Olalla–Camas Regeneration Harvest Plan Environmental Assessment

Bureau of Land Management
Roseburg District Office
South River Field Office
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U.S. Department of the Interior, Bureau of Land Management
Roseburg District Office
777 NW Garden Valley Blvd.
Roseburg, Oregon 97471

This environmental assessment analyzes proposed timber harvest designed in conformance with management direction provided in the 1995 Roseburg Record of Decision and Resource Management Plan (ROD/RMP), as amended prior to December 30, 2008.

The BLM is providing a 30-day period for public review and comment on the documents, and will accept comments until the close of business (4:30 PM, PDT) on July 30, 2015.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment be advised that your entire comment, including your personal identifying information, may be made publicly available at any time. While you can ask us in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so. If you choose to submit any written comments, they should be directed to Steven Lydick, South River Field Manager, at the above address.

The Roseburg District posts Environmental Assessments, Environmental Impact Statements, Findings of No Significant Impact, and Decision Records/Documents on the district web page under **Plans & Projects** at www.blm.gov/or/districts/roseburg, on the same day on which an electronic notice of availability is transmitted to those individuals and organizations on the District's NEPA mailing list who have expressed an interest in project planning and analysis. Individuals desiring a paper copy of such documents will be provided one upon request. Individuals with the ability to access these documents on-line are encouraged to do so. Internet use reduces paper consumption and administrative costs associated with copying and mailing.

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Chapter One

Purpose and Need for Action

This chapter provides a description of the purpose and need for the proposed action.

I. Background

The analysis area encompasses lands managed by the South River Field Office of the Roseburg District, Bureau of Land Management (BLM) in the Upper Middle Fork Coquille, East Fork Coquille, Olalla Creek-Lookingglass Creek, and Clarks Branch-South Umpqua 5th-field[1] watershed analysis units.[2]

These watersheds/watershed analysis units collectively cover an area of approximately 315,500 acres. The South River Field Office administers approximately 55,130 acres, or 17.5 percent of the lands in these watersheds, specifically:

- Upper Middle Fork Coquille – 19,571 acres or 29 percent,
- East Fork Coquille – 490 acres or 0.6 percent,
- Olalla Creek-Lookingglass Creek – 27,390 acres or 26.5 percent, and
- Clarks Branch-South Umpqua – 7,682 acres or 12.9 percent

A description of the historic condition of natural resources is provided in the Upper Middle Fork Coquille (USDI/BLM 1999a (MFC WA)), East Fork Coquille (USDI/BLM 2000 (EFC WA)), Olalla-Lookingglass (USDI/BLM 1998a (OL WA)), and Middle South Umpqua (USDI/BLM 1999b (MSU WA)) watershed analyses. Except for forest seral stages which can rapidly change as a consequence of timber harvest and natural events such as wildfire and windstorms, the existing characterization of resource conditions in the watershed analyses is generally representative of current conditions.

The proposed regeneration harvest units are all located in the General Forest Management Area which was designated by the Roseburg District *Record of Decision and Resource Management Plan* (ROD/RMP (USDI/BLM 1995a)) for sustainable timber production. Proposed harvest units are specifically located in:

- Sections 19, 29 and 31, T. 28 S., R. 8 W.;
- Sections 25, 31 and 35, T. 29 S., R. 7 W.;
- Section32, T. 29 S., R. 8 W.;
- Section 35, T. 29 S., R. 9 W.;
- Sections 5 and 7, T. 30 S., R. 8 W.; and
- Sections 3and 27, T. 30 S., R. 9 W., Willamette Meridian.

[1] This watershed was formerly named Middle South Umpqua.

[2] The U.S. Geological Survey implemented a new numbering/naming convention for hydrologic units (HUs). 5th-field watersheds are now designated as 10th-field HUs, and 6th-field subwatersheds as 12th-field HUs. To remain consistent with terminology from the Northwest Forest Plan and 1995 Roseburg District ROD/RMP specific to the Aquatic Conservation Strategy, original designations as 5th and 6th field hydrologic units are used in this document.

