Complex, 30-60	100%
92	Tet_b	Strike W-NW, 11º S, NE Syncline trough along SW edge	Preacher Loam, 0-30	40%
			Preacher-Bohannon-Xanadu Complex, 30-60	25%
			Digger-Preacher Complex, 60-90	32%
			Fernhaven-Digger Complex, 30-60	4%
93	Tet_b	Strike W-NW, 10º S, NE Syncline trough along S point	Digger-Bohannon-Umpcoos Complex, 60-90	0%
			Fernhaven-Digger Complex, 30-60	6%
			Honeygrove Gravelly Clay Loam, 3-30	94%
94	Tee	Strike N-NE, 7º W, SW edge bound by Tet	Absaquil-Honeygrove-McDuff Complex, 3-30	56%
			Digger-Bohannon-Umpcoos Complex, 60-90	44%

Appendix Table D–2: Unit Soils and Geology Evaluation Matrix

Unit	Rd Inches	Feet (=inches X 1000 feet/mile--625ft for *)	Area (sq ft) (= Feet X 9-21' Width)	Compaction Acreage	Unit Acreage	Existing Percentage Compaction (CA/UA)	Photo Date	New Rd (miles)	New Rd. Compaction (acres)	Total (new and existing) compaction Acreage	Total Percent Compaction	Ground?	Compactable Soil?	Geology?	Site Review?	Reason?[13]
1A*	30	18750	281250	6.46	269.3	2.40%	1960	1.23	1.7891567	8.25	3.06%	Y	Y		Y	WA Rec
12	3	3000	45000	1.03	32.7	3.16%	1960	0.36	0.5254961	1.56	4.77%		Y		N	
13	19	19000	285000	6.54	163.1	4.01%	1965	0.44	0.6398666	7.18	4.40%	Y	Y		N	
14	1	1000	15000	0.34	23.4	1.47%	1965	0.00	0	0.34	1.47%		Y		Y	Alder
15	5	5000	75000	1.72	37.3	4.61%	1965	0.00	0	1.72	4.61%		Y		N	
18	5.5	5500	82500	1.89	45.6	4.16%	?	0.00	0	1.89	4.16%	Y	Y		N	
19	14	14000	210000	4.82	113.3	4.26%	?	0.11	0.1530176	4.97	4.39%	Y	Y		N	
21	19.5	19500	292500	6.71	316.7	2.12%	?	0.00	0	6.71	2.12%		Y		N	
22	5.5	5500	82500	1.89	14.8	12.76%	?	0.00	0	1.89	12.76%				Y	Comp, RB, NR
23	3.5	3500	52500	1.21	22.2	5.43%	?	0.35	0.5045217	1.71	7.71%	Y	Y		N	
24	12	12000	180000	4.13	100.7	4.10%	?	0.05	0.0724361	4.20	4.18%		Y		N	
25	13	13000	195000	4.48	145.2	3.08%	?	0.60	0.8717348	5.35	3.68%		Y		N	
27	5	5000	75000	1.72	57.3	3.00%	1965	0.00	0	1.72	3.00%		Y		N	
28	6.25	6250	93750	2.15	102.2	2.11%	1965	0.21	0.3025152	2.45	2.40%		Y		N	
29	6.5	6500	97500	2.24	50.5	4.43%	1965	0.14	0.207781	2.45	4.85%		Y		N	
30	25	25000	375000	8.61	168.1	5.12%	1965	0.21	0.3043624	8.91	5.30%		Y	Y-WA	Y	LS-WA Rec
31	25	25000	375000	8.61	150.0	5.74%	1965	0.30	0.4301074	9.04	6.03%	Y	Y	Y-LS, WA	Y	LS-WA Rec-G, GB, Soil
32	13	13000	195000	4.48	179.5	2.49%	1965	0.86	1.2505406	5.73	3.19%		Y	Y-LS, WA	Y	LS-WA Rec-G
33	7	7000	105000	2.41	47.6	5.07%	1965	0.00	0	2.41	5.07%		Y	Y-WA	Y	LS-WA Rec
34	11.5	11500	172500	3.96	127.8	3.10%	1965	0.00	0	3.96	3.10%		Y		N	
35	13.5	13500	202500	4.65	59.3	7.84%	?	0.06	0.0875487	4.74	7.99%	Y	Y	Y-LS	Y	LS-G, GB, Soil
36	37.5	37500	562500	12.91	200.7	6.43%	?	0.11	0.1530321	13.07	6.51%	Y	Y	Y-LS, WA	Y	LS-WA Rec-G, GB, Soil
37	24	24000	360000	8.26	103.6	7.98%	?	0.00	0	8.26	7.98%		Y	Y-WA	Y	LS-WA Rec
38	5	5000	75000	1.72	35.6	4.84%	?	0.00	0	1.72	4.84%	Y	Y	Y-WA	Y	LS-WA Rec
39	0	0	0	0.00	19.7	0.00%	?	0.00	0	0.00	0.00%		Y	Y-WA	Y	LS-WA Rec
40	0	0	0	0.00	36.3	0.00%	?	0.00	0	0.00	0.00%		Y	Y-WA	Y	LS-WA Rec
41	5	5000	75000	1.72	24.5	7.03%	1965	0.00	0	1.72	7.03%		Y		N	
42	12	12000	180000	4.13	18.9	21.89%	1965	0.00	0	4.13	21.89%	Y	Y		Y	Comp, RB, NR
43	7	7000	105000	2.41	39.0	6.19%	1965	0.00	0	2.41	6.19%		Y		N	
44	3.5	3500	52500	1.21	14.2	8.51%	1965	0.00	0	1.21	8.51%	Y	Y		N	
45	22	22000	330000	7.58	79.7	9.50%	1970	0.34	0.4935253	8.07	10.12%	Y	Y		Y	Comp
46	58	58000	870000	19.97	402.5	4.96%	1965, 1970, 1981	0.79	1.1550937	21.13	5.25%	Y	Y		N	
47	9	9000	135000	3.10	47.6	6.52%	1970, 1981	0.40	0.5870668	3.69	7.75%		Y		N	
48	30	30000	450000	10.33	146.5	7.05%	1965	0.12	0.175592	10.51	7.17%	Y	Y		N	
49	8	8000	120000	2.75	56.6	4.87%	1965	0.08	0.1186468	2.87	5.08%	Y	Y		N	
50	21.5	21500	322500	7.40	109.5	6.76%	1965	0.48	0.7002154	8.10	7.40%	Y	Y		N	
51	3.5	3500	52500	1.21	34.2	3.53%	1965	0.00	0	1.21	3.53%	Y	Y		N	
52	34.5	34500	517500	11.88	217.2	5.47%	1965	1.03	1.4972305	13.38	6.16%	Y	Y		N	
53	40	40000	600000	13.77	120.5	11.43%	1965	0.00	0	13.77	11.43%	Y	Y	Y-Contact	Y	Comp, GB, Soil, G-Cont
54	81	81000	1215000	27.89	251.0	11.11%	1965	0.39	0.5674014	28.46	11.34%	Y	Y		Y	Comp
55	6	6000	90000	2.07	49.3	4.19%	1965	0.12	0.1700502	2.24	4.53%	Y	Y		N	
56	46.5	46500	697500	16.01	487.1	3.29%	?, 1965	2.03	2.9482939	18.96	3.89%	Y	Y		N	
57	1	1000	15000	0.34	68.1	0.51%	1965, 1992	0.14	0.2092792	0.55	0.81%	Y	Y		N	
58	7	7000	105000	2.41	247.4	0.97%	?	1.32	1.9138543	4.32	1.75%	Y	Y		N	
59	3.5	3500	52500	1.21	52.3	2.30%	?	0.13	0.1829666	1.39	2.65%	Y	Y		N	
60	19.5	19500	292500	6.71	215.3	3.12%	1960	0.41	0.6020195	7.32	3.40%	Y	Y		N	
61	3	3000	45000	1.03	34.0	3.04%	1960	0.00	0	1.03	3.04%	Y	Y		N	
63	17.5	17500	262500	6.03	84.0	7.17%	1965	0.09	0.1290468	6.16	7.33%	Y	Y	Y-Qal	Y	GB, Soil, G-Qal
64	4	4000	60000	1.38	35.0	3.93%	1970	0.00	0	1.38	3.93%		Y		N	
65	22	22000	330000	7.58	107.1	7.08%	1970	0.19	0.2783116	7.85	7.34%	Y	Y		N	
66	3	3000	45000	1.03	38.5	2.68%	1970, 1981	0.00	0	1.03	2.68%		Y	Y-WA	Y	LS-WA Rec
67	9.5	9500	142500	3.27	59.0	5.54%	1970, 1981	0.00	0	3.27	5.54%		Y	Y-WA	Y	LS-WA Rec
68	3	3000	45000	1.03	33.6	3.08%	1970	0.13	0.1826757	1.22	3.62%		Y		N	

[13] WA Rec-Middle Umpqua River Watershed Analysis (BLM, 2004) recommendation; Alder=Alder Conversion; Comp=Unit Compaction; RB=Rock Bands; NR=No Roads; GB=Ground Based Operations; LS=Landslide Potentials (Geology and WA Rec); G=Geology; G-Cont=Geological Contacts; G-Qal=Geology Alluvium;

Unit	Rd Inches	Feet (=inches X 1000 feet/mile--625ft for *)	Area (sq ft) (= Feet X 9-21' Width)	Compaction Acreage	Unit Acreage	Existing Percentage Compaction (CA/UA)	Photo Date	New Rd (miles)	New Rd. Compaction (acres)	Total (new and existing) compaction Acreage	Total Percent Compaction	Ground?	Compactable Soil?	Geology?	Site Review?	Reason?[13]
69	62	62000	930000	21.35	329.6	6.48%	1970	0.00	0	21.35	6.48%	Y	Y		N	
70	3	3000	45000	1.03	26.2	3.95%	1970, 1981	0.00	0	1.03	3.95%		Y		N	
71	8	8000	120000	2.75	72.9	3.78%	1981	0.00	0	2.75	3.78%	Y	Y		N	
74	3	3000	45000	1.03	37.4	2.77%	1965	0.21	0.3065006	1.34	3.59%	Y	Y		N	
75	28.5	28500	427500	9.81	91.2	10.76%	1965	0.24	0.3459041	10.16	11.14%	Y	Y		Y	Comp
76	7	7000	105000	2.41	46.3	5.20%	1981	0.17	0.2474172	2.66	5.74%		Y		N	
77	4	4000	60000	1.38	14.3	9.65%	1981	0.00	0	1.38	9.65%		Y		N	
78	2.5	2500	37500	0.86	35.0	2.46%	1981	0.00	0	0.86	2.46%		Y		N	
79	3.5	3500	52500	1.21	43.3	2.78%	1981	0.00	0	1.21	2.78%	Y	Y		N	
80	3	3000	45000	1.03	23.1	4.47%	1981	0.00	0	1.03	4.47%		Y	Y-WA	Y	LS-WA Rec
81	1.5	1500	22500	0.52	21.7	2.38%	1981	0.00	0	0.52	2.38%		Y		N	
82	6	6000	90000	2.07	50.2	4.12%	1981	0.00	0	2.07	4.12%		Y		N	
83	5.5	5500	82500	1.89	31.3	6.05%	1981	0.00	0	1.89	6.05%		Y		N	
84	6.5	6500	97500	2.24	45.5	4.91%	1981	0.23	0.3324496	2.57	5.64%		Y		N	
85	6	6000	90000	2.07	51.5	4.01%	1981	0.00	0	2.07	4.01%	Y	Y		N	
86	4	4000	60000	1.38	42.8	3.22%	1981	0.00	0	1.38	3.22%	Y	Y		N	
87	0	0	0	0.00	30.2	0.00%	1981	0.11	0.1662684	0.17	0.55%		Y		N	
88	2.5	2500	37500	0.86	39.6	2.17%	1981	0.35	0.5109507	1.37	3.46%	Y	Y		N	
89	2.75	2750	41250	0.95	38.9	2.44%	1981	0.00	0	0.95	2.44%	Y	Y		N	
90	1	1000	15000	0.34	38.0	0.91%	1981	0.00	0	0.34	0.91%		Y		N	
91	3.5	3500	52500	1.21	38.3	3.14%	1981	0.00	0	1.21	3.14%	Y	Y		N	
92	3	3000	45000	1.03	152.0	0.68%	1981	0.00	0	1.03	0.68%		Y		N	
93	4	4000	60000	1.38	22.4	6.15%	1981, 1965	0.00	0	1.38	6.15%		Y		N	
94	4	4000	60000	1.38	35.0	3.94%	1965, 1992	0.00	0	1.38	3.94%	Y	Y		N	
10*	15	9375	140625	3.23	129.1	2.50%	1960	0.37	0.5363906	3.76	2.92%	Y	Y		N	
11A*	24	15000	225000	5.17	104.7	4.94%	1960	0.33	0.483489	5.65	5.40%	Y	Y		N	
11B*	17.25	10781.25	161718.75	3.71	162.3	2.29%	1960	0.15	0.2245082	3.94	2.43%		Y		N	
1B*	39	24375	365625	8.39	114.0	7.36%	1960	0.44	0.6339466	9.03	7.92%	Y	Y		N	
1C*	16	10000	150000	3.44	88.3	3.90%	1960	0.72	1.0441559	4.49	5.08%	Y	Y		N	
22A	2.5	2500	37500	0.86	9.7	8.90%	?	0.00	0	0.86	8.90%				N	
22B	4	4000	60000	1.38	10.3	13.40%	?	0.00	0	1.38	13.40%				Y	Comp, RB, NR
22C	4	4000	60000	1.38	8.5	16.28%	?	0.00	0	1.38	16.28%				Y	Comp, RB, NR
22D	4.5	4500	67500	1.55	13.6	11.39%	?	0.00	0	1.55	11.39%				Y	Comp, RB, NR
22E	3	3000	45000	1.03	15.1	6.84%	?	0.00	0	1.03	6.84%				N	
26A	3.25	3250	48750	1.12	33.1	3.38%	1965, 1970	0.11	0.1668066	1.29	3.88%		Y		N	
26B	13.5	13500	202500	4.65	55.7	8.34%	1965, 1970	0.00	0	4.65	8.34%		Y		N	
26C	4	4000	60000	1.38	25.4	5.42%	1965, 1970	0.00	0	1.38	5.42%		Y		N	
26D	5.5	5500	82500	1.89	52.0	3.64%	1965, 1970	0.00	0	1.89	3.64%		Y		N	
26E	3	3000	45000	1.03	18.2	5.68%	1970	0.00	0	1.03	5.68%		Y		N	
26F	0.25	250	3750	0.09	34.4	0.25%	1970	0.00	0	0.09	0.25%		Y		N	
26G	0	0	0	0.00	11.7	0.00%	1970	0.00	0	0.00	0.00%		Y		N	
2A*	2	1250	18750	0.43	5.9	7.35%	1960	0.00	0	0.43	7.35%		Y		Y	Alder
2C*	4	2500	37500	0.86	32.3	2.67%	1960	0.00	0	0.86	2.67%	Y	Y	Y-WA	Y	LS-WA Rec, Alder
3*	25	15625	234375	5.38	244.1	2.20%	1960	1.17	1.7079061	7.09	2.90%	Y	Y		N	
34A	2.25	2250	33750	0.77	16.1	4.82%	?	0.12	0.1705739	0.95	5.88%		Y	Y-WA	Y	LS-WA Rec
41A	8	8000	120000	2.75	11.0	24.95%	1965	0.00	0	2.75	24.95%		Y		Y	Comp, RB, NR
4A*	0.5	312.5	4687.5	0.11	4.0	2.69%	1960	0.00	0	0.11	2.69%		Y		Y	Alder
4B*	2.25	1406.25	21093.75	0.48	5.6	8.62%	1960	0.13	0.1907047	0.67	12.01%		Y		Y	Comp, Alder
4C*	0.25	156.25	2343.75	0.05	1.2	4.43%	1960	0.00	0	0.05	4.43%		Y		Y	Alder
4D*	3	1875	28125	0.65	39.2	1.65%	1960	0.40	0.5859904	1.23	3.14%		Y		Y	Alder
4E*	2.5	1562.5	23437.5	0.54	10.6	5.09%	1960	0.00	0	0.54	5.09%	Y	Y		Y	Alder
4F*	7	4375	65625	1.51	15.3	9.85%	1960	0.00	0	1.51	9.85%		Y		Y	Alder
5*	6	3750	56250	1.29	23.4	5.51%	1960	0.00	0	1.29	5.51%		Y		N	
55A	0	0	0	0.00	3.1	0.00%	1965	0.00	0	0.00	0.00%		Y		Y	Alder
58A	13	13000	195000	4.48	244.7	1.83%	1965	0.56	0.8212913	5.30	2.16%		Y		N	
6*	6	3750	56250	1.29	41.6	3.10%	1960	0.18	0.2642462	1.56	3.73%		Y		N	
62A	3	3000	45000	1.03	10.9	9.52%	1981	0.00	0	1.03	9.52%		Y		N	
62B	2	2000	30000	0.69	8.1	8.54%	1981, 1992	0.00	0	0.69	8.54%	Y	Y		N	
62C	3.25	3250	48750	1.12	19.2	5.84%	1981	0.00	0	1.12	5.84%		Y		N	
64A	3	3000	45000	1.03	37.7	2.74%	1981	0.00	0	1.03	2.74%		Y		N	
64B	2	2000	30000	0.69	9.9	6.96%	1981	0.00	0	0.69	6.96%		Y		N	

Unit	Rd Inches	Feet (=inches X 1000 feet/mile--625ft for *)	Area (sq ft) (= Feet X 9-21' Width)	Compaction Acreage	Unit Acreage	Existing Percentage Compaction (CA/UA)	Photo Date	New Rd (miles)	New Rd. Compaction (acres)	Total (new and existing) compaction Acreage	Total Percent Compaction	Ground?	Compactable Soil?	Geology?	Site Review?	Reason?[13]
64C	3	3000	45000	1.03	25.1	4.11%	1981	0.00	0	1.03	4.11%		Y		N	
66A	1.5	1500	22500	0.52	23.7	2.18%	1981	0.00	0	0.52	2.18%		Y	Y-WA	Y	LS-WA Rec
66B	6	6000	90000	2.07	25.2	8.21%	1970, 1981	0.15	0.2249882	2.29	9.11%		Y		Y	WA Rec
6A*	7	4375	65625	1.51	13.1	11.53%	1960	0.00	0	1.51	11.53%		Y		Y	Comp, NR
7*	10.25	6406.25	96093.75	2.21	55.8	3.96%	1960	0.67	0.9797634	3.19	5.71%		Y		N	
72A	7	7000	105000	2.41	35.6	6.77%	1960, 1981	0.00	0	2.41	6.77%	Y	Y	Y-Qal	Y	
72B	1	1000	15000	0.34	10.9	3.17%	1960	0.00	0	0.34	3.17%	Y	Y	Y-Qal	Y	GB, Soil, G-Qal
72C	3	3000	45000	1.03	16.6	6.23%	1981	0.00	0	1.03	6.23%	Y	Y		N	
73A	0	0	0	0.00	8.4	0.00%	1965	0.00	0	0.00	0.00%		Y	Y-Contact	Y	Soil, G-Cont, Alder
74A	0.5	500	7500	0.17	4.6	3.75%	1965	0.00	0	0.17	3.75%	Y	Y		Y	Alder
8*	3	1875	28125	0.65	18.5	3.48%	1960	0.00	0	0.65	3.48%		Y		N	
9A*	18	11250	168750	3.87	72.4	5.35%	1960	0.51	0.7437498	4.62	6.38%		Y		N	
9B*	32	20000	300000	6.89	177.1	3.89%	1960	0.00	0	6.89	3.89%		Y		N	

2.1 GEOLOGIC DESCRIPTION AND INTERPRETATIONS

Based on a review of the literature, the following provides a brief description of the units and their associated hazards. Field visits conducted during this study revealed few geologic exposures.

The Tyee-Elkton Formation consists of siltstone with thin to thick sandstone lenses and rhythmically interbedded thin graded sandstone and siltstone. It may interfinger with the upper part of the Tyee Formation (Niem and Niem, 1990). Associated hazards include erosion and mass movement. Mass movement includes all forms of movement, ranging from creep to slumps to debris torrents (Beaulieu and Hughes, 1975). The silt portions of the unit are more susceptible to slumping and rotational failures.

The Tet_b-Tyee Formation, undifferentiated, consists of fine to medium-grained sandstone beds with minor beds of siltstone, further identified as inner to middle fan and slope facies or proximal turbidite ramp-slope facies (Niem and Niem, 1990). Associated hazards include rapid erosion, flash flooding, rapid mass movement, and stream bank erosion (Beaulieu and Hughes, 1975).

The project areas are located in the Tyee sedimentary basin. The stratigraphies include the Elkton Formation and a small portion of the undifferentiated delta facies of the Tyee Formation. Both units are sedimentary, with the Elkton being predominantly siltstone and the Tyee being predominantly sandstone. The siltstone of the Elkton is far less resistant than the sandstone of the Tyee or Bateman Formations. This lower resistance allows for deeper weathering and loss of cohesion. Therefore, slumping and transitional slides forms of mass wasting are more common than debris flow and torrent forms of mass wasting found in the Tyee Formations.

Thicker soils and steep slope angles can facilitate slump or rotational failures. Thinner soils and steep angles can facilitate debris flows and debris torrents. Siltstone and mudstone layers can facilitate block slides of overlying stratigraphy. This potential is increased with the increase of the stratigraphy dip angles.

While the management operations would have little impact on the geology, the geology can have impacts on operations. Care must be exercised in road construction to minimize intersections with stratigraphy dip angles inclined with the slope (USDI-BLM 1995). Such intersections would provide for slide potential. Many of the roads associated with this project would be pre-existing, thereby reducing the risk of new road construction intersections, and most new road construction and road renovation is located at ridge top. All of the mapped dip angles are slight, with the maximum mapped dip angle in the area being 15° or less; however, not all geologic structure has been mapped.

Units 31 and 32 are associated with a mapped ancient landslide (Niem and Niem, 1990) (Appendix Table D–3). The interpreted slide direction is to the south. This slide is inactive. As such, proposed management activities of thinning should not cause movement or reactivation, as long as roads are properly designed and constructed. While the proposed thinning operations should not increase the risk of activating existing or potential landslides, care must be exercised in road construction through landslide topography. Site-specific indicators can include sag ponds, "pistol butt" trees, seeps, and hummocky topography.

No faults were identified within the units. Structurally, the project area is a series of anticline and syncline systems, creating fairly uniform strike with alternating dip directions.

2.2 SOILS DESCRIPTION AND INTERPRETATIONS

Based on a review of the literature (Johnson *et al*, 2003), the following provides a brief description of the units and their associated hazards. Appendix Table D–3 lists the soils associated with the project units and the slope grade on which they occur. Appendix Table D–1 indicates the soils present in each unit.

Appendix Table D–3: Umpqua River Sawyer Rapids Project Soils

Soil Map Code	Soil Name	Slope
3E	Absaquil-Honeygrove-McDuff Complex	3%-30%
8G	Atring Gravelly Loam	60%-90%
10G	Atring-Larmine Complex	60%-90%
11G	Atring-Larmine-Rock Outcrop Complex	60%-90%
16E	Bateman Silt Loam	12%-30%
16F	Bateman Silt Loam	30%-60%
49G	Damewood-Bohannon-Umpcoos Complex	60%-90%
57F	Digger-Bohannon Complex	30%-60%
58G	Digger-Bohannon-Umpcoos Complex	60%-90%
59G	Digger-Preacher Complex	60%-90%
60G	Digger-Umpcoos-Rock Outcrop Complex	60%-90%
80F	Fernhaven-Digger Complex	30%-60%
97F	Honeygrove Gravelly Clay Loam	3%-30%
99E	Honeygrove-Peavine Complex	3%-30%
148F	McDuff-Absaquil-Honeygrove Complex	30%-60%
153D	Meda Loam	2%-20%
179E	Orford Gravelly Silt Loam	30%-60%
179F	Orford Gravelly Silt Loam	3%-30%
195E	Preacher Loam	0%-30%
195G	Preacher Loam	50%-75%
197E	Preacher-Bohannon Complex	3%-30%
199G	Preacher-Bohannon-Digger Complex	60%-90%
200F	Preacher-Bohannon-Xanadu Complex	30%-60%
212G	Rock Outcrop-Umpcoos Complex	60%-110%
224B	Sibold Fine Sandy Loam	0%-5%
253G	Umpcoos-Rock Outcrop-Damewood Complex	60%-90%
267C	Wintley Silt Loam	0%-12%
272E	Xanadu Gravelly Loam	30%-60%
272F	Xanadu Gravelly Loam	3%-30%

The 3E-Absaquil-Honeygrove-McDuff complex is located on the 3 percent to 30 percent slope of broad mountain ridge tops, forming in residuum and colluvium from sandstone and siltstone. The soil ranges in elevations from 300 to 2,500 feet above sea level.

The Absaquil soil is a silt loam forming on broad ridge tops and side slopes. It is deep and well-drained. Depth to bedrock is 40 to 60 inches.

The Honeygrove soil is a gravelly clay loam forming on foot slopes, side slopes, and broad ridges. It is deep and well-drained. Bedrock can be found at depths greater than 60 inches.

The McDuff soil is a silty clay loam forming on ridges and side slopes. It is a moderately deep, well-drained soil. Depth to bedrock is 20 to 40 inches.

The complex is susceptible to erosion and compaction, has a moderately slow permeability and low soil strength. Management concerns are also related to the steepness of slope. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground-based equipment is preferred. To reduce compaction, it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be used in road drainage design to reduce erosion and that roads, landings can be ripped after use to improve plant growth. Trees on McDuff soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

8G-Atring Gravelly Loam is located on 60 to 90 percent slopes forming from colluvium derived from sandstone. The soil ranges in elevation from 250 feet to 2,600 feet above sea level. The soil is well-drained, with a bedrock depth of 20 to 40 inches.

The soil is susceptible to erosion and compaction. It has a moderately rapid permeability. Hazards include slope failures, shallow depth to bedrock, and potential for windthrow. Because of potential for slope failure, onsite investigations may be needed prior to soil disturbance. Headwalls should be avoided when constructing roads. Erosion risk can be reduced by proper maintenance of waterbars, culverts, and seeding of disturbed soils.

The 10G-Atring-Larmine Complex is located on 60 to 90 percent slopes forming from colluvium derived from sandstone. The complex ranges in elevation between 250 feet and 2,600 feet above sea level.

The Atring soil is described above.

The Larmine soil is a gravelly to very gravelly loam forming on side slopes. It is well drained with a moderately rapid permeability.

The complex is susceptible to erosion and compaction. Hazards include slope failures, shallow depth to bedrock, and potential for windthrow. Because of potential for slope failure, onsite investigations may be needed prior to soil disturbance. Headwalls should be avoided when constructing roads. Erosion risk can be reduced by proper maintenance of waterbars, culverts, and seeding of disturbed soils.

The 11G-Atring-Larmine-Rock Outcrop Complex is located on 60 to 90 percent slopes of side slopes and headwalls, forming in colluvium derived from sandstone. The complex ranges between 250 feet and 2,600 feet above sea level.

The Atring and Larmine soils are described above.

The Rock Outcrop is areas of exposed bedrock with no soil development.

The complex is susceptible to erosion and compaction. Hazards include slope failures, shallow depth to bedrock, and potential for windthrow. Because of potential for slope failure, onsite investigations may be needed prior to soil disturbance. Headwalls should be avoided when constructing roads. Erosion risk can be reduced by proper maintenance of waterbars, culverts, and seeding of disturbed soils.

The 16E, 16F-Bateman Silt Loam is located on foot slopes and broad ridges (12 to 30 percent slopes) and side slopes and ridges (30 to 60 percent slopes), forming from residuum and colluvium derived from sandstone and siltstone. The complex ranges between 250 feet and 2,600 feet above sea level. It is well-drained, but has a moderately slow permeability. Depth to bedrock is 60 inches or greater.

The soil is susceptible to erosion and compaction with limitations due to steepness of slope, slow permeability, and low soil strength. While wheeled and tracked equipment can be used, low-pressure ground equipment would reduce risk of soil damage. Cable yarding is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion; and that roads, landings, and skid trails can be ripped after use to improve plant growth.

The 49G-Damewoood-Bohannon-Umpcoos Complex is located on 60 to 90 percent slopes of side slopes and headwalls, forming from colluvium derived from sandstone. The complex ranges between 200 feet and 2,200 feet above sea level.

The Damewood soil is a very gravelly to extremely gravely loam forming on the convex side slopes. It is moderately deep and well drained. Bedrock can be found between 20 and 40 inches depth.

The Bohannon soil is a gravelly loam forming on the convex midslopes and lower slopes. It is moderately deep and well drained. Bedrock can be found at a 31-inch depth.

The Umpcoos soil is a very gravelly sandy loam forming on the convex side slopes adjacent to areas of rock outcrops. It is shallow and well drained. Bedrock can be found at a 16-inch depth.

The Bohannon soil of the complex is susceptible to compaction. Cable yarding is preferred. To reduce compaction it is recommended that ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion; roads, landings, and skid trails can be ripped after use to improve plant growth (however, ripping may not be feasible due to bedrock exposure); end haul waste material to reduce damage to vegetation and potential for sedimentation; avoid headwall areas in road construction; and, due to slope failure, complete onsite investigations before disturbing soils.

The 57F-Digger-Bohannon Complex is located on 30 to 60 percent slopes of side slopes and ridges, forming from colluvium and residuum derived from sandstone. The complex ranges between 200 feet and 3,000 feet above sea level.

The Digger soil is a very gravelly loam forming on side slopes and ridges. It is a moderately deep, well drained. Bedrock can be found between 20 to 40 inches depth.

The Bohannon soil is described above.

The complex is susceptible to erosion. The Bohannon soil is susceptible to compaction. Ground-based equipment can be used in less sloping areas, but cable yarding is preferred. Low ground pressure equipment should be used in ground-base operations. To reduce compaction it is recommended that ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion; and roads, landings, and skid trails can be ripped after use to improve plant growth.

The 58G-Digger-Bohannon-Umpcoos is located on 60 to 90 percent slopes of side slopes and headwalls, forming from colluvium derived from sandstone. The complex ranges between 200 feet and 3,000 feet above sea level.

The Digger, Bohannon, and Umpcoos soils are described above.

The complex is susceptible to erosion and potential for slope failure (based on steepness). The Bohannon soil is susceptible to compaction. Cable yarding is preferred. To reduce compaction it is recommended that ground-based harvest be restricted to times when the soils are least susceptible to compaction.

It is further suggested that seeding and waterbars be applied to closed roads, the Digger an Umpcoos soils may not respond well to seeding due the exposure of bedrock; care be used in road drainage design to reduce erosion; roads, landings, and skid trails can be ripped after use to improve plant growth; end haul waste material to reduce damage to vegetation and potential for sedimentation; avoid headwall areas in road construction; and, due to slope failure, complete onsite investigations before disturbing soils.

The 59G-Digger-Preacher Complex is located on 60 to 90 percent slope of convex (Digger) and concave (Preacher) side slopes, forming from colluvium derived from sandstone. The complex ranges between 200 feet and 3,000 feet above sea level.

The Digger soil is described above.

The Preacher soil is a deep and well-drained loam forming on the concave side slopes. It is very deep and well drained. Bedrock can be found at depths greater than 60 inches.

The complex is susceptible to erosion and potential for slope failure. The Digger soil is susceptible windthrow as well as limitations by depth to bedrock. The Preacher soil is susceptible to compaction. Cable yarding is preferred. To reduce compaction it is recommended that ground-based harvest be restricted to times when the soils are least susceptible to compaction.

It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion; roads, landings, and skid trails can be ripped after use to improve plant growth; end haul waste material to reduce damage to vegetation and potential for sedimentation; avoid headwall areas in road construction; and, due to slope failure, complete onsite investigations before disturbing soils.

The 60G-Digger-Umpcoos-Rock Outcrop Complex is located on 60 to 90 percent slopes of side slopes and headwalls, forming from colluvium derived from sandstone. The complex ranges between 200 to 3,000 feet above sea level.

The Digger soil, Umpcoos soil, and Rock Outcrops are described above.

The complex is susceptible to erosion. Hazards include slope failures, shallow depth to bedrock, and potential for windthrow. Because of potential for slope failure, onsite investigations may be needed prior to soil disturbance. Headwalls should be avoided when constructing roads. Erosion risk can be reduced by proper maintenance of waterbars, culverts, and seeding of disturbed soils.

The 80F-Fernhaven-Digger Complex is located on 30 to 60 percent slopes of concave side slopes (Fernhaven) and convex side slopes and ridges (Digger), forming from colluvium and residuum from sandstone and siltstone. The complex ranges between 200 to 3,000 feet above sea level.

The Fernhaven soil is a very deep well drained gravelly loam, with moderate permeability. Depth to bedrock is 60 inches or greater.

While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion; and that roads, landings, and skid trails can be ripped after use to improve plant growth. Trees on Digger soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

The 97F-Honeygrove Gravelly Clay Loam is located on 3 to 30 percent slopes of broad ridges and side slopes, forming in residuum and colluvium derived from sandstone, siltstone, and volcanic rock. The soil ranges between 200 to 3,000 feet above sea level. It is a very deep, well-drained gravelly clay loam with a moderately slow permeability. Depth to bedrock is 60 inches or greater.

This soil is susceptible to compaction and erosion and has low soil strength. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion.

The 99E-Honeygrove-Peavine Complex is located on 3 to 30 percent slopes of broad ridges, forming in residuum and colluvium derived from sandstone, siltstone, and volcanic rock. The complex ranges between 200 and 3,000 feet.

The Honeygrove soil is described above.

The Peavine soil consists of moderately deep, well-drained silty clay loam, with a moderately slow permeability. The depth to bedrock is 20 to 40 inches.

The complex is susceptible to compaction and erosion and has low soil strength. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion. Trees on Peavine soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

The 148F-McDuff-Absaquil-Honeygrove Complex is located on 30 to 60 percent slopes of convex side slopes and ridges (McDuff), side slopes and ridges (Absaquil), and concave side slopes (Honeygrove), forming in residuum and colluvium derived from sandstone and siltstone. The complex ranges between 300 and 2,500 feet above sea level.

The McDuff and Honeygrove soils are described above.

The Absaquil soil consists of a deep, well-drained silt loam, with a moderately slow permeability. The depth to bedrock is 40 to 60 inches.

The complex is susceptible to compaction and erosion and has low soil strength. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion. Trees on McDuff soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

The 153D-Meda Loam is located on 2 to 20 percent slopes of alluvial fans and terraces, forming in mixed alluvium. The soil ranges between 20 feet and 1,000 feet above sea level. It is a very deep, well-drained loam with moderate permeability. The depth to bedrock is 60 inches or greater.

The soil is susceptible to compaction and erosion. Conventional logging equipment can be used, but limited when the soil is wet (see Plastic Limits). Low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion.

The 179E, 179F-Orford Gravelly Silt Loam is located on 3 to 30 percent and 30 to 60 percent slopes of ridges and side slopes, forming in residuum and colluvium derived from sandstone and siltstone. The soil ranges between 200 feet and 1,000 feet above sea level. It is a very deep, well-drained gravelly silt loam with moderately slow permeability. The depth to bedrock is 60 inches or greater.

The soil is susceptible to compaction and erosion and has low soil strength. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion.

The 195E, 195G-Preacher Loam is located on 0 to 30 percent and 50 to 75 percent slopes of broad ridges and side slopes, forming in colluvium and residuum derived from sandstone and siltstone. The soil ranges between 200 feet and 3,000 feet above sea level. It is a very deep, well-drained loam with moderate permeability. The depth to bedrock is 60 inches or greater.

The soil is susceptible to compaction and erosion. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion.

The 197E-Preacher-Bohannon Complex is located on 3 to 30 percent slopes of ridges (Preacher and Bohannon), concave side slopes (Preacher), and convex side slopes (Bohannon), forming in colluvium and residuum derived from sandstone and siltstone. The complex ranges between 200 and 3,000 feet above sea level.

The Preacher and Bohannon soils have been described above.

The complex is susceptible to compaction and erosion. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion. Trees on Bohannon soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

The 199G-Preacher-Bohannon-Digger Complex is located on 60 to 90 percent slopes of concave side slopes (Preacher) and convex side slopes (Bohannon and Digger), forming in colluvium derived from sandstone. The complex ranges between 200 feet and 2,200 feet above sea level.

The Preacher, Bohannon, and Digger Soils have been described above.

The complex is susceptible to compaction and erosion. Because of potential for slope failure, onsite investigations may be needed prior to soil disturbance. Headwalls should be avoided when constructing roads. Highlead or other cable yarding logging is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion. Trees on Bohannon and Digger soils commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

The 200F-Preacher-Bohannon-Xanadu Complex is located on 30 to 60 percent slopes of concave side slopes (Preacher and Xanadu), convex side slopes (Bohannon) and ridges (Bohannon), forming in residuum and colluvium derived from sandstone and siltstone. The complex ranges between 200 feet and 3,000 feet above sea level.

The Preacher and Bohannon soils have been described above.

The Xanadu soil consists of a very deep, well-drained gravelly loam, with a moderately slow permeability. The depth to bedrock is 60 inches or greater.

The complex is susceptible to compaction and erosion. The Xanadu soil also has a low soil strength. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion. Trees on Bohannon soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

The 212G-Rock Outcrop-Umpcoos Complex is located on 60 to 110 percent slopes of side slopes and headwalls, forming in colluvium derived from sandstone. The complex ranges between 200 feet and 3,000 feet above sea level.

The Rock Outcrop and Umpcoos Soil are described above.

The complex is susceptible to erosion. Hazards include slope failures, shallow depth to bedrock, and potential for windthrow. Highlead or other cable logging systems are best suited for this complex. Because of potential for slope failure, onsite investigations may be needed prior to soil disturbance. Headwalls should be avoided when constructing roads. Erosion risk can be reduced by proper maintenance of waterbars, culverts, and seeding of disturbed soils.

The 224B-Sibold Fine Sandy Loam is located on 0 to 5 percent slopes of floodplains, forming in mixed alluvium. The fine sandy loam ranges between 100 feet and 2,000 feet above sea level. It is a very deep, somewhat poorly drained fine sandy loam with a moderately slow permeability above its silty clay layer and very slow through the layer. The depth to bedrock is 60 inches or more.

The soil is susceptible to wetness, compaction, flooding, very slow permeability, and a low soil strength. As extrapolated from the Meda Loam and Best Management Practices, conventional logging equipment can be used, but limited when the soil is wet (see Plastic Limits). Low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion.

The 253G-Umpcoos-Rock Outcrop-Damewood complex is located on 60 to 90 percent slopes of side slopes and headwalls, forming in colluvium derived from sandstone. The complex ranges between 200 feet and 2,000 feet above sea level.

The Umpcoos soil, Rock Outcrop, and Damewood soil are explained above.

The complex is susceptible to erosion, slope failure, and shallow bedrock. Cable yarding is preferred. To reduce compaction it is recommended that ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion; roads, landings, and skid trails can be ripped after use to improve plant growth (however, ripping may not be feasible due to bedrock exposure); end haul waste material to reduce damage to vegetation and potential for sedimentation; avoid headwall areas in road construction; and, due to slope failure, complete onsite investigations before disturbing soils. Trees on Umpcoos soil commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

The 267C-Wintley Silt Loam is located on 0 to 12 percent slopes of high terraces, forming in mixed alluvium. The silt loam ranges between 80 feet and 800 feet above sea level. It is a very deep, well drained silt loam with a moderately slow permeability. The depth to bedrock is 60 inches or more.

The soil is susceptible to compaction, erosion, very slow permeability, high shrink/swell potential, and a low soil strength. Conventional logging equipment can be used, but limited when the soil is wet (see Plastic Limits). Low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion.

The 272E, 272F-Xanadu Gravelly Loam is located on 3 to 30 percent and 30 to 60 percent slopes of side slopes and ridges, forming in residuum and colluvium derived from sandstone and siltstone. The soil consists of a very deep, well-drained gravelly loam, with a moderately slow permeability. The depth to bedrock is 60 inches or greater.

The gravelly loam is susceptible to compaction and erosion and has a low soil strength. While wheeled and tracked equipment can be used, cable yarding and low-pressure ground equipment is preferred. To reduce compaction it is recommended that skid trails be laid out in advance and ground-based harvest be restricted to times when the soils are least susceptible to compaction. It is further suggested that seeding and waterbars be applied; care be used in road drainage design to reduce erosion.