II. Purpose (Objectives)

The purpose of the proposed action is to implement regeneration harvest on approximately 870 acres of selected stands in the General Forest Management Area to contribute to the annual allowable sale quantity (ASQ) of 45 million board feet declared by the Roseburg District ROD/RMP (pp. 8 and 60). The proposed action would contribute an estimated 15 to 18 million board feet of timber toward the declared ASQ.

Regeneration harvest is a plan-level decision made in the Roseburg District ROD/RMP (pp. 8 and 61). The proposed action would implement this decision in accordance with management objectives and management direction for regeneration harvest contained in the ROD/RMP.

The stands that are proposed for harvest were all previously thinned between 1998 and 2008, and range in age by 10-year age class from 60 to 90 years old. Management direction (ROD/RMP, pp. 61 and 151) provides for the scheduling of regeneration harvest at culmination of mean annual growth increment at ages 80 to 110 years, but also authorizes harvest of stands as young as 60 years in the General Forest Management Area order to develop a desired age class distribution across the landscape.

III. Need

There is a need for the proposed action in order to comply with the statutory requirement to manage suitable commercial forest lands revested by the government from the Oregon and California Railroad for the sustained production of timber, and offer a minimum of 80 percent of the declared ASQ.

There is a need for the contribution of a sustainable supply of timber and other forest products (RMP, p. 60) in support of the socio-economic benefits envisioned in the *Roseburg District Proposed Resource Management Plan/Environmental Impact Statement* (PRMP/EIS, Vol. 1, p. xii (USDI, BLM 1994)).

Based upon the general lack of regeneration harvest on the Roseburg District over the past two decades, there is a need for the proposed action in order meet the objectives for the land use allocation of providing a balance of seral stages (ROD/RMP, p. 150) and an age class distribution on the landscape envisioned by the PRMP/EIS (Vol. 1, Chapter 4-26, 27).

IV. Decisions Factors

Factors to be considered will include:

- The effectiveness of the alternatives in meeting the described objectives, including yarding methods, seasons of operation, access, activity fuels reduction, and reforestation.
- The nature and intensity of environmental impacts that would result from the proposed timber harvest, and the nature and effectiveness of measures such as design features and Best Management Practices to minimize impacts to other resources present.
- Compliance with 1995 ROD/RMP management direction; terms of consultation on species listed as threatened or endangered under the Endangered Species Act, and critical habitat designated for their survival and recovery; Essential Fish Habitat designated by the Magnuson-Stevens Fishery Conservation and Management Act (Federal Register 2002); effects on Survey & Manage species designated by the Northwest Forest Plan; Bureau Sensitive species managed under the BLM Special Status Species Program; and laws that include the Federal Land Policy and Management Act, Clean Water Act and O&C Act, among others.

- How to provide timber resources in support of local industry, and revenue to the Federal and County governments from the sale of those resources while reducing short and long-term costs of managing the lands in the project area.

V. Scoping

A. Internal Scoping

An interdisciplinary team was assembled at initiation of the project analysis. Issues identified for analysis were determined based on ROD/RMP management direction for utilization and protection of natural resources; circumstances and concerns identified through field reconnaissance; comments from external groups, and requirements set forth in laws, regulations, policy and court rulings.

B. External Scoping

Formal scoping period is not required for the preparation of an environmental assessment; however, the following measures were undertaken to engage interested members of the public.

Notice of project initiation was published June 10, 2014 in the Roseburg District Quarterly Planning Update (Summer 2014), informing the general public of the proposed action.

Notification and maps were provided to the Cow Creek Band of Umpqua Indians, the Coquille Indian Tribe, the Confederated Tribes of the Siletz, and the Confederated Tribes of Grand Ronde at the time of project initiation, requesting identification of any concerns, special interests, or legal rights in the lands in question.

Letters were sent to landowners; with property adjacent to BLM-administered lands where timber harvest is proposed, beside or astride identified haul routes, with registered surface water rights for domestic use located within one mile downstream of any proposed units, and/or downwind of proposed units that may be broadcast burned. The letters are intended to encourage these landowners to share any concerns or special knowledge of the project area that may be important to the analysis.