2.3 TIMBER PRODUCTION CAPABILITY CLASSIFICATIONS

A review of the Timber Production Capability Classification (TPCC) was made for the project actions. The TPCC was initiated in response to the 1972 Church Subcommittee Report that stated:

> *"…Clear-cutting should not be used as a cutting method on Federal land areas where:*
> *a. Soil, slope or other watershed conditions are fragile and subject to major injury.*
> *b. There is no assurance that the area can be adequately restocked within five years after harvest…" (USDI-BLM, 2004)*

As described in the BLM's Middle Umpqua River Watershed Assessment (USDI-BLM, 2004):

> *"During the 1986/1987 TPCC mapping project, sustainability of timber production was determined in the context of the timber management plan in place at that time, and in the context of the state of the art of applied logging engineering and silviculture practices in 1986. The assumptions used to assess sustainability were management for timber production through repeated clear-cut harvest on 40-year rotations using appropriate logging technology, followed by broadcast burn site preparation, planting, and timely application of treatments to insure seedling survival and growth. Reduction of forest yield was interpreted to occur if the site productivity was expected to drop by one site class as the result of the management regime described above (F. Price, Tioga TPCC Forester in 1986/1987)."*

Appendix Table D–4: Units FGNW Classification

EA Unit	Acreage	Classification
1A	4.46	FGNW
3	13.50	FGNW
4D	2.05	FGNW
6	5.86	FGNW
7	20.85	FGNW
9A	28.52	FGNW
9B	103.32	FGNW
11B	15.38	FGNW
15	7.38	FGNW
16	5.49	FGNW
19	7.25	FGNW
21	262.93	FGNW
22	14.84	FGNW
22A	9.50	FGNW
22B	10.28	FGNW
22C	8.43	FGNW
22D	13.60	FGNW
22E	15.11	FGNW
24	13.54	FGNW
25	13.28	FGNW
28	71.49	FGNW
30	11.53	FGNW
32	35.25	FGNW
33	1.23	FGNW
34	10.07	FGNW
36	2.83	FGNW
56	3.10	FGNW
73	12.10	FGNW
Total:	**723.17**	

A total of 725.31 acres were classified as FGNW, as listed in Appendix Table D–4. The proposed management of these units does not entail 40-year regeneration harvest, but are thinning operations. Therefore, the management practice is less intrusive as those described above; the harvest withdrawal of FGNW would not apply to these units.

The remaining units within the majority of the project (approximately 5,155 acres) are classified as either FGR1 or FGR2, or a combination of both. As stated in the Watershed Assessment (USDI-BLM, 2004):

> *"Lands were classified fragile-restricted (FGR1 and FGR2) if special harvest or restrictive measures (for example, partial log suspension, full log suspension, directional falling, aerial logging, or low impact alternative site preparation) were required to insure long-term sustainable harvest of wood products (USDI 1986)"*

2.4 SOIL COMPACTION

Historical aerial photographs were reviewed for each of the units to determine the amount of pre-existing compaction existing due to historic harvest operations. Select areas were then field verified, with emphasis on areas proposed for road construction. The Coos Bay District Record of Decision and Resource Management Plan (USDI-BLM, 1995) specifies that for ground-based yarding systems,

> *"...a. If tractors or rubber-tired skidders are used for log skidding, skid trails will be designated with the objective of having less than 12 percent of a harvest area affected by compaction. Existing skid roads will be used to the extent practical..."*

Field verification determined compaction widths of the skid trail systems identified in the aerial photographs. The widths ranged from nine feet up to 21 feet. The area of proposed skid trails, assuming a 16-foot width of compaction, was then added to the total of existing compaction. These areas of compaction were then compared with the total unit area, producing an estimate of existing compaction within each unit. Complete compaction analysis of all units is presented in Appendix Table D–2. The ground-based yarding units with greater than 10% final compaction are presented in Appendix Table D–5.

Appendix Table D–5: Ground-Based Units with More than 10% Total Compaction

EA Unit	Compaction Acreage	Unit Acreage	Existing Percentage Compaction (CA/UA) [14]	Photo Date	New Rd (miles) [15]	New Rd. Compaction (acres)	Total (new and existing) compaction Acreage	Total Percent Compaction
45	7.58	79.7	9.50%	1970	0.34	0.49	8.07	10.12%
54	27.89	251.0	11.11%	1965	0.39	0.57	28.46	11.34%
75	9.81	91.2	10.76%	1965	0.24	0.35	10.16	11.14%
42	4.13	18.9	21.89%	1965	0.00	0.00	4.13	21.89%
53	13.77	120.5	11.43%	1965	0.00	0.00	13.77	11.43%

Field review of the units with new road construction indicate that actual total compaction may be less than estimated, as the vast majority of new road construction is located on former compacted road bed. These former roads were incorporated in the existing compaction estimate. While the road itself may be new, the compaction is not. Areas without road construction will add no new compaction. The one unit that exceeds the 12 percent threshold (Unit 42 at 21.89% compaction) has no new compaction.

The Resource Management Plan 12 percent threshold was based on rubber-tired or tracked equipment operating on mineral soil. The newer technology of cut-to-length harvest operations were observed and reviewed in the field. The field review included observation of the tracks and trails, review the amount of slash used on those trails, the amounts of compaction in slash covered areas and non-slash covered areas, and comparison of compaction with the number of passes over an area. These observations are also supported by research that shows that slash covered forwarder trails limit the depth of compaction by forwarders.

If the ground-based harvesting is done correctly, there should be little compaction damage from the harvester-forwarder systems. The main requirements would be that the operators ensure that there is ample slash under the

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[14] Includes estimated renovated roads as proposed from the project manager, review of historic aerial photography for historic road construction and compaction, and field reviews of the project areas.

[15] Based on Forester/Timber Sales Manager's estimated new road compaction width area.

equipment, there should be no exposed mineral soil, to minimize passes to the greatest extent, and to use existing compacted skid roads for main pathways (Cafferata, 1992).

Based on the analysis of the historic, existing, and proposed compaction, as well as review of the harvest systems, total compaction for ground-based harvest systems will not exceed the 12 percent threshold defined in the Resource Management Plan.

2.5 MOISTURE CONTENT RECOMMENDATIONS FOR CUT-TO-LENGTH SYSTEMS

The soils present in the proposed ground-based units were analyzed for compaction impacts. Moisture content of soil is one of many factors in soil compaction and should be used as a "rule of thumb" as opposed to a steadfast regulation. As shown by Cafferata (1992),

> *"Major skid trails will be compacted to some degree regardless of machine type or moisture content. The smallest vehicle capable of doing the required job should be utilized. The least compaction can be expected from light vehicles operating on soils with high soil strength, thick litter layers, high organic matter content, and moisture contents that are drier than the plastic limit."*

Field reviews of previous cut-to-length operations on the District have detected no definable increase in compaction when the number of trips was limited and sufficient slash was placed on the travel surface. Monitoring of a cut-to-length operation conducted in the late spring on BLM land just east of the District showed that 12" of logging slash was effective in preventing compaction of soils even during a relatively high soil moisture condition.

The Resource Management Plan (USDI-BLM, 1995) specifically addresses soil moisture in that

> *"...b. Tractors or rubber tired skidders will be restricted to slopes less than 35 percent and used only during the driest part of the year, typically mid-July to mid-September..."*

The use of plastic limit for soil moisture indicates the soil is at the driest point irrespective of the time of year. Ground-based operations are limited to slopes less than 35 percent. Therefore, the soils that have a slope of 35% or less present on these units are presented in Appendix Table D–6.

The range of soil moisture is 10 to 35 percent, based on the individual soil members. The Fernhaven soil has the lowest soil moisture of 10 percent while the Peavine has a recommended moisture of 35 percent. A total listing of soils in individual units is found in Appendix Table D–1.

To determine the difference between the soils and associated management practices would require detailed field analysis. Even if the soils were differentiated in the field, because of their close association, it would be unlikely to operate within one soil without affecting the other. Soil moisture recommendations are based on the assumption of the use of rubber-tired or track equipment (Johnson *et al*, 2003; USDI-BLM, 1995), operating on exposed mineral soil. These operations included use of cat logging and yarding, common to industry prior to 1995; however, as described above, current harvest technology uses low-ground pressure systems that operate over a slash base. These systems show little or no compaction of the ground, or impact to soil structure.

The stipulation of the ROD RMP states that operations will occur in the driest time of year. The majority of maximum soil moistures is 25%. Only one soil, the Peavine, has a higher value of 35 percent; however, certain individual soils have lower moisture limits. Because of the intermixing of the soils within the units, soils with lower soil moisture recommendations need to be addressed during the time that is less than 25 percent but greater than the moisture limits of the other soil inclusions.

Appendix Table D–6: Soil Plastic Limits

Soil Map Code and Name (Johnson *et al*, 2003)	Depth[16]	Plastic Limit (Maximum Moisture) (Liquid Limit-Plasticity Index)[17]
3E-Absaquil-Honeygrove-McDuff Complex, 3%-30% slope	Absaquil 0”-10”	20%
	Honeygrove 0”-12”	25%
	McDuff 0”-10”	25%
16E, 16F-Bateman Silt Loam, 12%-60% slope	0”-7”	25%
57F-Digger-Bohannon Complex, 30%-60% slope	Digger 0”-28”	30%
	Bohannon 12”-32”	20%
80F-Fernhaven-Digger Complex, 30%-60% slope	Fernhaven 12”-63”	10%
	Digger 0”-28”	30%
97E-Honeygrove Gravelly Clay Loam, 3%-30% slope	0”-12”	25%
99E-Honeygrove-Peavine Complex, 3%-30% slope	Honeygrove 0”-12”	25%
	Peavine 0”-31”	35%
148F-McDuff-Absaquil-Honeygrove Complex, 30%-60% slope	McDuff 0”-10”	25%
	Absaquil 0”-10”	20%
	Honeygrove 0”-12”	25%
153D-Meda Loam, 2%-20% slope	0”-11”, 15”-85”	20%
179E, 179F-Orford Gravelly Silt Loam3%-60% slope	0”-12”	25%
195E-Preacher Loam, 0%-30% slope	Preacher 0”-10”	25%
197E-Preacher-Bohannon-Blachly Complex,3%-30% slope	Preacher 0”-10”	25%
	Bohannon 12”-32”	20%
200F-Preacher-Bohannon-Xanadu Complex, 30%-60% slope	Preacher 0”-10”	25%
	Bohannon 12”-32”	20%
	Xanadu 0”-8”	15%
224B-Sibold Fine Sandy Loam, 0%-5% slope	0”-6”	15%
267C-Wintley Silt Loam, 0%-12% slope	0”-60”	20%
272E, 272F-Xanadu Gravelly Loam, 3%-60% slope	Xanadu 0”-8”	15%

Therefore, it is recommended that no ground-based operations occur with any soil moistures greater than 25 percent without site-specific concurrence of a qualified specialist. While soil moistures range between a maximum and minimum in units shown in Appendix Table D–7, the operation must ensure the use of low-ground pressure equipment upon 100 percent slash covering of the equipment trail. Operations below the minimum soil moisture may include other forms of ground-based operations provided the project area is reviewed by a qualified specialist.

Appendix Table D–7: Units Containing 10% or More of Following Soils

EA Units	Recommended moisture range for low ground-pressure operations on 100% slash cover.	Minimum Moisture Soil
1C, 4C, 4D, 4E, 4F, 7, 41, 41A, 43, 45, 63, 68, 75	10%-25%	Fernhaven
1A, 2A, 2C, 9A, 10, 11A, 18, 19, 26E, 26F, 26G, 30, 31, 35, 36, 40, 46, 47, 58A, 60, 61, 62C, 64, 73A, 74, 74A, 76, 78, 79, 80, 82, 85, 88, 91, 92	15%-25%	Xanadu and Sibold
1B, 3, 4B, 9B, 11B, 12, 26C, 29, 48, 49, 50, 51, 52, 53, 54, 55, 55A, 56, 57, 58, 62A, 62B, 64A 64B, 64C, 65, 66, 66A, 66B, 67, 69, 70, 71, 72A, 72B, 72C, 94	20%-25%	Absaquil, Bohannon, Meda, and Wintley
13, 15, 16E, 16F, 23, 26D, 32, 34, 38, 39, 42, 44, 59, 83, 86, 89, 93, 97E, 99E, 179E, 179F, 195E	25%	Honeygrove, McDuff, Bateman, Orford, and Preacher

16 The depth with the most restrictive plastic limit was used.

17 When the plastic limit results in a range, the most conservative restriction of the range is used.

APPENDIX E.: SNAGS AND COARSE WOODY DEBRIS

MANAGEMENT DIRECTION AND ASSESSMENT RECOMMENDATIONS ON SNAGS FOR DENSITY MANAGEMENT PROJECTS

MANAGEMENT DIRECTION FROM THE COOS BAY DISTRICT RECORD OF DECISION AND RESOURCE MANAGEMENT PLAN (USDI-BLM 1995):

MANAGEMENT ACTIONS/DIRECTION - RIPARIAN RESERVES

Design and implement wildlife habitat restoration and enhancement activities in a manner that contributes to attainment of Aquatic Conservation Strategy objectives (USDI-BLM 1995, pg. 27).

MANAGEMENT ACTIONS/DIRECTION - MATRIX, INCLUDING GENERAL FOREST MANAGEMENT AREA AND CONNECTIVITY/DIVERSITY BLOCKS

Snags

Retain snags within a timber harvest unit at levels sufficient to support species of cavity-nesting birds at 40 percent of potential population levels. Meet the 40 percent minimum throughout the Matrix with per acre requirements met on average areas no larger than 40 acres (USDI-BLM 1995, pg. 27).

Large Down Wood

Provide a renewable supply of large down logs well distributed across the Matrix landscape in a manner that meets the needs of species and provides for ecological functions. Models will be developed for groups of plant associations and stand types that can be used as a baseline for developing prescriptions.

A minimum of 120 linear feet of logs per acre, averaged over the cutting area and reflecting species mix of the unit, will be retained in the cutting area. All logs shall have bark intact, be at least 16 inches in diameter at the large end, and be at least 16 feet in length. Logs shall be distributed throughout the cutting area, and not piled or concentrated in a few areas. Decay class 1 and 2 logs will be credited toward the total. Where this management action/direction cannot be met with existing coarse woody debris, merchantable material will be used to make up the deficit.

In areas of partial harvest, apply the same basic management actions/direction, but they can be modified to reflect the timing of stand development cycles where partial harvest is practiced.

Official Interpretations of Coarse Wood Debris Standards & Guidelines for partial harvests on Matrix lands

By letter dated August 23, 1994, the BLM Oregon Sate Director requested an interpretation of the down wood requirements in the Record of Decision from REO. REO referred the question to Research and Monitoring

Committee (RMC). The RMC response was attached to Instruction Memo No. OR-95-028 for distribution and implementation. Among other things, the response addressed the intent of the paragraph concerning the "areas of partial harvest" as follows:

> *Coarse Woody Debris Standards and Guidelines for partial harvest.*
> *"In areas of partial harvest, the same basic guidelines should be applied, but they should be modified to reflect the timing of the stand development cycles where partial harvest is practiced" (USDA-FS and USDI-BLM 1995, pg. C-40).*
>
> *We recognize that interpretation of these guidelines is difficult for stands which are being thinned or in which density management prescriptions are being implemented, especially when the harvested trees are generally less than 18 to 20 inches DBH. In partial harvest situations, the interdisciplinary team should modify the guidelines based on timing of the stand development and site conditions, including current CWD, availability of logs, and future production of CWD.*
>
> *During partial harvests early in the rotational cycle, it is not necessary to fall the larger dominant or codominant trees to provide logs. These trees will provide opportunities for CWD later in the rotational cycle, plus as these larger trees die from natural mortality, some can be retained to provide snags and future CWD.*

The BLM Oregon State Office issued Information Bulletin No. OR 97-064 to provide addition interpretation of the Standards and Guidelines concerning coarse wood debris on Matrix lands:

> *An accumulation of CWD should be designed into partial harvest prescriptions to provide a natural or biologically desired condition. The timing of stand development cycles providing snags and subsequent CWD from natural suppression and overstocking mortality should be accounted for, the desired conditions estimated, and then the advantages of treatment to improve habitat conditions beyond natural conditions should be assessed. The amounts of CWD should be specifically provided, including felling trees, to meet the desired conditions for late-successional forest related species. CWD trees are not normally required to be felled during harvest, especially trees with broken tops, advanced decay, or other deformities contributing habitat structural features. Leaving naturally dense clumps around snags to provide suppression mortality, scattering "structural" green trees, and allowing individual trees to grow into larger CWD materials should be considered in partial harvest plans. Leaving green trees and felling to provide a source for CWD should be part of the partial harvest prescription. The intent is to provide a source of "coarse wood debris well distributed across the landscape in a manner which meets the needs of species and provides for ecological functions."*

MANAGEMENT ACTIONS/DIRECTION - LATE-SUCCESSIONAL RESERVES

Develop Late-Successional Reserve assessments prior to habitat manipulation (USDI-BLM 1995, pg. 18).

Design projects to improve conditions for fish, wildlife, and watersheds if they provide late-successional habitat benefits or if their effect on late-successional associated species is negligible (USDI-BLM 1995, pg. 20).

Late Successional Reserve Assessment Recommendations (USDI-BLM and USDA-FS 1998)

Snags

The Late-Successional Reserve Assessment contains the following guidance on managing for snags in DM projects:

Density Management - Stand Selection Criteria
. . . *Prescriptions to recruit snags in the future suitable for nesting and roosting may include a preparatory density management entry to maintain or increase either individual or stand growth rates followed by an entry to recruit snags. The second entry would usually occur when the number of trees greater than 16 to 20 inches would allow for recruiting snags without adversely affecting the stand trajectory toward late-seral/old-growth conditions.*

Density Management - Desired Future Conditions
. . . *Stands would be managed to have at least 5 snags per acre greater than 20 inches in diameter and 16 feet tall on north facing slopes and at least 3 snags per acre greater than 20 inches in diameter and 16 feet tall on south facing slopes. To meet this desired future condition, at least 3 snags per acre on north facing slopes and 1 snag per acre on south facing slopes will be retained on completion of any density management treatment.*

Down Wood

The Late-Successional Reserve Assessment (USDI-BLM and USDA-FS 1998), prepared in accordance to the Northwest Forest Plan, contains the following guidance and recommendations on managing coarse wood debris in density management projects:

Desired Future Conditions
. . . *Maintain and/ or restore key structural components (large trees, snags and down logs) to mimic the abundance, condition, and distribution of these structures. . .* (pg. 62)

Treatment Guidelines for Northern Spotted Owl Home Ranges
. . . *When considering treatments of these stands the IDT* [interdisciplinary team] *should maintain . . . CWD.* (pg. 70)

Density Management-Commercial thinning
. . . *Where necessary, active recruitment of snags/ CWD . . . can be done concurrently [with thinning]. . . . Besides shaping the overstory, density management may also focus on creating gaps, setting the stage for understory regeneration, and recruiting snags and CWD.* (pg. 80)

Density Management in Riparian Reserves [that are also inside the Late-Successional Reserve]
The guidelines shown in Table 22 [in the LSR Assessment and reproduced below] *are recommendations for the coarse wood levels that should exist at stand age 80* [for LSR stands that are also inside the Riparian Reserve].

Recommended Range for Retention Levels of CWD (cu. ft./ac.)

Province	***Within the First Site Potential Tree Height from Any Perennial Stream***	***Within the Second Site Potential Tree Height from Any Perennial or First Site Potential of Any Intermittent Stream***
Coast Range	*3,600 - 9,400* [1]	*1,600 - 2,300* [2]

[1] *Ursitti, 1990. Includes all wood 4 inches and 1 meter in length and longer*
[2] *Spies, 1988/1991*

Prior to management activities, coarse wood surveys should be conducted in order to determine current wood levels. It is expected that in some stands, current levels will not meet the above guidance. Where this is the case, addition of wood during the proposed management activity may be necessary. It may not be possible, nor preferable, to meet the full guidance at the time of entry but rather to calculate the needs for the future stand [and prepare a strategy how the desired levels of coarse wood debris will be attained.] (pg. 90-91)

REO Review Exemption Criteria (attached to the Late-Successional Reserve Assessment)
. . . Treatments need to take advantage of opportunities to improve habitat conditions beyond "natural conditions." For example, exceeding "natural levels" of CWD within a 35-year-old stand can substantially improve the utility of theses stands for late-successional forest-related species. Treatments must take advantage of opportunities to optimize habitat for late-successional forest-related species in the short-term. . . .

. . . Within the limits dictated by acceptable fire risk, CWD objectives should be based on research that shows optimum levels of habitat for late successional forest related-species. And not be based simply on measurements within "natural stands." For example, recent research by Casey and Johnson in young stands on the Westside indicates owl prey base increases as CWD (over 4") within Douglas-fir forests increases, up to 8- to 10-percent groundcover south of the town of Drain, Oregon . . .

MIDDLE UMPQUA RIVER WATERSHED[18] ANALYSIS RECOMMENDATIONS (USDI-BLM 2004)

SNAGS

Several of the following snag management recommendations are drawn from the Late-Successional Reserve *Assessment (USDI-BLM; USDA-FS 1998). The intent is to provide consistency between the recommendations for the Riparian Reserve and the Late-Successional Reserve.*

Manage stands to attain snag sizes, numbers, and decay classes that will support 100% of potential population levels of those primary excavator species within the watershed by stand age 100 years.

Use stand growth models, or other techniques, to design density management treatments to put the stands on a trajectory to produce 17-inch dbh snags by age 60 years, and 20-inch dbh and larger snags by age 100 years.

If it is necessary to kill trees to provide snag and down wood habitat, select trees to kill from among the smaller two-thirds of the trees in the stand. Killing trees from among the larger third of the trees in the stand will delay attainment of other late-successional attributes and would select against the trees that are best adapted to the site.

[18] The Middle Umpqua River Watershed was renamed the Umpqua River-Sawyer Rapids Watershed shortly after the completion of the watershed analysis. The watershed was renamed as the result of standardization of 5th field watershed naming protocols.

Appendix Table E–1: The Minimum Sizes and Numbers of Snags that Will Support 100% of Potential Populations of Primary Excavator Species Occurring in the Project Area

	Snag outside bark DBH class (inches)	*Number of Snags/ 100 acres by decay class*		*Total snags/ 100 acres*	*Total snags/ 40 acres*	*Total snags/ 1 acre*
		Hard snags (decay classes 2-3)	*Soft snags (decay classes 4-5)*			
Number of snags needed to support a 100% population	*11+*	*8*	*8*	*16*	*6.4*	*0.2*
	15+	*237*	*0*	*237*	*94.8*	*2.4*
	17+	*100*	*24*	*124*	*49.6*	*1.2*
	25+	*6*	*0*	*6*	*2.4*	*0.1*
	Totals:	***351***	***32***	***383***	***153.2***	***3.8***

Appendix Table E–1 *shows the minimum sized snags that the primary excavator species can use. The primary excavator species prefer to use larger snags when available (20-inch dbh minimum, at least 30-inch dbh average). Therefore, manage Riparian Reserve stands to provide 3.8 snags per acre greater than 20-inches dbh by age 100 years, where it is practical to do so without delaying attainment of other late-successional habitat attributes or preventing attainment of ACS objectives in the long-term.*

On site-by-site bases, ID teams may defer attaining snag levels supportive of 100% of potential population levels if the ID team finds that attaining the snag recommendations would delay attainment of scarce late-successional habitat attributes, or would prevent the attainment of ACS objectives in the long-term.

ID teams may defer delay killing trees to attain target snag levels if post-treatment mortality following a density management treatment is predicted.

DOWN WOOD

Manage stands so that when the stands are 80 years old, they will have the potential to attain the following levels of down wood. These recommendations for down wood attainment are based on Spies and Franklin (1991), and Spies et al. (1988): and Ursitti (1990):

- First site potential tree height – from 3,600 to 9,400 cubic feet/ acre (includes all wood 4-inches in diameter and 1-meter long and larger).
- Second site potential tree height– from 1,600 two 2,300 cubic feet/ acre (includes all wood greater than 4-inches on the large end).
- At least 255 cubic feet of decay class I or II[19]. Where possible and consistent with obtaining other late-successional stand characteristics, obtain decay class I and II amounts comparable with the upper end of the range observed in old growth (385 cubic feet/ acre.) These higher levels would enhance habitats for large woody debris associated species and would compensate for those areas where large woody debris amounts are near or below the natural variability.

Meeting these levels of down wood may be unobtainable or in some cases undesirable in younger stands. However, density management treatment designs should put stands on a trajectory to attain these levels by stand age 80 years, or provide for supplementing down wood levels through future projects.

[19] The Coos Bay District Resource Management Plan direction for coarse wood debris on GFMA land is retain at least 120 lineal feet of decay class I & II logs that are at least 16"X16'. A 16' long log, 14" small end & 16" large end, contains 19.7 cubic feet. If we obtain the minimum standard of 120 lineal feet of logs that are 16'X16" (7.5 16-ft logs/ acre), we will have 147.75 cubic feet/ acre. Spies & Franklin (1991) show the following levels of decay class II material 4" diameter & larger by age class: 13 to 64 cubic feet in 40 to 80-yr old stands; 56 to 255 cubic feet in 80- to 195-year -old stands and 137 to 385 cubic feet in older stands.

SNAG DYNAMIC AND USE

Appendix Table E–2 lists the snag nesting habitat minimum requirements (Brown 1985 and Marcot 1992) for the species of primary excavator birds found in the Umpqua River-Sawyer Rapids Watershed:

Appendix Table E–2: Snag Requirements for Primary Excavators Found in the Umpqua River-Sawyer Rapids Watershed

Bird Species	Minimum Snag DBH (with bark) usable by the species	Snag Size & Decay Class usable by the bird species for nesting habitat	
		Hard Snags (decay classes 2-3)	Soft Snags (decay classes 4-5)
Downy woodpecker	11+	X	X
Red-breasted sapsucker	15+	X	
Hairy woodpecker	15+	X	
Northern flicker	17+	X	X
Red-breasted nuthatch	17+	X	
Pileated woodpecker	25+	X	

Appendix Table E–3: The Number of Snags Needed to Support 100%, Population Levels of Primary Excavators in a Forested Habitat in the Umpqua River-Sawyer Rapids Watershed (from the Marcot 1992)

	Snag outside bark DBH class (inches)	Number of Snags/ 100 acres by decay class		Total snags/ 100 acres	Total snags/ 1 acre
		Hard snags (decay classes 2-3)	Soft snags (decay classes 4-5)		
Number of snags needed to support a 100% population	11+	8	8	16	0.16
	15+	237	0	237	2.37
	17+	100	24	124	1.24
	25+	6	0	6	0.06
	Totals:	**351**	**32**	**383**	**3.83**

The data in Appendix Table E–3 are from the Marcot model (1992) and show the number of snags by size and decay class to meet the 100% cavity nesting habitat needs for the primary excavator species in the Umpqua River-Sawyer Rapids Watershed. As shown in the Appendix Table E–2 and Appendix Table E–3, the primary excavator birds have minimum snag diameter and state of decay requirements that must be met in addition to numbers of snags on the landscape. For example, retaining snags in decay class 4 or 5 will not provide the nesting habitat required by most of the species. In addition, a snag's decay class is not a static condition. As shown in Appendix Table E–4, and Appendix Table E–5, leaving hard snags without making provisions for additional snag recruitment, will not necessarily provide snag habitat over the long-term. This is because the hard snags smaller than 18.8-inches dbh will transition to soft snags within 30 years. This indicates that a second entry would be needed for snag creation, and that snags in the larger diameter classes will provide habitat for a longer period.

Appendix Table E–4: Estimated Age When Douglas-fir Snags Reach a Deterioration State

snag size	decay class1	decay class2	decay class 3	decay class 4	decay class 5
3.6-7.2 inch dbh	0-4	5-8	9-16	17	fallen
7.6-18.8 inch dbh	0-5	6-13	14-29	30-60	>60
>18.8 inch dbh	0-6	7-18	19-50	51-125	>125

Appendix Table E–5 shows the stand age, for two example stands, when the average new mortality meets or exceeds the minimum snag diameter used by a range of primary excavator species for a range of sites and management conditions. This suggests 50-year-old and younger second growth stands will not reliably provide hard snags except on the better sites and in thinned stands. The dbh for hard snags in these young stands will be 11 inches or less and thus will only provide suitable nesting habitat for the smaller excavator species (USDI-BLM 2004).

Appendix Table E–5: Stand Age When the Average New Mortality Meets or Exceeds the Minimum Snag Diameter Used by a Range of Primary Excavator Species

Snag dbh	SI 115, 291 trees/ ac at age 32			SI 127, 259 trees/ac at age 31		
	unthinned stand	Stand thinned to 120 trees/ ac at age 40-yrs	Stand thinned to 60 trees/ ac at age 40-yrs	unthinned stand	Stand thinned to 120 trees/ ac at age 40-yrs	Stand thinned to 60 trees/ ac at age 40-yrs
11-inches +	60-yr old	50-yr old	50-yr old	40-yr old	40-yr old	40-yr old
15-inches +	100-yr old	60-yr old	50-yr old	70-yr old	50-yr old	50-yr old
17-inches +	120-yr old	70-yr old	50-yr old	80-yr old	50-yr old	50-yr old
25-inches +	>200-yr old	>200-yr old	not determined	200-yr old	170-yr old	90-yr old

Lundquist and Mariani (1991) observed that cavity-nesting birds show a disproportional preference for large (>20-inch dbh) snags. Lundquist and Mariani concur with several authors cited in their paper that argue for snag management based on mean nest-tree diameters instead of minimum diameter guidelines. Based on their study, Lundquist and Mariani recommend managing for snags of at least at 30-inches. Lundquist and Mariani also observed cavity-nesting species had a strong preference for decay class II and III snags, and in western Washington, preferred Douglas-fir, hemlock and western hemlock snags to snags of other tree species.

COARSE WOOD DEBRIS AMOUNTS FOUND IN NATURAL STANDS

Appendix Table E–6: Down Woody Debris Volumes in Natural Young, Mature, and Old-Growth Douglas-fir Forests in Oregon and Washington

	young stands: 40 to 80 years old	mature stands: 80 to 195 years old	old-growth stands: >195 years old
Decay class 2: average cubic meters/ hectare	2.0	8.3	16
Decay class 2: 95% confidence limits of the mean expressed in cubic meters/ hectare	0.9 to 4.5	3.9 to 17.8	9.6 to 26.9
Decay class 2: average cubic feet/ acre	28.6	118.7	228.8
Decay class 2: 95% confidence limits of the mean expressed in cubic feet/ acre	12.9 to 64.4	55.8 to 254.5	137.3 to 384.7
Log volume: average cubic meters/ hectare	223	124	266
Log volume: 95% confidence limits of the mean expressed in cubic meters/ hectare	163 to 305	93 to 165	219 to 324
Log volume: average cubic feet/ acre	3,188.9	1,773.2	3,803.8
Log volume: 95% confidence limits of the mean expressed in cubic feet/ acre	2,330.9 to 4,361.5	1,329.9 to 2,359.5	3,131.7 to 4,633.2

Source: Spies; Franklin 1991
Notes: The volumes include all woody debris 4 inches in diameter and larger as measured on the large end.
Conversion factor: 1cubic meter/ hectare = 35.3 cubic feet /2.471 acres or 14.3 cubic feet / acre

ESTIMATING CUBIC FOOT VOLUMES

Appendix Table E–7 displays cubic foot volume to a 4-inch top for Douglas-fir trees and may be useful to estimate cubic foot volume recruitment based on cutting and leaving trees of certain diameter classes. Cutting four trees per acre would provide 255 cubic feet of decay class I coarse wood debris provided the cut trees have the heights and diameters corresponding to the light-gray cells. Cutting three trees per acre would provide 255 cubic feet of decay class I coarse wood debris provided the cut trees have the heights and diameters corresponding to the medium-gray cells.

Appendix Table E–7: Tree Volume to a 4-Inch Top, Excluding a 1.5-Foot Stump

DBH class	Total tree height in feet							
	50	**60**	**70**	**80**	**90**	**100**	**110**	**120**
15	21.5	26.4	31.3	36.2	41.1	45.9	50.7	55.4
16	--	29.6	35.1	40.6	46.1	51.5	56.8	62.1
17	--	32.9	39.1	45.2	51.2	57.3	63.2	69.2
18	--	36.4	43.2	49.9	56.6	63.3	69.9	76.5
19	--	47.4	54.8	62.2	69.5	76.8	84.0	91.1
20	--	51.8	59.9	67.9	76.0	83.9	91.8	99.6

Source: Hartman *et al.*, no date

- Light grey shaded blocks indicates cutting and leaving 4 trees/ ac of these sizes will produce at minimum 255 cubic feet of decay class I coarse wood debris that is greater than 4-inches in diameter. (255/4 = 63.75)
- Medium gray shaded blocks indicates cutting and leaving 3 trees/ ac of these sizes will produce at minimum 255 cubic feet of decay class I coarse wood debris that is greater than 4-inches in diameter. (255/3 = 85)

The accepted method of estimating cubic foot volume of a tree is to sum the estimate volumes for each log in the tree. Attempts to derive a formula for estimating cubic foot volume of an entire tree have not been satisfactory. However as a rule-of-thumb, one half the dbh squared [$(dbh/2)^2$] gives a rough estimate of the cubic foot volume in a second growth Douglas-fir (Dilworth 1976 pg. 173) and may be useful for estimating cubic foot of coarse wood debris in the field..

Appendix Table E–8: Snag Summary

Umpqua River-Sawyer Rapids Snag Summary

							Pre-Treatment Snags Per Acre														LSR:		GFMA:	All LUA:	
EA Unit	Stand Birth Date	Unit Prescription	LUA	Acres	Pre-DBH*	Post-DBH*	Hard & Soft 3 to 10 inches	Hard 11 to 14 inches	Hard 15 to 16 inches	Soft 15 to 16 inches	Hard 17 to 23 inches	Hard 24+ inches	Soft 24+ inches	All Snags 3-inch+	All Hard Snags 11-inch +	All Soft Snags 11-inch +	Pre-TPA*	Post-TPA*	Third of post TPA	Diameter class for 2/3 point	Total snag needs at 2/acre, 16"-18"	Total snag needs at 4/acre, 18-inch+	Total snag needs at 1.5/acre, 16-inch+	Total CWD needs at 1/acre, 18-inch+	Comments
1A		130 BA, 82tpa	LSR	40.6	11.9	17	52.1	0.0	0.0	0.0	0.0	0.0	0.4	52.5	0.0	**0.4**	244	82	27	17	81.2				24 tpa BM, 10tpa RA
1A	1958	130 BA, 82 tpa	LSR	228.7			52.1	0.0	0.0	0.0	0.0	0.0	0.4	52.5	0.0	**0.4**			0		457.4				
1B	1953	120 BA, 72 tpa	LSR	114	12.6	17.4	43.7	0.0	0.0	0.0	0.0	0.0	0.6	44.3	0.0	**0.6**	243	72	24	17	228				8 tpa RA
1C	1953	130 BA, 85 tpa	LSR	73.8	11.4	16.7	117.1	0.0	0.0	0.0	0.0	0.0	0.0	117.1	0.0	0.0	331	85	28	17	147.6				15 tpa BM
1C	1954	24 X 24 75 tpa,	GFMA	6.1			117.1	0.0	0.0	0.0	0.0	0.0	0.0	117.1	0.0	0.0			0						
1C	1958	130 BA, 85 tpa	LSR	8.4			117.1	0.0	0.0	0.0	0.0	0.0	0.0	117.1	0.0	0.0			0	17	16.8				
2A	1958	Alder Conversion	LSR	5.9	10	19.5	10.3	**6.9**	0.0	0.0	0.0	0.0	0.0	17.2	6.9	0.0	387	18	AC: N/A	AC: N/A					21 tpa BM
2C	1958	Alder Conversion	LSR	32.3	10	19.5	10.3	**6.9**	0.0	0.0	0.0	0.0	0.0	17.2	6.9	0.0	387	18	AC: N/A	AC: N/A					21 tpa BM
3	1958	120 BA, 77 tpa, 1/4ac gaps	LSR	244.1	10	16.9	43.4	0.0	0.0	0.0	0.0	0.0	0.0	43.4	0.0	0.0	256	77	26	16	488.2				2 tpa CQ, 4tpa RA, 3 gaps south 1/3 north aspect, 5 gaps along main ridge
4A	1957	Alder Conversion	LSR	4	9.3	15.3	26.1	0.0	0.0	0.0	0.0	0.0	0.0	26.1	0.0	0.0	438	24	AC: N/A	AC: N/A					Leave BLM >9", single stem < 9", leave minor species
4B	1957	Alder Conversion	LSR	5.6	9.3	15.3	26.1	0.0	0.0	0.0	0.0	0.0	0.0	26.1	0.0	0.0	438	24	AC: N/A	AC: N/A					same as above
4C	1957	Alder Conversion	LSR	1.2	9.3	15.3	26.1	0.0	0.0	0.0	0.0	0.0	0.0	26.1	0.0	0.0	438	24	AC: N/A	AC: N/A					same as above
4D	1957	Alder Conversion	LSR	39.2	9.3	15.3	26.1	0.0	0.0	0.0	0.0	0.0	0.0	26.1	0.0	0.0	438	24	AC: N/A	AC: N/A					same as above
4E	1957	Alder Conversion	LSR	10.6	9.3	15.3	26.1	0.0	0.0	0.0	0.0	0.0	0.0	26.1	0.0	0.0	438	24	AC: N/A	AC: N/A					same as above
4F	1954	Alder Conversion	GFMA	10.4	9.3	15.3	26.1	0.0	0.0	0.0	0.0	0.0	0.0	26.1	0.0	0.0	438	24	AC: N/A	AC: N/A					same as above
4F	1954	Alder Conversion	LSR	4.9	9.3	15.3	26.1	0.0	0.0	0.0	0.0	0.0	0.0	26.1	0.0	0.0	438	24	AC: N/A	AC: N/A					same as above
5	1953	>=11" DiameterLeave	LSR	23.4	7.5	13.7	21.4	0.0	0.0	0.0	0.0	0.0	0.0	21.4	0.0	0.0	535	59	20	12					34 tpa RA, possible precommercial thinning 150 tpa
6	1957	24 X 24 75 tpa,	LSR	41.6	No Exams									0.0	0.0	0.0			0						
6A	1958	Alder Conversion	LSR	13.1	No Exams									0.0	0.0	0.0			AC: N/A	AC: N/A					
7	1957	55 tpa, 100BA	LSR	55.8	12.9	17.7	28.7	0.0	0.0	0.0	0.0	0.0	0.0	28.7	0.0	0.0	223	57	19	19		223.2		55.8	5 tpa RA
8	1954	24 X 24 75 tpa,	LSR	18.5	No Exams									0.0	0.0	0.0			0						
9A	1954	80 tpa, 135 BA, RD=32	GFMA	72.4	8.8	17.6	34.6	0.0	0.0	0.0	0.0	0.0	0.0	34.6	0.0	0.0	289	79	26	16			108.6		49 tpa BM, 45 tpa RA
9B	1953	120 BA, 80 tpa, RD=29	GFMA	177.1	11.7	16.6	20.8	0.0	0.0	0.0	0.0	0.0	0.0	20.8	0.0	0.0	228	79	26	18			265.65	177.1	11 BM, 9 CQ
10	1957	120 BA, 80 tpa, RD=30	GFMA	129.1	12.3	16.9	41.6	0.0	0.0	0.0	0.0	0.0	0.0	41.6	0.0	0.0	231	79	26	16			193.65		
11A	1954	120 BA, 80 tpa, RD=30	GFMA	104.7	11.5	16	27.6	0.0	**2.8**	0.0	**2.0**	0.0	0.0	32.4	4.8	0.0	270	86	29	15					
11B	1959	135 BA, 70 tpa, RD=32	GFMA	162.3	13.4	18.9	41.4	0.0	0.0	0.0	0.0	0.0	0.0	41.4	0.0	0.0	182	70	23	18			243.45	162.3	51 tpa BM, 21 tpa CQ, 2 tpa RA
12	1954	23 X 23, 80 tpa	GFMA	32.6	No Exams									0.0	0.0	0.0			0						similar to 11A & 11B
13	1956	125 BA, 75 tpa, RD=30	GFMA	163.1	13.1	17.2	4.9	0.0	0.0	0.0	0.0	0.0	0.1	5.0	0.0	0.1	175	77	26	16			244.65		1 tpa BM, 1 tpa RA
14	1956	Alder Conversion	GFMA	23.4	10.7	19.3	33.0	0.0	0.0	0.0	0.0	0.0	0.4	33.4	0.0	**0.4**	94	19	AC: N/A	AC: N/A					2 tpa GF, 20 tpa WH, 45 tpa BM
15	1960	110 BA, 80 tpa, RD=28	GFMA	37.3	9.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	401	82	27	15					95 tpa BM
18	1956	>=16" Diameter Leave X 35'	LSR	45.6	15.7	19.9	29.6	0.0	0.0	0.0	**5.1**	0.0	1.8	36.5	5.1	**1.8**	125	65	22	17	91.2				14 tpa BM, spacing override X 35'
19	1956	140 BA, 78 tpa,	LSR	59.1	11.8	18.2	43.3	0.0	0.0	0.0	0.0	0.0	0.0	43.3	0.0	0.0	278	70	23	18		236.4		59.1	30 tpa BM West side
19	1966	135 BA, 70tpa,	LSR	54.1	11.8	18.8	43.3	0.0	0.0	0.0	0.0	0.0	0.0	43.3	0.0	0.0	278	63	21	19		216.4		54.1	30 tpa BM East side
21	1958	25X25 60-70 tpa	CON	316.7	No Stand Exams									0.0	0.0	0.0		60-70	20						No precommercial thinning -500+ tpa
22	1958	25X25 60-70 tpa	CON	14.8	No Stand Exams									0.0	0.0	0.0		60-70	20						No precommercial thinning -500+ tpa
22A-E	1958	25X25 60-70 tpa	CON	57.1	No Stand Exams									0.0	0.0	0.0		60-70	20						No precommercial thinning -500+ tpa
23	1958	23X23 80 tpa	CON	22.2	No Stand Exams									0.0	0.0	0.0		80	27						No precommercial thinning -500+ tpa
24	1958	25X25 60-70 tpa	CON	100.7	No Stand Exams									0.0	0.0	0.0		60-70	20						No precommercial thinning -500+ tpa
25	1958	90 BA, 80 tpa, RD=27	GFMA	145.2	10.4	14.2	16.0	0.0	0.0	0.0	0.0	0.0	0.1	16.1	0.0	0.1	248	80	27	14					2 tpa BM, 15 tpa RA
26A-B	1959	105 BA, 70 tpa, RD=26	GFMA	88.8	8.1	16.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	468	70	23						
26C-D	1959	80 BA, 70 tpa, RD=22	GFMA	77.4	8.2	14.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	490	70	23						
26E-G	1966	80 BA, 70 tpa, RD=22	GFMA	64.3	No Exams									0.0	0.0	0.0		70	23						similar to 26A & 26C
27	1971	25X25 60-70 tpa	GFMA	57.3	No Exams									0.0	0.0	0.0		70	23						Thin through the Alder
28	1958, 1960	25X25 60-70 tpa	GFMA	102.1	No Exams									0.0	0.0	0.0		70	23						Thin through the Alder
29	1966	105 BA, 80 tpa, RD=27	GFMA	50.5	9.8	15.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	281	80	27						
30	1958	112 BA, 70 tpa,1/4 acre gaps	LSR	168.2	12.1	17.2	46.9	0.0	0.0	0.0	0.0	0.0	0.0	46.9	0.0	0.0	218	69	23	15					6-1/4 acre gaps on north aspects
31	1959	140 BA, 70 tpa,	LSR	150	14	19.7								0.0	0.0	0.0	218	69	23						
32	1955	>=12" Diameter Leave X 35'	LSR	179.5	7.1	15.3	56.5	0.0	0.0	0.0	0.0	0.0	0.0	56.5	0.0	0.0	740	65	22	13					80-90 BA
33	1966	24 X 24 75 tpa,	LSR	47.6	No Exams									0.0	0.0	0.0		75	25						
34	1966	24 X 24 75 tpa,	LSR	127.8	No Exams									0.0	0.0	0.0		75	25						
34A	1970	24 X 24 75 tpa,	LSR	16.1	No Exams									0.0	0.0	0.0		75	25						
35	1953	138 BA, 80 tpa,	LSR	59.3	10.6	17.9								0.0	0.0	0.0	396	79	26						Area between 35 & 36 out