Timely comments were received from a single organization, reviewed and addressed as warranted, below. Additional comments from two organizations were received in December 2014 and March 2015 and were not considered to have been filed in a timely manner and are not addressed here.

We encourage the BLM to be proactive in treating riparian reserves. The BLM states in their planning update that "No entries for the purpose of timber management would be made into thinned and un-thinned Riparian Reserves associated with many of the proposed units."

As described in the Purpose and Need (p. 2), the proposed action is regeneration harvest to be consistent with a plan level decision made in the Roseburg District ROD/RMP and management direction contained therein. The project is intended to generate volume creditable toward the Roseburg District's annual ASQ. Regeneration harvest is not authorized in Riparian Reserves, and any volume generated by activities of harvest in Riparian Reserves is not creditable toward the annual ASQ. Hence, such actions would not be consistent with the stated Purpose and Need.

We encourage the BLM to avoid making such general statements this early in the planning process about riparian reserves that cover such a large amount of land. We would rather see the BLM design site specific treatments for each riparian reserve stand.

The BLM is proposing to implement a project consistent with a plan-level decision for timber harvest in the General Forest Management Area. Management direction for Riparian Reserves was established by the 1995 ROD/RMP and as such is outside the scope of this EA to change. The statement referenced in the comments is only intended to apply to Riparian Reserves associated with the units proposed for harvest in this environmental assessment, most of which were previously thinned. The proposed action has no relationship to plan revisions currently underway.

VI. Issues for Analysis

Through internal scoping and consideration of informal external scoping comments, the interdisciplinary team identified the following issues for analysis.

A. Timber Resources

- How would the alternatives meet requirements of the Oregon &California Act of 1937 for sustainable timber production on lands allocated to the General Forest Management Area and contribute to attaining the annual ASQ of 45 million board feet declared by the Roseburg District ROD/RMP (p. 8)?
- How would the alternatives meet the objective of providing a distribution of seral stages within the General Forest Management Area, and on the landscape as a whole?
- What effects would the alternatives have on the spread of Port-Orford-cedar root disease caused by the *Phytopthera lateralis* pathogen?

B. Wildlife

- What would be the direct and indirect effects of the alternatives on the Federally-threatened northern spotted owl in terms of disturbance and habitat modification, and the direct and indirect effects on the function of designated critical habitat?
- What would be the direct and indirect effects of the alternatives to the Federally-threatened marbled murrelet in terms of disturbance and modification of suitable nesting habitat, and the direct and indirect effects on designated critical habitat?
- What would be the direct and indirect effects of the alternatives on Bureau Sensitive species, and to habitat provided by BLM-managed lands in the project area?
- What would be the direct and indirect effects of the alternatives on Survey and Manage species and habitat provided by BLM-managed lands in the project area?
- What would be the direct and indirect effects of the alternatives on landbirds and habitat provided by BLM-managed lands in the project area?

C. Botany

- Would the proposed action have any impacts on Bureau Special Status (BSS) plant species?
- Would the proposed action have any impacts on botanical and fungi species managed under provisions of the Survey and Manage program?

D. Noxious Weeds and Non-Native Invasive Plants

- Would the proposed action lead to introduction of or a measurable increase in noxious weed species on site or would the occurrence of noxious weed species have adverse effects on the project area?

E. Fish, Aquatic Habitat and Water Resources

- What would be the direct and indirect effects of the alternatives on the Federally-threatened Oregon Coast coho salmon and other fish species that inhabit streams in proximity to proposed timber harvest units?
- What effects would the alternatives have on aquatic habitat conditions, including critical habitat designated for the Oregon Coast coho salmon and Essential Fish Habitat designated for Oregon Coast coho salmon and Chinook salmon?
- What effects would the alternatives have on water quality, specifically temperature and shade, and sediment and turbidity in streams in the project area?
- What effects would the alternatives have on the timing and quantity of stream flows in the project area?