EA Unit	Stand Birth Date	Unit Prescription	LUA	Acres	Pre-DBH*	Post-DBH*	Hard & Soft 3 to 10 inches	Hard 11 to 14 inches	Hard 15 to 16 inches	Soft 15 to 16 inches	Hard 17 to 23 inches	Hard 24+ inches	Soft 24+ inches	All Snags 3-inch+	All Hard Snags 11-inch +	All Soft Snags 11-inch +	Pre-TPA*	Post-TPA*	Third of post TPA	Diameter class for 2/3 point	Total snag needs at 2/acre, 16" 18"	Total snag needs at 4/acre, 18-inch+	Total snag needs at 1.5/acre, 16-inch+	Total CWD needs at 1/acre, 18-inch+	Comments
36	1960	120 BA, 75 tpa,	LSR	16.1	12	16.9	1.3	0.0	0.0	0.0	0.0	**0.1**	0.0	1.4	0.1	0.0	216	75	25	16	32.2				
36	1967	120 BA, 75 tpa,	LSR	184.7	12	16.9	1.3	0.0	0.0	0.0	0.0	**0.1**	0.0	1.4	0.1	0.0	216	75	25	16	369.4				
37	1960	24 X 24 75 tpa,	LSR	103.6	No Exams									0.0	0.0	0.0		75	25						
38	1960	100 BA, 80 tpa, linear gaps	LSR	35.6	10.7	15								0.0	0.0	0.0	270	79	26						4-50'X250' SW linear gaps, underplant WRC
39	1940	>=19" Diameter Leave X 50'	LSR	19.7	17.7	24								0.0	0.0	0.0	173	59	20						underplant WRC
40	1930	>=19" Diameter Leave X 50'	LSR	36.3	No Exams									0.0	0.0	0.0		75	25						similar to unit 39, underplant WRC
41& 41A	1961	130 BA, 68 tpa	LSR	35.5	12.7	19.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	224	68	23						30 TPA GC
42	1962	120 BA, 80 tpa,	LSR	18.9	12.9	17	0.0	**7.9**	2.0	0.0	0.0	0.0	0.0	9.9	9.9	0.0	211	69	23	15					
43	1962	125 BA, 70 tpa, 1/4 acre gaps	LSR	39	13	18.1	39.8	0.0	0.0	0.0	0.0	0.0	0.8	40.6	0.0	**0.8**	203	69	23	17	78				3-1/4 acre gaps on lower slopes north aspect
44	1961	>=19" Diameter Leave	LSR	14.2	17.2	22.6								0.0	0.0	0.0	97	47	16						
45	1969	80 BA, 50 tpa	LSR	79.7	10.4	16.9	6.5	0.0	0.0	0.0	0.0	0.0	0.0	6.5	0.0	0.0	285	50	17	15					Scattered larger trees
46	1960	105 BA, 70 tpa,	LSR	298.2	11.7	16.6	28.8	0.0	0.0	0.0	0.0	0.0	0.0	28.8	0.0	0.0	228	67	22	16	596.4				5 tpa BM, 3 tpa RA
46	1960	>=17" Diameter Leave X 50'	LSR	58.1	13.1	19.8	28.8	0.0	0.0	0.0	0.0	0.0	0.0	28.8	0.0	0.0	181	40	13	18	116.2			58.1	Open grown, 68 tpa BM
46	1967	120 BA, 90 tpa, RD=30	GFMA	46.2	11.7	15.3	28.8	0.0	0.0	0.0	0.0	0.0	0.0	28.8	0.0	0.0	228	90	30	16			69.3		5 tpa BM, 3 tpa RA
47	1968	105 BA, 71 tpa	LSR	47.6	11.4	16.4	5.1	0.0	2.3	0.0	0.0	0.0	0.0	7.4	2.3	0.0	242	71	24	16	95.2				3 tpa BM
48	1959	140 BA, 80 tpa, RD=33	GFMA	12.6	13.5	17.9	19.9	0.0	0.0	0.0	0.0	0.0	0.0	19.9	0.0	0.0	181	79	26	16			18.9		29 tpa BM, adjacent to Arsenaults
48	1959	140 BA, 80 tpa, RD=33	GFMA	133.7	13.5	17.9	19.9	0.0	0.0	0.0	0.0	0.0	0.0	19.9	0.0	0.0	181	79	26	16			200.55		29 tpa BM
49	1968	150 BA, 80 tpa, RD=30	GFMA	56.6	12.3	16.7	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	**1.0**	239	79	26	16			84.9		
50	1960	145 BA, 75 tpa, RD=33	GFMA	109.5	13.6	18.6	27.7	0.0	0.0	0.0	0.0	0.0	2.1	29.8	0.0	**2.1**	204	76	25	18			164.25	109.5	18 tpa BM, 3 tpa RA
51	1971	24 X 24, 75 tpa	CON	34.1	No Exams									0.0	0.0	0.0			0						similar to 52
52	1967	100 BA, 85 tpa, RD=26	CON	217.2	10.5	14.5	2.5	**0.8**	0.0	0.0	0.3	**0.1**	0.5	4.2	1.2	**0.5**	248	85	28	15					36 tpa BM, 12 tpa RA
53	1957	135 BA, 75 tpa, RD=32	CON	113.8	13.6	17.9	41.4	0.0	0.0	0.0	0.0	0.0	0.0	41.4	0.0	0.0	175	77	26	16			170.7		6 tpa BM, 3 tpa RA
53	1957	135 BA, 75 tpa, RD=32	GFMA	6.7	13.6	17.9	41.4	0.0	0.0	0.0	0.0	0.0	0.0	41.4	0.0	0.0	175	77	26	16			10.05		6 tpa BM, 3 tpa RA
54	1962	120 BA, 75 tpa, RD=30	GFMA	237.4	10.8	16.4	23.3	0.0	0.0	0.0	0.0	**0.2**	0.0	23.5	0.2	0.0	290	78	26	15					1 tpa BM, 16 tpa RA
54	1968	120 BA, 75 tpa, RD=30	CON	13.7	10.8	16.4	23.3	0.0	0.0	0.0	0.0	**0.2**	0.0	23.5	0.2	0.0	290	78	26	15					1 tpa BM, 16 tpa RA
55	1959	120 BA, 80 tpa, RD=30	GFMA	49.3	11.4	16.8	9.6	0.0	0.0	2.7	0.0	0.0	1.0	13.3	0.0	**3.7**	251	79	26	16			73.95		21 tpa RA
55a	1959	Alder Conversion	GFMA	3.1	15.7	0								0.0	0.0	0.0	106	0	AC: N/A	AC: N/A					111 tpa DF 7 & 8" suppressed
56	1953	115 BA, 86tpa, RD=29	GFMA	93.7	11.6	15.2	23.8	**0.3**	0.0	0.0	0.0	**0.1**	0.4	24.6	0.4	**0.4**	223	86	29	14					5 tpa BM, 20 tpa RA, 3 tpa CQ
56	1959	115 BA, 86tpa, RD=29	GFMA	393.4	11.6	15.2	23.8	**0.3**	0.0	0.0	0.0	**0.1**	0.4	24.6	0.4	**0.4**	223	86	29	14					5 tpa BM, 20 tpa RA, 3 tpa CQ
57	1920	125 BA, 40 tpa,	GFMA	68.1	18.1	24	0.0	**10.2**	0.0	0.0	**3.8**	**2.1**	0.3	16.4	**16.1**	**0.3**	107	39	13						mixed stand
58	1953	120 BA, 75 tpa, RD=31	GFMA	247.4	11.6	16.6	16.1	**1.9**	0.0	0.0	0.0	0.0	0.9	18.9	1.9	**0.9**	271	75	25	18			371.1	247.4	12 tpa BM, 34 tpa RA
58A	1959	24 X 24, 75 tpa	GFMA	244.7	No Exams									0.0	0.0	0.0		75	25						similar to 53
59	1953	120 BA, 75 tpa, RD=31	GFMA	52.3	11.6	16.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	271	75	25	15					12 tpa BM, 34 tpa RA
60	1960	130 BA, 70 tpa, RD=31	GFMA	215.3	13.6	16.1	0.0	**2.7**	0.0	0.0	0.0	0.0	0.0	2.7	2.7	0.0	144	73	24	16			322.95		8 tpa BM, 2 tpa CQ, 2 tpa MA
61	1960	130 BA, 70 tpa, RD=31	GFMA	34	13.6	16.1								0.0	0.0	0.0	144	73	24						8 tpa BM, 2 tpa CQ, 2 tpa MA
62A-C	1972	23 x 23 80 tpa	GFMA	38.1	No Exams									0.0	0.0	0.0		80	27						
63	1960	140 BA, 66 tpa,	GFMA	64.3	14.8	19.5	10.5	**3.0**	0.0	0.0	0.0	0.0	0.0	13.5	3.0	0.0	173	66	22	18			96.45	64.3	20 tpa MA
63	1977	140 BA, 66 tpa,	GFMA	19.6	14.8	19.5	10.5	**3.0**	0.0	0.0	0.0	0.0	0.0	13.5	3.0	0.0	173	66	22	18			29.4	19.6	20 tpa MA
64	1968	110 BA, 80 tpa, RD=29	GFMA	35	11.9	15.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	220	84	28	14			52.5		
64A-C	1975	23 x 23 80 tpa	GFMA	72.7	No Exams									0.0	0.0	0.0		80	27						
65	1968	130 BA, 70 tpa, RD=30	LSR	26.2	11.8	18.6	10.2	0.0	0.0	0.0	0.0	0.0	0.0	10.2	0.0	0.0	318	68	23						
65	1969	130 BA, 70 tpa, RD=30	GFMA	80.9	11.8	18.6	10.2	0.0	0.0	0.0	0.0	0.0	0.0	10.2	0.0	0.0	318	68	23						
66	1970	100 BA, 100 tpa,	LSR	38.5	9	13.4	7.6	0.0	0.0	0.0	0.0	0.0	0.0	7.6	0.0	0.0	375	103	34	12					51 tpa RA, drop and pre-commercially thin
66A	1976	27 X 27 60 tpa, 1/4 acre gaps	LSR	23.7	No Exams									0.0	0.0	0.0		70	23						3 1/4 acre gaps
66B	1970	27 X 27 60 tpa, 1/4 acre gaps	LSR	25.2	No Exams									0.0	0.0	0.0		70	23						4 1/4 acre gaps
67	1969	>=14" Diameter Leave X 50'	LSR	59	12.1	16.3	14.1	0.0	0.0	0.0	0.0	0.0	0.0	14.1	0.0	0.0	207	65	22	14					8 tpa RA
68	1950	120 BA, 65 tpa,	LSR	33.6	13.5	18.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	178	66	22	18		134.4		33.6	7 tpa GC, 17 tpa RA
69	1950	25 X 25, 70 tpa	LSR	325.4			27.7	**0.6**	0.0	0.0	0.4	0.0	0.0	28.7	1.0	0.0			0						
69	1960	25 X 25, 70 tpa	LSR	4.2			10.7	0.0	0.0	0.0	0.0	0.0	0.0	10.7	0.0	0.0			0						
70	1971	23 X 23 80 tpa	LSR	26.2	No Exam									0.0	0.0	0.0		80	27						
71	1971	120 BA, 80 tpa, 1/4 acre gaps	LSR	72.9	10.8	16.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	332	83	28	13					11 tpa BM, 5 1/4 acre gaps on north aspects
72A	1973	23 X 23 80 tpa	GFMA	35.6	No Exam									0.0	0.0	0.0		80	27						
72B	1950	160 BA, 65 tpa,	GFMA	10.9	16.3	20.9								0.0	0.0	0.0	194	67	22						
72C	1973	23 X 23 80 tpa	GFMA	16.6										0.0	0.0	0.0			0						
73a	1957	Alder Conversion	LSR	8.4	14.5	16.3	8.5	0.0	0.0	0.0	0.9	**1.1**	1.0	11.5	2.0	**1.0**	168	19	AC: N/A	AC: N/A					26tpa BM

EA Unit	Stand Birth Date	Unit Prescription	LUA	Acres	Pre-DBH*	Post-DBH*	Hard & Soft 3 to 10 inches	Hard 11 to 14 inches	Hard 15 to 16 inches	Soft 15 to 16 inches	Hard 17 to 23 inches	Hard 24+ inches	Soft 24+ inches	All Snags 3-inch+	All Hard Snags 11-inch +	All Soft Snags 11-inch +	Pre-TPA*	Post-TPA*	Third of post TPA	Diameter class for 2/3 point	Total snag needs at 2/acre, 16"-18"	Total snag needs at 4/acre, 18-inch+	Total snag needs at 1.5/acre, 16-inch+	Total CWD needs at 1/acre, 18-inch+	Comments
74	1957	150BA, 55+ tpa,	LSR	37.4	13.2	18.2	28.4	0.0	0.0	0.0	0.0	0.0	0.7	29.1	0.0	**0.7**	154	47	16	18		149.6	56.1	37.4	47 tpa RA,
74a	1957	Alder Conversion	LSR	4.6	No Exam									0.0	0.0	0.0			AC: N/A	AC: N/A					similar to 73a
75	1965	120 BA, 75 tpa,	LSR	91.2	13.7	17.4	32.0	0.0	0.0	0.0	0.0	0.0	0.0	32.0	0.0	0.0	213	73	24	16	182.4				41 tpa RA
76	1973	110 BA, 80 tpa,	LSR	46.3	11	15.5	7.6	0.0	0.0	0.0	0.0	0.0	0.0	7.6	0.0	0.0	205	79	26	14					
77	1971	25 x 25 70 tpa,	LSR	14.3	No Exam									0.0	0.0	0.0		70	23						similar to unit 76
78	1976	23 X 23 80 tpa	LSR	35	No Exam									0.0	0.0	0.0									similar to unit 83
79	1976	80 BA, 120 tpa,	LSR	43.3	7.8	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	424	120	40	10					drop or defer or pct
80	1976	80 BA, 120 tpa,	LSR	23.1	No Exams									0.0	0.0	0.0		120	40						similar to unit 79
81	1978	80 BA, 120 tpa,	LSR	21.7	No Exams									0.0	0.0	0.0		120	40						similar to unit 79
82	1969	120 BA, 75 tpa, 1/4 acre gaps	LSR	50.2	13.3	17.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	181	74	25	16	100.4				drop south mixed stand, 2 1/4 acre gaps
83	1976	80 BA, 80 tpa,	LSR	31.3	9.3	13.7	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.0	**0.6**	343	79	26	12					drop lower 1/3rd
84	1972	110 BA, 75 tpa, 1/4 acre gaps	LSR	45.5	9.7	16.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	300	74	25	13					3 1/4 acre gaps north aspects
85	1972	127BA, 80 tpa,	LSR	51.5	13.1	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	200	83	28	16	103				
86	1972	100 BA, 60 tpa,	LSR	42.8	12.2	17.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	203	59	20	16	85.6				
87	1977	19 X 19, 120 tpa	LSR	30.2	No Exam									0.0	0.0	0.0		120	40						similar to 79
88	1978	23 X 23, 80 tpa	LSR	39.6	No Exam									0.0	0.0	0.0		80	27						similar to 86
89	1976	90 BA, 80 tpa,	LSR	38.9	8.4	14.4	12.5	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	294	84	28	12					
90	1976	75 BA, 60 tpa	LSR	38	8.4	15.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	317	59	20	12					
91	1979	60 BA, 60 tpa,	LSR	38.3	8.5	12.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	481	59	20	11					
92	1911	Wildife Rx	LSR	152	see comment		23.4	**3.2**	**4.1**	0.0	0.8	0.0	0.1	31.6	8.1	**0.1**	115	115	38	21					Wildlife Rx: manage for snags CWD and MAMU. Pre/post tpa DF only. Also 39 tpa madrone
93	1929	>=20" Diameter Leave X 50'	LSR	22.4	20.9	24.5	29.9	0.0	0.0	0.0	0.0	0.0	0.0	29.9	0.0	0.0	111	71	24	25		89.6			
94	1975	23 X 23, 80 tpa	GFMA	35	No Exams		22.9	0.0	0.0	0.0	0.0	0.0	0.0	22.9	0.0	0.0		80	27						
		Total Acres		**9,209**													**Total Snags and Pieces of CWD**				**3,269**	**1,050**	**2,777**	**1,078**	

Snag needs 100% of potential populations **3.51** **0.32**

Snag needs 40% of potential populations **1.4** **0.13**

Snags < 15 ft were not inclued in T09 Snag Summary Table. Therefore, assume all short snags <24 inches dbh were hard, and all short 24-inch+ dbh were soft