F. Soils

- What would be the direct effects of the alternatives in terms of soil displacement and compaction, and in terms of increased potential for erosion and reductions in site productivity caused by soil displacement and compaction?
- What would be the direct and indirect effects of the alternatives on slope stability and the risk of slope failures and landslides?

G. Fuels Management, Fire Risk, and Air Quality

- What direct and indirect effects would the alternatives have on present and future risk of fire within the proposed harvest units?
- What would be the effects of fuels reduction, implemented as part of the proposed action, on air quality?

H. Carbon Storage and Release

- What effects would the alternatives have on release of carbon, in the form of carbon dioxide (CO_2), at the project scale and in comparison to annual national and global CO_2 emissions, and future carbon sequestration by the forested stands proposed for timber harvest?

I. Recreation and Visual Resources

- How would the alternatives affect recreational opportunities provided by the project area?
- How would the alternatives affect use of off-highway vehicles within the project area, and how would unauthorized uses be discouraged?
- How would the alternatives comply with Visual Resource Management objectives?

VII. Conformance

A. Applicable Planning Documents

Effects of natural resource management, including timber management, were analyzed in the Roseburg District PRMP/EIS. This EA will consider environmental consequences of no action and the proposed action to determine if the impacts would exceed those already analyzed in the PRMP/EIS, which would preclude a Finding of No Significant Impact and require preparation of a Supplemental Environmental Impact Statement. Additional information and analysis provided by the following documents is incorporated by reference.

- *Final Supplemental Environmental Impact Statement* (FSEIS) *on Management of Habitat for Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl* (USDA/FS and USDI/BLM 1994a),
- FSEIS *for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA/FS and USDI/BLM 2000),
- FSEIS *for Management of Port-Orford-Cedar in Southwest Oregon* (USDA/FS and USDI/BLM 2004a).
- FSEIS *to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines* (USDA/FS and USDI/BLM 2004b);
- *Final Supplement to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines* (USDA/FS and USDI/BLM 2007), and
- *Final Environmental Impact Statement for the Revision of the Resource Management Plans for the Western Oregon Bureau of Land Management* (USDI/BLM 2008a (2008 FEIS)).

Implementation would conform to management direction from the Roseburg District ROD/RMP as amended by the following:

- *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA/FS and USDI/BLM 1994b);
- *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA/FS and USDI/BLM 2001a); and
- *Record of Decision and Resource Management Plan Amendment for Management of Port-Orford-Cedar in Southwest Oregon, Coos Bay, Medford, and Roseburg Districts* (USDI/BLM 2004b).

B. Applicable Laws and Regulations

Design and implementation of the proposed action would conform to applicable laws, regulations, and Executive Orders that include but are not limited to:

- **The Oregon and California Act of 1937:** Section 1 of the Act stipulates that suitable commercial forest lands revested by the government from the Oregon and California Railroad are to be managed for the sustained production of timber.
- **The Federal Land Policy and Management Act (FLPMA):** Section 302 at 43 U.S.C. 1732(a), directs that "The Secretary shall manage the public lands . . .in accordance with the land use plans developed by him under section 202 of this Act when they are available . . ."
- **National Historic Preservation Act, 1997 National Programmatic Agreement and 1998 Oregon State Historic Preservation Office Protocols:** Protection of resources of historic or cultural value.
- **Clean Water Act:** Section 313 and Executive Order 12088 require federal agencies with all programs and requirements for controlling water pollution from nonpoint sources.
- **Clean Air Act:** Directs federal agencies to maintain and enhance air quality.

- **The Endangered Species Act:** Section 7(a) (2) directs that each Federal agency shall, in accordance with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary to be critical.
- **Migratory Bird Treaty Act and Executive Order 13186:** Protection of migratory birds.
- **Lacey Act, Federal Noxious Weed Act and Executive Order 13112:** Minimize the risk of establishment or spread of noxious weeds and invasive non-native plants.
- **Magnuson-Stevens Fishery Conservation and Management Act:** Section 305(b) (2) directs federal agencies to consult with NMFS on all activities, or proposed actions, permitted, funded, or undertaken by the agency that may adversely affect Essential Fish Habitat.

Chapter Two

Discussion of the Alternatives

This chapter describes the basic features of the alternatives being analyzed.

I. Alternative One – No Action

The No Action alternative describes a baseline against which the effects of proposed action alternatives can be compared. It discusses the consequences of not taking any action and assumes that current resource trends will continue into the future.

Under this alternative, no timber harvest would occur and stand development would continue along present growth trajectories.

There would be no need for any temporary or permanent road construction to facilitate timber yarding and log hauling. Renovation and/or improvements to roads that are designed to reduce erosion, correct drainage deficiencies, improve water quality, and provide for user safety would not be undertaken. There would be no decommissioning of roads that are surplus to long-term management needs. Roads would be maintained on an as needed basis in order to provide resource protection, accommodate reciprocal users, and protect the government's infrastructure investments.

No activity fuels would be generated within or outside of the Wildland Urban Interface that would require treatment to reduce risk of fire or to facilitate reforestation efforts.

Selection of the No Action Alternative would not constitute a decision to reallocate these lands to non-commodity uses. The decision maker does not need to make a specific decision to select the No Action Alternative. The proposed action could simply be dropped and the National Environmental Policy Act (NEPA) process ended. Future activities in the area would not be precluded and could be analyzed in subsequent NEPA documents.

II. Alternative Two – The Proposed Action

The BLM would conduct regeneration harvest with dispersed green tree retention on approximately 870 acres of lands in the General Forest Management Area (GFMA), incorporating road construction, road renovation, road decommissioning, and fuels management as described below. Individual units are assigned a unique identification number based on township, range, section and an identifying letter (*i.e.* 29-7-31A and 29-7-31B). Project maps can be found in Appendix A of this EA.

Table 2.1 describes proposed harvest units in terms of acres thinned in the previous entry, net unit acres after removal of all Riparian Reserves acres (regardless of previous treatment) and established buffers for previously identified Survey and Manage or Bureau Sensitive species; estimated thousand board feet (MBF) per acre, gross unit volume, net unit volume after allowance for green tree retention, and anticipated manner of yarding.

Unit acres may differ from previous sale acreages based on differences between traversed acres and GIS generated acres, portions of units dropped because they are thinned Riparian Reserves that would not be subject to regeneration harvest, portions of units dropped because they did not meet minimum age criteria of 60 years, or removal of rights-of-way acres within unit boundaries.

Table 2.1 Proposed Harvest Units

Unit ID No.	Gross Acres	Net Acres [3]	Estimated MBF/Acre[4]	Estimated Total Unit Volume	Estimated Net Harvest Volume[5]	Yarding Method (% Cable/% Ground-Based)
28-8-19A	31	21	30,500	640,500	480,000	80/20
28-8-29B	8	6	31,500	189,000	142,000	30/70
28-8-29C	15	9	31,500	284,000	213,000	20/80
28-8-29D	23	10	31,500	315,000	236,000	20/80
28-8-31A	18	4	30,000	120,000	90,000	100/0
28-8-31B	39	23	33,000	759,000	569,000	0/100
28-8-31D	18	3	30,000	90,000	67,000	0/100
28-8-31E	13	6	30,000	180,000	135,000	0/100
29-7-25A	55	30	22,500	675,000	506,000	65/35
29-7-31A	14	8	26,000	208,000	156,000	0/100
29-7-31B	38	25	26,000	650,000	487,000	25/75
29-7-35A	103	81	22,000	1,780,000	1,330,000	85/15
29-8-32A	63	57	15,000	855,000	641,000	0/100
29-9-35A	24	20	14,000	280,000	210,000	100/0
29-9-35B	37	33	29,000	957,000	718,000	0/100
29-9-35C	22	16	19,000	304,000	228,000	100/0
30-8-5A	35	34	36,000	1,224,000	918,000	0/100
30-8-5B	20	17	30,000	510,000	382,000	100/0
30-8-5C	29	26	33,500	871,000	653,000	100/0
30-8-7A	39	25	28,000	700,000	525,000	0/100
30-8-7B	157	120	25,000	3,000,000	2,250,000	50/50
30-8-7D	57	49	25,000	1,225,000	919,000	70/30
30-9-3A	113	103	28,000	2,884,000	2,163,000	0/100
30-9-3B	52	51	23,000	1,173,000	880,000	80/20
30-9-3C	26	13	25,500	331,500	249,000	85/15
30-9-3D	46	31	22,500	698,000	523,000	100/0
30-9-27A	13	13	18,500	240,000	180,000	100/0
30-9-27B	38	33	19,000	627,000	470,000	100/0
Totals	**1,146**	**867**		**21,770,000**	**16,320,000**	