Excluded large residual trees when determining the top 2/3 diameter class

Appendix Table E–9: Coarse Wood Debris Summary

EA Unit	Stand Birth Date	Unit Prescription	LUA	Acres	Pre-DBH	Post-DBH	Cubic Feet per Acre	LSR & Riparian Reserve Recommended Levels of CWD: 0 to 200 ft. from Perennial Streams 3,600 - 9,400 cubic feet/ acre	LSR & Riparian Reserve Recommended Levels of CWD: Rest of Area in the Riparian Reserves 1,600 - 2,300 cubic feet/ acre	Decay Class 1&2 CWD >16 inches Dia and >16 feet long: Pieces per Acre	Decay Class 1&2 CWD >16 inches Dia and >16 feet long: Linear Feet per Acre	S&G for Matrix Land: 120 linear feet of DC 1&2 >16 inches diameter & >16 ft long	Diameter class for 2/3 point	Notes
1A		130 BA, 82tpa	LSR	40.6	11.9	17	1,577.0	below	below	0.3	22.1	below	17	
1A	1958	130 BA, 82 tpa	LSR	228.7			1,577.0	below	below	0.3	22.1	below		
1B	1953	120 BA, 72 tpa	LSR	114.0	12.6	17.4	2,731.5	below	equal or exceed	0.0	0.0	below	17	
1C	1953	130 BA, 85 tpa	LSR	73.8	11.4	16.7	3,095.8	below	equal or exceed	0.0	0.0	below	17	
1C	1954	Special Mark	GFMA	6.1			3,095.8	below	equal or exceed	0.0	0.0	below		
1C	1958	130 BA, 85 tpa	LSR	8.4			3,095.8	below	equal or exceed	0.0	0.0	below	17	
2A	1958	Alder Conversion	LSR	5.9	10	19.5	406.6	below	below	0.0	0.0	below	AC: N/A	
2C	1958	Alder Conversion	LSR	32.3	10	19.5	406.6	below	below	0.0	0.0	below	AC: N/A	
3	1958	120 BA, 77 tpa, 1/4ac gaps	LSR	244.1	10	16.9	669.9	below	below	0.0	0.0	below	16	
4A	1957	Alder Conversion	LSR	4.0	9.3	15.3	59.2	below	below	0.0	0.0	below	AC: N/A	
4B	1957	Alder Conversion	LSR	5.6	9.3	15.3	59.2	below	below	0.0	0.0	below	AC: N/A	
4C	1957	Alder Conversion	LSR	1.2	9.3	15.3	59.2	below	below	0.0	0.0	below	AC: N/A	
4D	1957	Alder Conversion	LSR	39.2	9.3	15.3	59.2	below	below	0.0	0.0	below	AC: N/A	
4E	1957	Alder Conversion	LSR	10.6	9.3	15.3	59.2	below	below	0.0	0.0	below	AC: N/A	
4F	1954	Alder Conversion	GFMA	10.4	9.3	15.3	59.2	below	below	0.0	0.0	below	AC: N/A	
4F	1954	Alder Conversion	LSR	4.9	9.3	15.3	59.2	below	below	0.0	0.0	below	AC: N/A	
~~**5**~~	~~1953~~	~~>=11" DiameterLeave~~	~~LSR~~	~~23.4~~	~~7.5~~	~~13.7~~	~~1,517.7~~	~~below~~	~~below~~	~~0.0~~	~~0.0~~	~~below~~	~~12~~	Dropped
6	1957	24 X 24 75 tpa,	LSR	41.6	No Exams			No Data	No Data			No Data		
6A	1958	Alder Conversion	LSR	13.1	No Exams			No Data	No Data			No Data	AC: N/A	
7	1957	55 tpa, 100BA	LSR	55.8	12.9	17.7	1,336.5	below	below	0.0	0.0	below	19	
8	1954	24 X 24 75 tpa,	LSR	18.5	No Exams			No Data	No Data			No Data		
9A	1954	80 tpa, 135 BA, RD=32	GFMA	72.4	8.8	17.6	827.4	below	below	0.0	0.0	below	16	
9B	1953	120 BA, 80 tpa, RD=29	GFMA	177.1	11.7	16.6	1,026.0	below	below	0.5	17.5	below	18	
10	1957	120 BA, 80 tpa, RD=30	GFMA	129.1	12.3	16.9	1,105.9	below	below	0.0	0.0	below	16	
11A	1954	120 BA, 80 tpa, RD=30	GFMA	104.7	11.5	16	941.9	below	below	0.0	0.0	below	15	
11B	1959	135 BA, 70 tpa, RD=32	GFMA	162.3	13.4	18.9	2,073.2	below	equal or exceed	0.7	45.6	below	18	
12	1954	23 X 23, 80 tpa	GFMA	32.6	No Exams			No Data	No Data			No Data		
13	1956	125 BA, 75 tpa, RD=30	GFMA	163.1	13.1	17.2	1,370.9	below	below	0.0	0.0	below	16	
14	1956	Alder Conversion	GFMA	23.4	10.7	19.3	665.2	below	below	0.0	0.0	below	AC: N/A	
15	1960	110 BA, 80 tpa, RD=28	GFMA	37.3	9	16	417.2	below	below	0.0	0.0	below	15	
18	1956	>=16" Diameter Leave X 35'	LSR	45.6	15.7	19.9	3,708.8	equal or exceed	equal or exceed	0.0	0.0	below	17	
19	1956	140 BA, 78 tpa,	LSR	59.1	11.8	18.2	1,294.4	below	below	1.7	114.0	below	18	
19	1966	135 BA, 70tpa,	LSR	54.1	11.8	18.8	1,294.4	below	below	1.7	114.0	below	19	
21	1958	25X25 60-70 tpa	CON	316.7	No Exams			No Data	No Data			No Data		
22	1958	25X25 60-70 tpa	CON	14.8	No Exams			No Data	No Data			No Data		
22A-E	1958	25X25 60-70 tpa	CON	57.1	No Exams			No Data	No Data			No Data		
23	1958	23X23 80 tpa	CON	22.2	No Exams			No Data	No Data			No Data		
24	1958	25X25 60-70 tpa	CON	100.7	No Exams			No Data	No Data			No Data		

EA Unit	Stand Birth Date	Unit Prescription	LUA	Acres	Pre-DBH	Post-DBH	Cubic Feet per Acre	LSR & Riparian Reserve Recommended Levels of CWD: 0 to 200 ft. from Perennial Streams 3,600 - 9,400 cubic feet/ acre	Rest of Area in the Riparian Reserves 1,600 - 2,300 cubic feet/ acre	Decay Class 1&2 CWD >16 inches Dia and >16 feet long: Pieces per Acre	Linear Feet per Acre	S&G for Matrix Land: 120 linear feet of DC 1&2 >16 inches diameter & >16 ft long	Diameter class for 2/3 point	Notes
25	1958	90 BA, 80 tpa, RD=27	GFMA	145.2	10.4	14.2	1,226.7	below	below	0.0	0.0	below	14	
26A-B	1959	105 BA, 70 tpa, RD=26	GFMA	88.8	8.1	16.6	1,010.8	below	below	0.0	0.0	below		
26C-D	1959	80 BA, 70 tpa, RD=22	GFMA	77.4	8.2	14.8	3,291.9	below	equal or exceed	0.0	0.0	below		
26E-G	1966	80 BA, 70 tpa, RD=22	GFMA	64.3	No Exams			No Data	No Data			No Data		
27	1971	25X25 60-70 tpa	GFMA	57.3	No Exams			No Data	No Data			No Data		
28	1958, 1960	25X25 60-70 tpa	GFMA	102.1	No Exams			No Data	No Data			No Data		
29	1966	105 BA, 80 tpa, RD=27	GFMA	50.5	9.8	15.6	3,761.1	equal or exceed	equal or exceed	0.0	0.0	below		
30	1958	112 BA, 70 tpa,1/4 acre gaps	LSR	168.2	12.1	17.2	2,829.4	below	equal or exceed	0.2	23.6	below	15	
31	1959	140 BA, 70 tpa,	LSR	150.0	14	19.7		No Data	No Data			No Data		
32	1955	>=12" Diameter Leave X 35'	LSR	179.5	7.1	15.3	3,052.1	below	equal or exceed	0.0	0.0	below	13	
33	1966	24 X 24 75 tpa,	LSR	47.6	No Exams			No Data	No Data			No Data		
34	1966	24 X 24 75 tpa,	LSR	127.8	No Exams			No Data	No Data			No Data		
34A	1970	24 X 24 75 tpa,	LSR	16.1	No Exams			No Data	No Data			No Data		
35	1953	138 BA, 80 tpa,	LSR	59.3	10.6	17.9		No Data	No Data			No Data		
36	1960	120 BA, 75 tpa,	LSR	16.1	12	16.9	1,249.0	below	below	0.2	17.1	below	16	
36	1967	120 BA, 75 tpa,	LSR	184.7	12	16.9	1,249.0	below	below	0.2	17.1	below	16	
37	1960	24 X 24 75 tpa,	LSR	103.6	No Exams			No Data	No Data			No Data		
38	1960	100 BA, 80 tpa, linear gaps	LSR	35.6	10.7	15		No Data	No Data			No Data		
39	1940	>=19" Diameter Leave X 50'	LSR	19.7	17.7	24		No Data	No Data			No Data		
40	1930	>=19" Diameter Leave X 50'	LSR	36.3	No Exams			No Data	No Data			No Data		
41& 41A	1961	130 BA, 68 tpa	LSR	35.5	12.7	19.4	2,564.9	below	equal or exceed	0.0	0.0	below		
42	1962	120 BA, 80 tpa,	LSR	18.9	12.9	17	332.0	below	below	0.0	0.0	below	15	
43	1962	125 BA, 70 tpa, 1/4 acre gaps	LSR	39.0	13	18.1	1,202.4	below	below	0.0	0.0	below	17	
44	1961	>=19" Diameter Leave	LSR	14.2	17.2	22.6		No Data	No Data			No Data		
45	1969	80 BA, 50 tpa	LSR	79.7	10.4	16.9	229.0	below	below	0.0	0.0	below	15	
46	1960	105 BA, 70 tpa,	LSR	298.2	11.7	16.6	1,045.0	below	below	0.1	7.7	below	16	
46	1960	>=17" Diameter Leave X 50'	LSR	58.1	13.1	19.8	1,045.0	below	below	0.1	7.7	below	18	
46	1967	120 BA, 90 tpa, RD=30	GFMA	46.2	11.7	15.3	1,045.0	below	below	0.1	7.7	below	16	
47	1968	105 BA, 71 tpa	LSR	47.6	11.4	16.4	1,870.0	below	equal or exceed	0.0	0.0	below	16	
48	1959	140 BA, 80 tpa, RD=33	GFMA	12.6	13.5	17.9	1,304.2	below	below	0.0	0.0	below	16	
48	1959	140 BA, 80 tpa, RD=33	GFMA	133.7	13.5	17.9	1,304.2	below	below	0.0	0.0	below	16	
49	1968	150 BA, 80 tpa, RD=30	GFMA	56.6	12.3	16.7	2,513.1	below	equal or exceed	0.0	0.0	below	16	
50	1960	145 BA, 75 tpa, RD=33	GFMA	109.5	13.6	18.6	1,964.7	below	equal or exceed	1.8	52.6	below	18	
51	1971	24 X 24, 75 tpa	CON	34.1	No Exams			No Data	No Data			No Data		
52	1967	100 BA, 85 tpa, RD=26	CON	217.2	10.5	14.5	1,195.9	below	below	1.4	65.2	below	15	
53	1957	135 BA, 75 tpa, RD=32	CON	113.8	13.6	17.9	501.8	below	below	0.0	0.0	below	16	
53	1957	135 BA, 75 tpa, RD=32	GFMA	6.7	13.6	17.9	501.8	below	below	0.0	0.0	below	16	
54	1962	120 BA, 75 tpa, RD=30	GFMA	237.4	10.8	16.4	1,368.7	below	below	0.2	16.3	below	15	
54	1968	120 BA, 75 tpa, RD=30	CON	13.7	10.8	16.4	1,368.7	below	below	0.2	16.3	below	15	

EA Unit	Stand Birth Date	Unit Prescription	LUA	Acres	Pre-DBH	Post-DBH	Cubic Feet per Acre	LSR & Riparian Reserve Recommended Levels of CWD: 0 to 200 ft. from Perennial Streams 3,600 - 9,400 cubic feet/ acre	Rest of Area in the Riparian Reserves 1,600 - 2,300 cubic feet/ acre	Decay Class 1&2 CWD >16 inches Dia and >16 feet long: Pieces per Acre	Linear Feet per Acre	S&G for Matrix Land: 120 linear feet of DC 1&2 >16 inches diameter & >16 ft long	Diameter class for 2/3 point	Notes
55	1959	120 BA, 80 tpa, RD=30	GFMA	49.3	11.4	16.8	837.8	below	below	0.0	0.0	below	16	
55a	1959	Alder Conversion	GFMA	3.1	15.7	0	1,078.5	below	below	0.0	0.0	below	AC: N/A	
56	1953	115 BA, 86tpa, RD=29	GFMA	93.7	11.6	15.2	1,066.0	below	below	0.4	28.1	below	14	
56	1959	115 BA, 86tpa, RD=29	GFMA	393.4	11.6	15.2	1,066.0	below	below	0.4	28.1	below	14	
57	1920	125 BA, 40 tpa,	GFMA	68.1	18.1	24	2,834.2	below	equal or exceed	2.7	152.1	meet or exceed		
58	1953	120 BA, 75 tpa, RD=31	GFMA	247.4	11.6	16.6	2,515.4	below	equal or exceed	0.1	12.4	below	18	
58A	1959	24 X 24, 75 tpa	GFMA	244.7	No Exams			No Data	No Data			No Data		
59	1953	120 BA, 75 tpa, RD=31	GFMA	52.3	11.6	16.6	271.0	below	below	1.1	85.5	below	15	
60	1960	130 BA, 70 tpa, RD=31	GFMA	215.3	13.6	16.1	1,621.2	below	equal or exceed	0.3	18.0	below	16	
61	1960	130 BA, 70 tpa, RD=31	GFMA	34.0	13.6	16.1		No Data	No Data			No Data		
62A-C	1972	23 x 23 80 tpa	GFMA	38.1	No Exams			No Data	No Data			No Data		
63	1960	140 BA, 66 tpa,	GFMA	64.3	14.8	19.5	255.8	below	below	1.5	57.0	below	18	
63	1977	140 BA, 66 tpa,	GFMA	19.6	14.8	19.5	255.8	below	below	1.5	57.0	below	18	
64	1968	110 BA, 80 tpa, RD=29	GFMA	35.0	11.9	15.9	941.1	below	below	0.0	0.0	below	14	
64A-C	1975	23 x 23 80 tpa	GFMA	72.7	No Exams			No Data	No Data			No Data		
65	1968	130 BA, 70 tpa, RD=30	LSR	26.2	11.8	18.6	857.4	below	below	0.0	0.0	below		
65	1969	130 BA, 70 tpa, RD=30	GFMA	80.9	11.8	18.6	857.4	below	below	0.0	0.0	below		
~~**66**~~	~~1970~~	~~100 BA, 100 tpa,~~	~~LSR~~	~~38.5~~	9	~~13.4~~	~~1,089.7~~	~~below~~	~~below~~	~~0.0~~	~~0.0~~	~~below~~	~~12~~	Dropped
66A	1976	27 X 27 60 tpa, 1/4 acre gaps	LSR	23.7	No Exams			No Data	No Data			No Data		
66B	1970	27 X 27 60 tpa, 1/4 acre gaps	LSR	25.2	No Exams			No Data	No Data			No Data		
67	1969	>=14" Diameter Leave X 50'	LSR	59.0	12.1	16.3	1,337.0	below	below	0.0	0.0	below	14	
68	1950	120 BA, 65 tpa,	LSR	33.6	13.5	18.1	794.9	below	below	1.4	68.4	below	18	
69	1950	25 X 25, 70 tpa	LSR	325.4			1,393.0	below	below	1.6	146.6	meet or exceed		
69	1960	25 X 25, 70 tpa	LSR	4.2			1,393.0	below	below	1.6	146.6	meet or exceed		
70	1971	23 X 23 80 tpa	LSR	26.2	No Exam			No Data	No Data			No Data		
71	1971	120 BA, 80 tpa, 1/4 acre gaps	LSR	72.9	10.8	16.4	1,184.8	below	below	0.0	0.0	below	13	
72A	1973	23 X 23 80 tpa	GFMA	35.6	No Exam			No Data	No Data			No Data		
72B	1950	160 BA, 65 tpa,	GFMA	10.9	16.3	20.9		No Data	No Data			No Data		
72C	1973	23 X 23 80 tpa	GFMA	16.6				No Data	No Data			No Data		
73a	1957	Alder Conversion	LSR	8.4	14.5	16.3		No Data	No Data			No Data	AC: N/A	
74	1957	150BA, 55+ tpa,	LSR	37.4	13.2	18.2	2,321.2	below	equal or exceed	4.3	205.3	meet or exceed	18	
74a	1957	Alder Conversion	LSR	4.6	No Exam			No Data	No Data			No Data	AC: N/A	
75	1965	120 BA, 75 tpa,	LSR	91.2	13.7	17.4	1,380.1	below	below	0.8	45.6	below	16	
76	1973	110 BA, 80 tpa,	LSR	46.3	11	15.5	620.4	below	below	0.0	0.0	below	14	
77	1971	25 x 25 70 tpa,	LSR	14.3	No Exam			No Data	No Data			No Data		
78	1976	23 X 23 80 tpa	LSR	35.0	No Exam			No Data	No Data			No Data		
~~**79**~~	~~1976~~	~~80 BA, 120 tpa,~~	~~LSR~~	~~43.3~~	~~7.8~~	~~11~~	~~1,609.2~~	~~below~~	~~equal or exceed~~	~~0.0~~	~~0.0~~	~~below~~	~~10~~	Dropped
80	1976	80 BA, 120 tpa,	LSR	23.1	No Exams			No Data	No Data			No Data		
81	1978	80 BA, 120 tpa,	LSR	21.7	No Exams			No Data	No Data			No Data		

EA Unit	Stand Birth Date	Unit Prescription	LUA	Acres	Pre-DBH	Post-DBH	Cubic Feet per Acre	LSR & Riparian Reserve Recommended Levels of CWD: 0 to 200 ft. from Perennial Streams 3,600 - 9,400 cubic feet/ acre	Rest of Area in the Riparian Reserves 1,600 - 2,300 cubic feet/ acre	Decay Class 1&2 CWD >16 inches Dia and >16 feet long: Pieces per Acre	Linear Feet per Acre	S&G for Matrix Land: 120 linear feet of DC 1&2 >16 inches diameter & >16 ft long	Diameter class for 2/3 point	Notes
82	1969	120 BA, 75 tpa, 1/4 acre gaps	LSR	50.2	13.3	17.2	399.9	below	below	0.0	0.0	below	16	
83	1976	80 BA, 80 tpa,	LSR	31.3	9.3	13.7	1,449.5	below	below	0.0	0.0	below	12	
84	1972	110 BA, 75 tpa, 1/4 acre gaps	LSR	45.5	9.7	16.5	1,457.8	below	below	0.0	0.0	below	13	
85	1972	127BA, 80 tpa,	LSR	51.5	13.1	16.7	757.7	below	below	0.0	0.0	below	16	
86	1972	100 BA, 60 tpa,	LSR	42.8	12.2	17.7	994.5	below	below	0.0	0.0	below	16	
87	1977	19 X 19, 120 tpa	LSR	30.2	No Exam			No Data	No Data			No Data		
88	1978	23 X 23, 80 tpa	LSR	39.6	No Exam			No Data	No Data			No Data		
89	1976	90 BA, 80 tpa,	LSR	38.9	8.4	14.4	0.0	below	below	0.0	0.0	below	12	
90	1976	75 BA, 60 tpa	LSR	38.0	8.4	15.2	844.7	below	below	0.0	0.0	below	12	
91	1979	60 BA, 60 tpa,	LSR	38.3	8.5	12.9	964.1	below	below	0.0	0.0	below	11	
92	1911	Wildife Rx (snags, CWD & MAMU	LSR	152.0	No thin		1,589.6	below	below	2.3	162.9	meet or exceed	21	
93	1929	>=20" Diameter Leave X 50'	LSR	22.4	20.9	24.5	1,012.3	below	below	1.6	171.1	meet or exceed	25	
94	1975	23 X 23, 80 tpa	GFMA	35.0	No Exams			No Data	No Data			No Data		
		Total Acres		**9,209.0**			**1,433**	**Area-Weighted Cubic Feet for Units Where CWD Data Are Available**			**27.9**	**Area-Weighted Cubic Feet CWD 16X16, for Units Where CWD Data Are Available**		

GFMA Units (Matrix)
Connectivity Units (Matrix)
Late-Successional Reserve Units

0.05 Significance level
1,273 Average
1,106 Median
896 Standard Deviation
87 Count
188 Confidence

APPENDIX F.: ESSENTIAL FISH HABITAT AND NO EFFECTS TABLE

Magnusen Stevensen Act –Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires Federal action agencies to consult with the Secretary of Commerce regarding any action or proposed action authorized, funded, or undertaken by the agency that "may adversely affect" essential fish habitat (EFH) identified under the MSA. EFH has been defined for the purposes of the Magnuson-Stevens Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (NMFS 2000). NOAA Fisheries has further added the following interpretations to clarify this definition:

· "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate;

· "Substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities;

· "Necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and

· "Spawning, breeding, feeding, or growth to maturity" covers the full life cycle of a species.

NOAA Fisheries proposed EFH for Pacific Coast salmon, including Chinook and Coho salmon, within Amendment 14 to the Pacific Coast Salmon Plan (NMFS 2000). Chinook and Coho salmon are present within the action area. Therefore, EFH for this species exists within the action area.

In freshwater, the salmon fishery EFH includes all those streams, lakes, ponds, wetlands, and other currently viable water bodies and most of the habitat historically accessible to salmon (except above certain impassable natural barriers) in Washington, Oregon, Idaho, and California.

The freshwater EFH for fall Chinook and Oregon Coast Coho salmon for the Umpqua River hydrologic unit # 17100303 consists of four major components, (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration corridors; and (4) adult migration corridors and adult holding habitat. Also identified are important features of essential habitat for spawning, rearing, and migration include adequate (1) substrate composition; (2) water quality; (3) water quantity, depth, and velocity: (4) channel gradient and stability; (5) food, (6) cover and habitat complexity; (7) space; (8) access and passage; (9) habitat and flood plain connectivity, for all life stages.

Essential Fish Habitat, as it relates to this proposed action consists of migration, and spawning and rearing habitat for fall Chinook salmon and Oregon Coast Coho salmon over their present distribution in the Umpqua River-Sawyer Rapids 5th field watershed, as well as, EFH in the Lower Elk Creek and Mehl Creek sub-watersheds. Historic distribution of Chinook and Oregon Coast Coho salmon within these watersheds may vary slightly from the current distribution but the exact extent of the historical distribution is not known. The 3 sub-watersheds containing treated acres (306 acres) within the Smith River basin contain EFH for fall Chinook and Oregon Coast Coho salmon above a former impassable natural falls, the Smith River Falls. This falls was modified 1938 by creating a jump pool and lowering the height of a section of the falls. A fish-way was constructed in the early 1971 allowing anadromous fish easy swim through access to upstream areas. Fall Chinook and Oregon Coast Coho salmon EFH is now established in all accessible stream reaches within these sub-watersheds.