[3] Acres may increase or decrease based on confirmation of stream inception points which will define the exact extent of Riparian Reserves.
[4] Rounded to nearest 500 board feet.
[5] Assumes there will be a 25 percent reduction in total volume for retention of nine large conifers per acre. Net unit volumes are rounded to nearest 1,000 board feet.

A. Marking Prescription

Riparian Reserves

Riparian Reserves in the Middle Fork Coquille, East Fork Coquille, Olalla Creek-Lookingglass Creek, and Clarks Branch-South Umpqua watersheds would be established on all streams and waterbodies based on a site-potential tree height calculated from the average site index of inventory plots throughout each of the individual watersheds that are located on lands capable of supporting commercial timber stands. The site-potential tree heights for the East Fork Coquille River and Upper Middle Fork watersheds are 220 feet and 180 feet, respectively. The site-potential tree height for both the Olalla Creek-Lookingglass Creek and Clarks Branch-South Umpqua watersheds is 160 feet.

On intermittent and perennial non-fish-bearing streams, Riparian Reserves would be one site-potential tree height in width, slope distance, measured from the top of the stream bank. On all fish-bearing streams, perennial or intermittent, Riparian Reserves width would be two site-potential tree heights in width, slope distance, measured from the top of the stream bank. On wetlands greater than one-acre in size, Riparian Reserves would be one site-potential tree height in width measured from the outer edge of riparian vegetation, or the extent of seasonally saturated soils. (ROD/RMP, p. 24)

Timber in adjacent upland stands would be felled away from Riparian Reserves to protect and maintain their physical integrity. Should a tree fall into the Riparian Reserves, the Contract Administrator would make a determination on whether the tree or portion thereof can be removed without undue risk of creating circumstances that could result in erosion and stream sedimentation.

Yarding or equipment operation would generally be prohibited within Riparian Reserves, although yarding may be allowed through Riparian Reserves where necessary, subject to pre-designation of the yarding corridors and authorization by the contract administrator. In Unit 28-8-31A, full suspension of logs would be maintained to the extent practicable in the Riparian Reserve and required within 50 feet of the stream over which timber would be yarded. If necessary to clear yarding corridors within Riparian Reserves, any cut trees would be directionally felled toward the stream and left on site for potential in-stream recruitment.

Measures would be implemented to protect any tailhold trees located in Riparian Reserves from serious damage by requiring the use of straps, plates or cribbing. If cutting were to be necessary, the trees would be felled toward the stream and left on site for potential in-stream recruitment.

General Forest Management Area

Management direction specifies retention of six to eight green conifers per acre, averaged over entire unit acreages, consisting of individual trees, small clumps or stringers (ROD/RMP, p. 64), reflecting existing conifer species composition and the full range of diameter classes greater than 20 inches diameter breast height.

Entries into younger stands would reserve the largest six to eight trees per acre (ROD/RMP, p. 151). In addition, retain green trees for snag recruitment in harvest units where there is an identified near term snag deficit (ROD/RMP, p. 64). Selection of retention trees would favor sugar pine, ponderosa pine, incense-cedar, western redcedar and port-Orford-cedar, where present, over grand fir to move stand composition toward more historical conditions. In particular, Units 29-7-31 A and B, and the west end of Unit 30-8-7A contain good numbers of ponderosa pine and incense-cedar. In Unit 30-8-5A, in addition to some incense-cedar there are three Port-Orford-cedar trees previously reserved as seed trees for their apparent resistance to Port-Orford-cedar root disease (*Phytopthera lateralis*).