A. Description of the Proposed Action

The Proposed Action is to treat approximately 9,208 acres of land through a variety of density management thinning and hardwood conversion timber harvest applications. Approximately 70% of the proposed project is within the Late Successional Reserve and Riparian Reserve land use allocations, and 23% is within the General Forest Management Area and Connectivity land use allocations as designated by the *Coos Bay District Resource Management Plan and Record of Decision.*

The Umpqua Field Office will treat 31-80 year old stands (based on Forest Operations Inventory and Stand Exam Data) of primarily Douglas-fir stands within Late Successional Reserves #263, #265, and #266, Riparian Reserves, and the adjacent General Forest Management Area land. The project would thin approximately 9,041 acres of primarily conifer stands and convert about 167 acres of primarily red alder stands. About 6,307 acres are in need of density management thinning in the Riparian Reserve and the Late-Successional Reserve to enhance the growth and vigor of the residual trees and to provide for larger and healthier trees. Approximately 2,734 acres in the General Forest Management Areas will receive a commercial thinning to enhance the growth and vigor of the residual trees to provide larger and healthier trees. Dense stands will be thinned from below to leave approximately 65-100 stems per acre by removing primarily the suppressed, intermediate, and smaller co-dominant conifers. Dominant and larger co-dominant conifers are to be retained. Red alder is a very small component in these stands; but depending on the condition, size, and stand prescription of the alder units, individual alder trees and small patches will be either left uncut, thinned, cut to facilitate understory conifer regeneration, or converted to conifer.

The timber stands identified for commercial thinning in this project are characterized by uniform structure, heavy stocking, slowing growth rate, and low stand vigor. Ultimately, the spread of fire, insects, or disease may jeopardize the health of adjacent forests.

The stands within the Riparian Reserves in this project are in the same over-stocked condition as the commercial thinning units described above and the need for timely treatment is the same. If left untreated, these stands will not achieve the desired vegetation characteristics envisioned in the Aquatic Conservation Strategy. Controlling the stocking and/or re-establishing conifer species on these lands through density management treatments is required to meet the need for achieving the future condition on the Riparian Reserves desired in the Resource Management Plan.

The stands within the Late-Successional Reserve in this project are also in the same over-stocked condition as the commercial thinning units described above and the need for timely treatment is the same. The proposed treatments of the stands inside the Late Successional Reserve will restore landscape level vegetation patterns observed on historical aerial photos through a combination of different thinning densities and selective retention of red alder.

Harvest could be accomplished with a combination of skyline cable, cut-to-length ground based, and helicopter logging equipment depending on road access, steepness of the terrain, and environmental impacts.

New road construction will consist of construction of temporary, semi-permanent roads, or permanent roads depending on management objectives. Road renovation will consist of brushing, grading, and providing adequate drainage to older existing roads. Road improvement will consist of capital improvements such as placing rock surfacing on existing dirt roads or adding culverts. Roads no longer needed for administrative purposes, deemed unnecessary for forest management purposes in the near future or have a high probability of causing resource damage, will be decommissioned.

The Umpqua River – Sawyer Rapids harvest area is large and the project area will be broken up into 10-15 sales each with a timber sale decision. The 9,041 acres are spread across six 5th field watersheds and nine 6th field watersheds and cover 84.46 stream miles of which 7.55 miles are fish bearing TableF-1.

Appendix Table F–1: Project Area location by Subwatershed and Watershed with Fish Bearing Miles and Total Stream Miles.

Subwatershed	Fish Bearing Miles	Total Stream Miles	Fifth Field Watershed
Big Creek-Lower Umpqua River	0	2.28	Upper Smith River
Halfway Creek	0	0.27	Upper Smith River
Little Mill Creek-Weatherly Creek	1.19	21.77	Umpqua River-Sawyers Rapids
Lower Camp Creek	0	0.66	Mill Creek-Lower Umpqua River
Lower Elk Creek	0.58	3.29	Elk Creek
Lutsinger Creek-Sawyer Creek	2.66	29.38	Umpqua River-Sawyers Rapids
Paradise Creek	3.10	26.31	Umpqua River-Sawyers Rapids
Upper Camp Creek	0.02	0.02	Mill Creek-Lower Umpqua River
Vincent Creek	0	0.47	Lower Smith River-Lower Umpqua River
Total	**7.55**	**84.46**	

The project is primarily within the Umpqua River – Sawyer Rapids (UR-SR) Fifth Field Watershed (1710030304) which contains three 6th field watersheds (Little Mill Creek-Weatherly Creek #171003030403; Lutsinger Creek-Sawyer Creek #171003030402; and Paradise Creek #171003030401), with smaller acres falling in five other 5th field watersheds; 1) Lower Smith River-Lower Umpqua River #1710030307 (one 6th field, Vincent Creek #171003030702), 2) Upper Smith River #1710030306 (two 6th fields, Big Creek-Lower Umpqua River #171003030604 and Halfway Creek #171003030602), 3) Elk Creek #1710030303 (one 6th field, Lower Elk Creek #171003030310), 4) Upper Umpqua River #1710030301 (one 6th field, Mehl Creek #171003030108), and 5) Mill Creek-Lower Umpqua River #1710030305 (one 6th field, Lower Camp Creek #171003030504). Approximately 91% of the treatment acres fall within the UR-SR 5th field watershed. The remainder of the treated acres are in timber units that are adjacent to and over the ridge from planned units or are ridgetop units that fall over the ridges and into these other watersheds.

B. Analysis of the Potential Adverse Effects on EFH and the Managed Species

Components of the proposed action are designed to minimize or avoid all together adverse impacts to Essential Fish Habitat, and on Chinook and Oregon Coast Coho salmon. Several features of the proposed action may enhance aquatic habitat features as shown below in Appendix Table F–2: Timber Harvest Components and Potential Effects on Essential Fish Habitat.

Appendix Table F–2: Timber Harvest Components and Potential Effects on Essential Fish Habitat

	Timber Harvest	Roads	Yarding	Timber Haul	Site Prep
Major Components of EFH					
Spawning and Incubation Availability of spawning gravel of suitable size Siltation of spawning gravels Redd scour caused by high flows Redd de-watering Temperature/Water quality problems Redd disturbance from trampling	**0** Maintain habitat requirements and components at current levels; this action is not in proximity to streams that support Chinook or Coho salmon. Upstream riparian and aquatic habitat is buffered from impacts by a 60’ no harvest riparian zone.	+ Improves habitat components. Proper culvert sizing on renovated and upgraded roads improves sediment routing and stream function to potentially make gravel available for fish use in downstream EFH	+ Improves habitat components. Five of the 357 planned stream crossing yarding corridors cross occupied EFH. Trees will be cut toward the stream from the corridor to accommodate yarding. Whole trees will benefit stream function, substrate routing and aquatic species	**0** Maintain habitat requirements and components at current levels: Log haul over streams that support Chinook or Coho salmon will occur only on paved roads.	**0** Maintain habitat requirements and components at current levels. Burn piles will be buffered from impacts to riparian buffer trees and streams
Juvenile Rearing Diminished pool frequency, area, or depth Diminished channel complexity, cover Temperature/Water quality problems Blockage of access to habitat, both upstream or downstream Loss of off-channel areas or wetlands Low water/High water flows Predation from habitat simplification or loss of cover Nutrient availability Diminished prey/competition for prey	**0** Maintains habitat requirements and components at current levels; this action is not in proximity to streams that support Chinook or Coho salmon. Upstream riparian and aquatic habitat is buffered from impacts by a 60’ no harvest riparian zone.	**0** Maintains habitat requirements and components at current levels: this action is not in proximity to streams that support Chinook or Coho salmon.	+ Improves habitat components. Corridor trees will provide increased channel complexity and in-stream cover.	**0** Maintains habitat requirements and components at current levels; this action is on paved roads in proximity to streams that support Chinook or Coho salmon.	**0** Maintains habitat requirements and components at current levels.

	Timber Harvest	Roads	Yarding	Timber Haul	Site Prep
Juvenile Migration Corridors Water quality Low water/High water flows Altered flow timing/quantity Passage blockage Increased predation from habitat simplification or modification	**0** Maintains habitat requirements and components at current levels, this action is not in proximity to streams that support Chinook or Coho salmon. Upstream riparian and aquatic habitat is buffered from impacts by a 60' no harvest riparian zone.	**0** Maintains habitat requirements and components at current levels, this action is not in proximity to streams that support Chinook or Coho salmon.	**0** Five of the 357 planned stream crossing yarding corridors cross streams that support Chinook or Coho salmon. Maintains habitat requirements and components at current levels,	**0** Maintains habitat requirements and components at current levels; this action is on paved roads in proximity to streams that support Chinook or Coho salmon.	**0** Maintains habitat requirements and components at current levels; this action is not in proximity to streams that support Chinook or Coho salmon.
Adult Migration Corridors and Adult Holding Habitat Passage blockage (e.g. culverts, dams) Water quality (high temperatures, pollutants) High/Low flows and water diversions Channel simplification/modification Reduced frequency of holding pools Lack of cover/depth of holding pools Reduced cold water refugia Increased predation from habitat modification	**0** Maintains habitat requirements and components at current levels; this action is not in proximity to streams that support Chinook or Coho salmon. Upstream riparian and aquatic habitat is buffered from impacts by a 60' no harvest riparian zone.	**0** Maintains habitat requirements and components at current levels; this action is not in proximity to streams that support Chinook or Coho salmon.	**0** Five of the 357 planned stream crossing yarding corridors cross streams that support Chinook or Coho salmon. Maintains habitat requirements and components at current levels.	**0** Maintains habitat requirements and components at current levels; this action is on paved roads in proximity to streams that support Chinook or Coho salmon.	**0** Maintains habitat requirements and components at current levels; this action is not in proximity to streams that support Chinook or Coho salmon.
Important Features of EFH	**Timber Harvest**	**Roads**	**Yarding**	**Timber Haul**	**Site Prep**
Substrate Composition	**0**	+ Improves habitat components. New culverts on renovated and upgraded roads will be sized to route substrate and improve stream function.	+ Improves habitat components. Corridor trees will be cut toward the stream to accommodate yarding. Whole trees will benefit stream function, substrate routing and aquatic species	**0**	**0**
Water Quality	**0**	**0**	**0**	**0**	**0**
Water Quantity, Depth, and Velocity	**0**	**0**	**0**	**0**	**0**
Channel Gradient and Stability	**0**	**0**	**0**	**0**	**0**

	Timber Harvest	Roads	Yarding	Timber Haul	Site Prep
Food	**0**	**0**	+ Improves habitat components. Cut trees in yarding corridors will provide woody material for terrestrial and aquatic insects to inhabit and increase availability to fish.	**0**	**0**
Cover and Habitat Complexity	**0**	**0**	+ Improves habitat components. Cut trees in yarding corridors that reach stream will increase in-channel habitat complexity.	**0**	**0**
Space	**0**	**0**	**0**	**0**	**0**
Access and Passage	**0**	**0**	**0**	**0**	**0**
Habitat and Flood Plain Connectivity	**0**	**0**	**0**	**0**	**0**
Direct Mortality to EFH Fish Species	**Timber Harvest**	**Roads**	**Yarding**	**Timber Haul**	**Site Prep**
Fish Mortality	**0**	**0**	**0**	**0**	**0**

0 – no impact on Essential Fish Habitat
+ – potential positive effect on Essential Fish Habitat component

Timber Harvest
The proposal is to treat 31-80 year old stands of primarily Douglas-fir stands within Late-Successional Reserves, Riparian Reserves, and the adjacent General Forest Management Area land. The project would thin approximately 9,041 acres of primarily conifer stands and convert to conifer about 167 acres of primarily red alder. About 6,307 acres are in need of density management thinning in the Riparian Reserve and the Late-Successional Reserve to enhance the growth and vigor of the residual trees and to provide for larger and healthier trees. Approximately 2,734 acres in the General Forest Management Area will receive a commercial thinning to enhance the growth and vigor of the residual trees to provide larger and healthier trees. Dense stands ranging up to a pre-thinning density of 535 trees per acre will be thinned from below to leave approximately 65-100 stems per acre by removing primarily the suppressed, intermediate, and smaller co-dominant conifers. Dominant and larger co-dominant conifers are to be retained. Red alder is a very small component in these stands; but depending on the condition, size, and stand prescription of the red alder units, individual alder trees and small patches will be either left uncut, thinned, cut to facilitate understory conifer regeneration, or converted to conifer.

Trees will be harvested to meet a variety of management goals. Harvest will not reduce canopy cover below 60% except within red alder conversion sites. Streamside vegetation buffers will be used to prevent sediment delivery and protect bank stability, beneficial litter inputs and shade. Along intermittent streams, no trees will be cut within 30 feet of the stream bank on vertically and laterally confined (entrenched and constrained) channels or within 30 feet of the floodplain on unconstrained channels. Along perennial streams, shade buffers will extend 60 feet upslope from the stream bank or floodplain. A no-harvest buffer similar to the intermittent stream buffer will be used on the north side of east-west running perennial stream reaches since stand treatments will not affect shade. Inner gorge areas and slumps adjacent to streams will be excluded from harvest. The distance from the edge of the water to the top of a streambank, to the top of a slump, or to the outer edge of the floodplain can be several feet to tens of feet wide, particularly on perennial streams. As a result, the width of the no treatment area often extends beyond the minimum 30 feet on intermittent streams to 60 feet on perennial streams. Some of the buffer trees could be cut to create yarding corridors. Trees cut from the protection buffer will be left on site as coarse woody debris or in-channel wood.

No timber harvest will occur within 60 feet of any stream channel containing Chinook and Oregon Coast Coho salmon or any perennial streams above their distribution, or within 30 feet of any upstream intermittent and ephemeral stream channel at any time of the year. No change in timber stand characteristics will occur in these riparian management areas. As a result, these streamside protection areas will continue to provide shade to the stream, nutrients through litter fall, streambank stability, recruitment of coarse woody material, terrestrial invertebrate production, and filtration of overland and floodwater flow.

Road/Landing Construction, Improvement, and Renovation
The project area has an extensive existing road network including a well maintained paved system. These roads generally parallel major streams containing the critical EFH of fall Chinook and Oregon Coast Coho salmon. Some new roads will have to be constructed to accommodate timber harvest, however no new roads will be constructed within the critical EFH of inhabited streams or on any floodplain of any stream. Most of the new roads consist of short spurs off main roads out short ridgelines to landing sites (Table F-3). Most of the road surfaces will be rocked, however some new construction will be out rocky ridges and require no surface rock. Landings will be constructed at wide spots in the road system.

Portions of seventeen spurs ranging in length from 0.01 mile to 0.23 mile, averaging 0.07 mile, and totaling approximately 1.27 miles will be constructed in Riparian Reserves. None of these new spurs are on flood plains and none of them are in the Riparian Reserve of perennial stream channels. They are positioned on or near ridgetops within Riparian Reserves of headwall streams. Eleven of these spurs will be decommissioned or fully decommissioned at the end of project activities.

Appendix Table F–3: Road Construction Lengths by Subwatershed

Subwatershed	No. of road segs	Total Rock (mi.)	Total Dirt (mi.)	Length range (mi.)	Average length (mi.)	Number of decom	Number fully decom	Number of intermittent stream crossings
Lutsinger Creek-Sawyer Creek	60	5.78	2.22	0.01-0.77	0.13	27	0	3
Little Mill Creek-Weatherly Creek	41	4.96	2.22	0.03-0.92	0.17	14	0	2
Paradise Creek	28	3.04	1.09	0.03-0.40	0.15	0	28	0
Vincent Creek	4	0.49	0	0.08-0.20	0.12	1	0	0
Big Creek-Lower Umpqua River	3	0.32	0	0.05-0.16	0.11	0	0	0
Halfway Creek	2	0	0.17	0.07-0.10	0.085	2	0	0
Mehl Creek	1	0.11	0	0.11	N/A	0	0	0
Wassen Creek	1	0.10	0	0.10	N/A	0	0	0
Totals	**140**	**14.8**	**5.70**	**N/A**	**N/A**	**44**	**28**	**5**

There are only five intermittent stream crossings on the eighteen proposed midslope spurs. Thirteen of the eighteen mid-slope spurs will be decommissioned or fully decommissioned following harvest. This includes removing, during the in-water work period, three of the intermittent stream crossing culverts and their fill material.

Renovation and improvement of existing roads provides an opportunity to correct drainage problems. Poorly constructed and poorly maintained legacy roads are a risk to aquatic resources. Road renovation and improvement will allow the District to address a variety of problems across a relatively large geographic area. Treatments such as brushing, road grading and resurfacing, and culvert replacement will occur. New culverts will be installed only on intermittent stream channels well above inhabited EFH.

The original road system was constructed for timber management such as fire salvage, timber harvest or private timber company access. Some of these roads have not been used or maintained for decades and still have the original culverts at stream crossings. These culverts are undersized and in poor condition. As a result, they inhibit proper stream channel function primarily by slowing or stopping the downstream routing of substrate. New culverts will be installed during the in-water work period and sized to accommodate the 100-year flood event, which will promote proper stream function. This will allow stored gravels to be transported and routed downstream to possibly reach fish bearing stream sections and be used as spawning substrate.

<u>Timber Yarding</u>

Harvest will be accomplished with a combination of skyline cable, cut-to-length ground based, and helicopter logging equipment. Areas with road access and slopes, greater than 35%, will be harvested with a skyline cable logging system. A helicopter will be required to aerial yard logs in those areas where road access is not economically feasible, or where other protection needs preclude the use of cable logging systems. Helicopter yarding would be allowed in areas specified as cable or ground based yarding. A cut-to-length harvester and forwarder will be permitted on slopes < 35% and when soil moisture content is below the 25% plastic limit, typically mid-summer to early fall.

Cable yarding system will be used over the majority of acres covering 5,700 acres, followed by ground based yarding on 2,196 acres, then helicopter yarding on 1,306 acres. Ground based yarding and helicopter yarding will not occur in the stream protection zone, however cable based logging systems are allowed to have yarding corridors over stream channels.

Yarding corridors will be kept to a minimum because of the existing road system which accommodates uphill yarding to roadside landing sites or developed landings. The logging plan indicates that approximately 357 yarding corridors will be needed to cross over stream channels. It is estimated that 94% of these corridors will occur over ephemeral and intermittent non-fish bearing stream channels far above inhabited EFH. Full suspension of yarded logs will be required over all stream channels. To avoid unnecessary damage to streamside trees by swinging or deflected yarded logs, each corridor that crosses a stream channel will have the trees within the 12 foot wide corridor cut and dropped toward the stream and left on site. Natural canopy gaps will be used when available. These cut trees will also act as a buffer to any unintended ground disturbance within the corridors.

Ninety-four percent of the proposed corridors are positioned on the landscape above EFH containing fall Chinook and Oregon Coast Coho. Only 20 corridors will pass over fish bearing stream reaches. Five corridors of these 20 are over Sawyer Creek within Unit 63 and are the only corridors over EFH occupied by fall Chinook and Oregon Coast Coho proposed within the project area.

The maximum canopy opening over Sawyer Creek resulting from these 5 corridors would be 60 feet or 2.8% of the entire EFH through this unit. These 5 corridors will be widely spaced. Likely only a few trees will be cut from each corridor and trees cut toward the stream will fall and be suspended over the stream bed because of slight entrenchment. All logs yarded through the corridors will get full suspension and will not be hauled on streambanks or through the water. These 5 yarding corridors proposed over habitat containing major components of EFH in Sawyer Creek will result in no negative impacts to those components.

Cutting corridor trees will occur in the summer months. Based on fall Chinook and Oregon Coast Coho salmon life history only juvenile Coho will be present in Sawyer Creek during summer. No direct mortality to juvenile O C Coho will result from cutting and dropping corridor trees toward the stream or from log yarding over the channel. Sawyer Creek through this reach is incised approximately 5 feet below the first terrace and is approximately 20 feet wide. Cut trees will be fully branched and be greater than 60 feet in length and will not impact the stream surface. Yarded logs will have full suspension and will not touch streambanks or the stream surface. Habitat surveys show this reach of Sawyer Creek has only two key pieces of in-stream wood. This could be increased by approximately 20-25 whole trees if only 4-5 trees are cut per yarding corridor. This action would benefit EFH of Sawyer Creek by providing channel complexity and cover for predator avoidance.

Some of the important features of EFH may benefit from the project design features for log yarding. Aquatic habitat surveys within the project area show many streams have insufficient large woody material (LWM) in the channel. This is also true for many on the un-surveyed intermittent and small perennial streams. Substrate composition, food, and cover, and habitat complexity may be improved from yarding corridor trees being cut and dropped into these stream channels. Approximately 352 yarding corridors are planned over stream channels throughout the rest of the project area. If approximately 5 trees are cut and dropped into stream channels, up to 1,760 whole trees could be positioned within aquatic habitat totaling over one mile in channels above occupied EFH throughout the project area. These trees would improve stream function through gravel retention and storage, increased habitat complexity, and provide increased substrate for terrestrial and aquatic macro-invertebrates which could enter the food chain benefiting fish and other aquatic species.

Log Haul

A well maintained road system will minimize or eliminate any potential log haul impacts to streams and aquatic life. The greatest impact would be from rainfall run-off which can carry fine sediment to a stream at a road crossing. Eliminating road surface run-off before it gets transported to streams is important in protecting water quality and aquatic habitats. Expected haul routes in this project are currently in good condition or will be renovated or up-graded to current standards for surfacing and run-off management.

Depending on how timber purchasers decide to haul logs to mills there could be up to approximately 58 stream channel crossings used for log haul over the life of the project. Approximately 48 of these crossing will be over intermittent non-fish bearing streams. Ten of these will cross perennial stream channels with 7 of these crossing over occupied EFH streams. Six of these 7 crossings are on mainline roads with paved surfaces and one is on a main-line gravel all weather surface road. No sediment will be delivered into these streams from log haul at these sites and no impacts to the major components of EFH will occur.

Site Preparation

Post-harvest fuel loadings in regeneration harvest-like red alder conversion units will require some form of fuels treatment to prepare the sites for planting. Multiple site preparation options exist based upon anticipated post-harvest site conditions but it is likely most of the acres will be prepared for planting by hand and machine piling and burning. A minimum harvest distance of 30 feet from the edge of a stream will apply for all alder conversion units. This puts pile burning out a distance to avoid damage to buffer trees. None of the alder conversion units are on or near occupied EFH stream channels, therefore there will be no impacts to the quality or quantity of EFH over the project area due to site preparation.

C. Federal Action Agency's Conclusions

Based on the implementation of project design criteria which sets guidance for on the ground actions and Best Management Practices which sets standards for the protection of resource values, the Coos Bay District BLM concludes that this project will have "no adverse affect" on Essential Fish Habitat at either the site or the 5^{th} field watershed level.

D. Proposed Mitigation

Project design criteria and best management practices are very effective in minimizing and avoiding adverse effects on EFH therefore no mitigation is required.

NMFS (National Marine Fisheries Service). 2000. Appendix A: Description and identification of essential fish habitat, adverse impacts, and recommended conservation measures for salmon. Amendment 14 to the Pacific Coast Salmon Plan. Pacific Fishery Management Council (January 1999).

Appendix Table F–4: Evaluation Criteria and Effects Determination for Middle Umpqua-Sawyer Rapids Density Management Units

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
1A Cable/Ground	Adjacent to fish presence and buffered ≥60 feet.	Yes- 0.23 mi. rocked road Intermittent channel with buffer	No	No fish bearing crossings All weather gravel road with 5 intermittent stream crossings	No	Yes 6 full suspension over intermittent channel.	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
1B Cable/Ground	0.30 mi. above fish bearing stream	No	No	No fish bearing crossings. All weather gravel road with 8 intermittent stream crossings	No	No All yarding will be directed away from stream channels.	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
1C Cable/Ground	0.60	Yes – 0.17 mi ridgetop RR from intermittent headwater stream	No	No fish bearing crossings. All weather gravel road with 7 intermittent stream crossings	No	Yes 8 full suspension over intermittent channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
2A Cable	Adjacent to fish presence and buffered ≥60 feet	No	No	No fish bearing crossings. All weather gravel road with 4 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
2C Ground	Adjacent to fish bearing stream and with a ≥ 60 foot buffer.	No	No	No fish bearing crossings. All weather gravel road with 5 intermittent stream crossings	No.	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
3 Cable/Ground Helicopter	0.25 mi.	No	No	No fish bearing crossings. All weather gravel roads. From cable landings there are 6 interm channel x-ings. From heli landings there are 9 interm channel x-ings	No	Yes 7 full suspension over intermittent channel 0.5 mi above fish habitat	No. No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
4A thru F Cable Ground (E)	0.5 to 1.25 mi. above fish bearing	No	No	No fish bearing crossings. All weather gravel road with 8 intermittent stream crossings	Yes 1 road landing 2.5 miles above fish bearing channel	Yes 2 full suspension over intermittent channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
5 Cable	0.50	No	No.	No fish bearing crossings. All weather gravel road with 8 intermittent stream crossings	No	Yes 1 full suspension over intermittent channel, 0.75 mi above fish bearing channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
6 and 6A Cable Helicopter	0.75 mi	No	No	No fish bearing crossings Unit 6 has an all weather gravel road with 7 intermittent stream crossings. Unit 6A has one paved crossing over a fish bearing stream.	No	Yes 1 full suspension over intermittent channel, 0.75 mi above fish bearing channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
7 Cable	1.25 mi	No	No	No fish bearing crossings. All weather gravel road with 8 intermittent stream crossings	No	Yes 1 full suspension over intermittent channel, 1.25 mi above fish bearing channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
8 Cable	0.30 mi	No	No	No fish bearing crossings. All weather gravel road with 8 intermittent stream crossings	No	Yes 1 full suspension over intermittent channel, 0.25 mi above fish bearing channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
9A Cable	0.25	No	No	No fish bearing crossings. All weather gravel road with 8 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
9B Cable Helicopter	Adjacent to fish bearing stream with ≥ 60 foot buffer.	No	No	No fish bearing crossings. All weather gravel road with 8 intermittent stream crossings.	No.	Yes 13, full suspension over intermittent channel, 400 Ft above fish bearing channel.	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
10 Cable/Ground	Corner of unit is adjacent to fish bearing stream with ≥ 60 foot buffer.	No	Yes Existing swing road will be renovated in 0.30 mi. of RR.	Yes 1 rocked crossing on natural surface road over resident fish bearing stream 1.0 mile above anadromous habitat All weather gravel road with 3 intermittent stream crossings.	No	Yes 5 full suspension over intermittent channel, 0.50 mi above fish bearing channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
11A Cable/Ground	0.50 mi.	Yes 0.02 mi.	No	Yes 1 rocked crossing on natural surface road over resident fish bearing stream 1.0 mile above anadromous habitat. All weather gravel road with 3 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
11B Cable Helicopter	Corner of unit is adjacent to fish bearing stream with ≥ 60 foot buffer to 0.25mi.	Yes 0.08 mi	No	Yes 1 rocked stream crossing on natural surface road over resident fish bearing stream 1.0 mile above anadromous habitat All weather gravel road with 11 intermittent stream crossings	No	Yes 7 full suspension over intermittent channel, 0.25 mi above fish bearing channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
12 Cable	Corner of unit is adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	Yes 1 rocked crossing on natural surface road over resident fish bearing stream 1.0 mile above anadromous habitat. All weather gravel road with 3 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
13 Cable/Ground	0.30 mi above the Umpqua River	Yes 400 feet. 1 intermittent stream crossing (culvert) on private land	Yes Improve existing swing road in 0.30 mi of RR	No fish bearing crossings. All weather gravel road with 3 intermittent stream crossings.	No	Yes 6 full suspension over intermittent channel, 1.0 mi above Umpqua R.	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
14 Cable	0.25 mi above Umpqua River with no connectivity	No	No	No	No	Yes 2 full suspension over intermittent channel, 1.0 mi above Umpqua R	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
15 Cable	Corner of unit is adjacent to fish bearing stream with ≥ 60 foot buffer	No	Yes Improvement of 0.25 mi in RR	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
18 Cable/Ground	0.50 mi	No	No	No fish bearing crossings. All weather gravel road with 7 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
19 Cable/Ground	1.0 mi.	No	No	No fish bearing crossings. All weather gravel road with 7 intermittent stream crossings	Yes One of 3 possible helicopter landings is in a RR of a fish-bearing stream. Stream will be given a 60-foot buffer.	Yes 5 full suspension over intermittent channel, 1.0 mi above Umpqua R.	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
21 Cable Helicopter21	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No fish bearing crossings. Ridge Route with no stream crossings. Or All weather gravel road with 19 intermittent stream crossings	Yes One of 3 possible helicopter landings is in a RR of a fish bearing stream Stream will be given a 60-foot buffer	Yes 3 full suspension over intermittent channel, 0.50 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
22 Cable Helicopter	0.50 mi.	No	No	No fish bearing crossings. Ridge Route with no stream crossings.	No	Yes 2 full suspension over intermittent channel, 1.0 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
22A, 22B, 22C, 22D, 22E Helicopter Cable	0 25	No	No	No fish bearing crossings. Ridge Route with no stream crossings. Or All weather gravel road with 19 intermittent stream crossings	Yes One of 3 possible helicopter landings is in a RR of a fish bearing stream Stream will be given a 60-foot buffer	Yes 1 full suspension over intermittent channel, 0.50 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
23 Cable	0.75 mi.	No	Yes Renovation of existing private road in riparian zones	Yes One crossing on a rocked all weather private road All weather gravel road with 6 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
24 Cable/Ground Helicopter	0.25	No	No	No	No	Yes 1 full suspension over intermittent channel, 0.75 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
25 Cable	Corner of unit contains fish bearing stream with ≥ 60 foot buffer	No	No	No fish bearing crossings. All weather gravel road with 19 intermittent stream crossings. And all weather gravel road with 6 intermittent stream crossings	No	Yes 5 full suspension over intermittent channel, 0.35 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
26 A,D,E,F Cable	Corner of unit D contains fish bearing stream with ≥ 60 foot buffer.	No	No	No fish bearing crossings. And all weather gravel road with 5 intermittent stream crossings.	No	Yes 6 full suspension over intermittent channel, 0.35 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
26 B,C,D.G Helicopter	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
26 A,D,E,F Cable	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No fish bearing crossings. And all weather gravel road with 5 intermittent stream crossings	No	Yes 6 full suspension over intermittent channel, 0.35 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
27 Cable	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No fish bearing crossings. And all weather gravel road with 6 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
28 Cable	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No fish bearing crossings. And all weather gravel road with 6 intermittent stream crossings	No	Yes 2 full suspension over intermittent channel, 0.35 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
29 Cable	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No fish bearing crossings	No	Yes 4 full suspension over intermittent channel, 0.35 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
30 Cable	0.75 mi	No	No	No fish bearing crossings. And all weather gravel road with 5 intermittent stream crossings	No	Yes 4 full suspension over intermittent channel, 1.0 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
31 Cable/Ground	Adjacent to fish bearing stream with ≥ 60 foot buffer	Yes 0.01 mi	Yes Road improvement with 2 intermittent stream crossings 0.50 mi above fish bearing stream	No fish bearing crossings. And all weather gravel road with 6 intermittent stream crossings	No	Yes 9 full suspension over intermittent channel, 1.0 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
32 Helicopter	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No fish bearing crossings. And all weather gravel road with 2 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
32 Cable	0.75 mi	No	No	No fish bearing crossings. And all weather gravel road with 5 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
33 Cable	1.50 mi	No	No	No fish bearing crossings And all weather gravel road with 5 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
34, 34A Cable	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No fish bearing crossings. And all weather gravel road with 5 intermittent stream crossings	No	Yes 5 full suspension over intermittent channel, 1.0 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
35 Cable/Ground	!.50 mi	No	No	No fish bearing crossings. And all weather gravel road with 5 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
36 Cable/Ground	One unit corner is adjacent to a fish bearing stream with ≥ 60 foot buffer	Yes 0.09 mi	No	No fish bearing crossings. And all weather gravel road with 3 intermittent stream crossings	No	Yes 1 full suspension over intermittent channel, 2.5 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
36 Helicopter	0.50 mi	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
37 Helicopter	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
38 Ground/Heli	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
39, 40 Helicopter	200 feet from fish bearing stream	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
41, 41A Cable	1.7 mi	No	No	No	No	Yes 2 full suspension over intermittent channel, 1.7 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
42.44,45 Ground	0.50 + mi	No	No	No	No	Yes 2 full suspension over intermittent channel, 1.7 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
42,43,45 Cable	1.7 mi	No	No	No	No	Yes 9 full suspension over intermittent channel, 2.0 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
46 Cable	Adjacent to fish bearing stream with ≥ 60 foot buffer	Yes 0.05 mi	No	No	No	Yes 9 full suspension over intermittent channel, 0.5 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
46 Helicopter/ Ground	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No fish bearing crossings. And all weather gravel road with 3 intermittent stream crossings	No	Yes 1 full suspension over intermittent channel, 0.5 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
47 Cable	0.50 mi	No	No	No fish bearing crossings. And all weather gravel road with 3 intermittent stream crossings	No	Yes 9 full suspension over intermittent channel, 0.5 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
48 Cable/Ground	0.30 mi	No	Yes One renovated intermittent stream crossing on an existing private road 1.0 mi above fish bearing	No fish bearing crossings And all weather gravel road with 1 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
49 Cable/Ground	0.50 mi. to Umpqua with streams disconnected by agricultural pastures	No	Yes Three renovated intermittent stream crossings on an existing road .50 mi above fish bearing w/no connection	No fish bearing crossings And all weather gravel road with 2 intermittent stream crossings	Yes Intermittent stream with no connection to Umpqua River	Yes 2 full suspension over intermittent channel, 0.5 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
50 Cable/Ground	0.50 mi. to Umpqua R., with streams disconnected by agricultural pasture	No	Yes Five renovated intermittent stream crossings on an existing road .50 mi above fish bearing w/no connection	No fish bearing crossings. And all weather gravel road with 8 intermittent stream crossings	No	Yes 1 full suspension over intermittent channel, 0.5 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
51 Cable/Ground	0.50 mi. to Umpqua R. with streams disconnected by agricultural pastures	No	Yes One renovated intermittent stream crossing on an existing road 1.0 mi above fish bearing w/no connection	No fish bearing crossings. And all weather gravel road with 9 intermittent stream crossings	No	Yes 6 full suspension over intermittent channel, 1.0 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
52 Cable/Ground	0.50 mi. to Umpqua R. with streams disconnected by agricultural pastures	Yes 0.04 mi	Yes Two renovated intermittent stream crossings on an existing road 1.0 mi above fish bearing w/no connection	No fish bearing crossings. And all weather gravel road with 3 intermittent stream crossings with no connection to fish bearing stream.	No	Yes 6 full suspension over intermittent channel, 1.0 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
53 Ground/Cable	1.0 to 1.5 mi	No	No	No	No	Yes 6 full suspension over intermittent channel, 1.3 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
54 Ground/Cable	0.50 mi	Yes 0.06 mi	Yes Three renovated intermittent stream crossings on an existing road 0.75 mi above fish bearing .	No fish bearing crossings. And all weather gravel road with 4 intermittent stream crossings	No	Yes 29 full suspension over intermittent channel, 1.0 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
55, 55A Ground/Cable	0.75 mi	No	Yes Four renovated intermittent stream crossings on an existing road 0.75 mi above fish bearing .	No fish bearing crossings. And all weather gravel road with 6 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
56 Cable Ground Helicopter	Adjacent to fish bearing stream with ≥ 60 foot buffer	Yes 0.15 mi	No	No fish bearing crossings And all weather gravel road with 6 intermittent stream crossings	No	Yes 36 full suspension over intermittent channels, 0.1 mi above fish bearing stream. 5 full suspension over fish bearing stream. (Butler Cr.)	No Intermediate lift trees to ensure suspension over streamside trees. No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
57 Cable Ground	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No fish bearing crossings	No	Yes Up to 5 full suspension over fish bearing stream. (Butler Cr.)	No Intermediate lift trees to ensure suspension over streamside trees. No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
58, 58A Cable/Ground	Adjacent to fish bearing stream with ≥ 60 foot buffer	Yes 0.19 mi	No	No fish bearing crossings. And all weather gravel road with 1 intermittent stream crossing	No	Yes 17 full suspension over intermittent channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
59 Cable/Ground	Adjacent to fish bearing stream with > 60 foot buffer	Yes 0.01 mi	No	No fish bearing crossings. And all weather gravel road with 1 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
60 Cable/Ground	Adjacent to fish bearing stream with > 60 foot buffer	No	Yes Existing road in headwall crossing	No	No	Yes 8 full suspension over intermittent channel 0.50 mi above fish bearing stream	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
61 Cable/ground	0.50 mi	No	No	No fish bearing crossings And all weather gravel road with 3 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
62A Cable	1.50 mi	No	No	No fish bearing crossings And all weather gravel road with 3 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
63 Cable/Ground Helicopter	Adjacent to fish bearing stream with ≥ 60 foot buffer	No	No	No fish bearing crossings. And all weather gravel road with 3 intermittent stream crossings	No	Yes 3 full suspension over intermittent channel 0.50 mi above fish bearing stream 4 x-ings over fish bearing – Sawyer Creek	No Intermediate lift trees to ensure suspension over streamside trees. No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
64, 64A, 64B, 64C Cable	Adjacent to fish bearing stream with > 60 foot buffer	No	No	No fish bearing crossings And all weather gravel road with 3 intermittent stream crossings	No	Yes 2 full suspension over intermittent channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
65 Cable Ground	0.30 mi	No	No	No fish bearing crossings And all weather gravel road with 3 intermittent stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
66 Helicopter	0.25 mi	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
66A, 66B Cable	0.39 mi	Yes 0.02 mi in 66B	No	No	No	Yes 3 full suspension over intermittent channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
67 Cable	0.80 mi	No	Yes Road improvement over 1 intermittent crossing.	No fish bearing crossings And all weather gravel road with 1 intermittent stream crossings	No	Yes 2 full suspension over intermittent channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
68 Cable	1.25 mi	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
69 Ground/Cable	Adjacent to fish bearing stream with > 60 foot buffer. Above a long standing barrier to anadromous fish	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
70 Cable	0.20 mi in the Mill Creek watershed; and 1.0 mi in Sawyer Creek	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
71 Cable/Ground	1.25 mi from the Umpqua River with no connection thru pastures	Yes 0.07 mi	Yes Road improvement over 2 intermittent crossing	No fish bearing crossings. And all weather gravel road with 6 intermittent stream crossings	No	Yes 1 full suspension over intermittent channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
72A, 72B, 72C Ground/Cable	0.70 mi from Umpqua R. with no connection thru agricultural Pastures	No	Yes Road improvement over 1 intermittent crossing	No fish bearing crossings. And all weather gravel road with 1 stream crossings with no connection to fish bearing stream.	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
73A, 74A Cable/Ground Hardwood conv	2.25 mi above barrier falls	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
74 Cable/Ground	2.0 mi above barrier falls	No	Yes Road improvement over 1 intermittent crossing in 73	No	No	Yes 4 full suspension over intermittent channel in unit 73	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
75 Cable/Ground	!.0 mi	Yes 0.07 mi	No	No	No	Yes 19 full suspension over intermittent channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
76, 77, 78, 79 Cable/Ground	Adjacent to fish bearing stream with > 60 foot buffer.	No	No	No	No	Ye 1 full suspension over intermittent channel in unit 78, 0.20 mi above fish bearing	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
80, 81 Cable	0.50mi and 0,20mi	No	No	No fish bearing crossings And all weather gravel road with 4 stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
82, 83, 84, 85 Cable/Ground	Adjacent to fish bearing stream with > 60 foot buffer	No	No	No	No	Yes 82 (5), 83 (8), 84 (7), 85 (2) full suspension over intermittent channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
86 Ground	1.0 mi	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
87 Cable	0.75 mi	No	No	No	No	Yes 3 full suspension over intermittent channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream

Unit Number	Approximate Distance of Timber Harvest Activity Above Fish Bearing (mi.)	New Road Construction In Riparian Reserve	Road Improvement or Renovation in RR	Haul Route: Dirt or Gravel in RR with fish Bearing Crossing	Log Landings in Riparian Reserve	Yarding Corridors Over Stream Channel	Reasonable Expectation of Any Direct Site Level Impact to Fish or Aquatic Habitat.
88 Cable/Ground	0.30 mi	No	No	No fish bearing crossings. And all weather gravel road with 1 stream crossings	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
89 Ground/Cable	Adjacent to fish bearing stream with > 60 foot buffer	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
90, 91 Cable/Ground	0.25mi (unit 90); Adjacent to fish bearing stream with > 60 foot buffer (unit 91)	No	No	No fish bearing crossings. And all weather gravel road with 1 intermittent stream crossing in unit 91	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
93 Cable	1,70 mi	No	No	No	No	No	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream
94 Cable/Ground	Adjacent to fish bearing stream with > 60 foot buffer	No	Yes Road improvement over 2 intermittent crossing	No fish bearing crossings. And all weather gravel road with 1 intermittent stream crossing	No	Yes 11 full suspension over intermittent channel	No No loss of fish or aquatic habitat and no direct or indirect delivery mechanism of sediment to a fish bearing stream