As a contribution toward achieving the analytical assumption of providing an average of at least 1.2 snags per acre (PRMP/EIS, Chapter 4-43) to support cavity nesting birds at 40 percent of potential population levels (ROD/RMP, p. 34), snags 20 inches or greater in diameter breast height would be reserved where operationally practicable and not a safety concern. Most of the stands proposed for harvest are younger stands that lack snags. Consequently, retention trees would be marked to reflect the upper range of specified retention (8 trees per acre), and an additional one tree per acre for near term snag recruitment, bringing the total to nine retention trees per acre.

At a minimum, an average of 120 linear feet per acre of large down wood in Decay Classes 1 and 2 would be provided, initially described in the ROD/RMP (p. 65) as pieces greater than or equal to 16 inches in diameter and 16 feet long.

Plan maintenance in the 1997 Roseburg District Annual Program Summary (USDI/BLM 1998b, p. 26) describes a range of scenarios by which this requirement may be met. In addition to natural events such as windfall, or purposely felling retention trees, is allowance for logs from felling breakage that are greater than 30 inches in diameter and greater than ten feet in length, logs in excess of 16 inches in diameter and greater than 25 cubic feet in volume, or the largest material available. Existing large down wood in Decay Classes 3, 4 and 5 would also be reserved under contract provisions.

B. Yarding

For ground-based yarding:

- Operations would be restricted to the dry season, typically mid-May through mid-October, when soils are least susceptible to compaction. The season may be extended if early-spring and/or late-autumn conditions are dry or shortened in the event of abnormally wet weather;
- Equipment would operate on pre-designated trails, using existing trails where practicable, with operations generally limited to slopes of 35 percent or less. Operations on steeper pitches between gentler benches could be authorized where appropriate (USDI/BLM 2002);
- Equipment would avoid perennially wet areas;
- Erosion control measures such as waterbars, slash placement and seeding in skid trails would be implemented where the potential for erosion and delivery to water bodies, floodplains and wetlands exists. Waterbars would be constructed on skid trails using guidelines in Table I-21, page 298, WOPR Appendix I;
- Reused and new skid trails would affect less than 10 percent of the harvest area;
- The width of skid trails would be limited to what is operationally necessary for the equipment (approximately 12 foot width);
- One-end suspension of logs would be ensured during ground-based skidding; and
- Skid trails would be subsoiled and temporary roads be subsoiled and blocked where they join main vehicular roads following completion of ground-based yarding.

For cable yarding:

- Equipment would be capable of maintaining a minimum one-end log suspension. If necessary, contract requirements may specify the type of logging carriage used, and/or require intermediate support.
- Yarding to and hauling off of unsurfaced roads would be restricted to the dry season, typically mid-May through mid-October, subject to circumstances described above.

Cable yarding requires use of trees for tailholds and guyline anchors. Contract provisions require that purchasers obtain written approval before attaching logging equipment to any tailhold tree in the timber reserve and protect against undue damage through use of tree plates, straps, or cribbing. Guyline trees are generally cut because they are located within the guyline radius of cable yarding equipment and hence are subject to state safety regulations.

C. Access

Primary access would be provided by BLM roads and privately-controlled roads where the BLM has rights of use under easement or the terms of reciprocal rights-of-way agreements. The existing network of decommissioned roads within units used for the previous thinning entries would be reopened as needed, principally by blading the existing road bed, and would generally be sufficient to provide in-unit access to landing areas, with one exception discussed below.

Although a few exceptions exist, unnumbered temporary spur roads were primarily built to facilitate ground-based harvest. As such, no surfacing was required as operations on these units was restricted to the dry season. Should a contractor propose to surface a temporary spur road to facilitate all-weather operations, the BLM would consider the proposal(s) on a case-by-case basis, subject to the following provisions: surfacing would be at the purchaser's expense; and upon completion of operations, decommissioning would include removal and disposal of the surfacing aggregate.

In all instances, road work associated with construction, renovation, improvements and decommissioning would be limited to the dry season, typically from mid-May through mid-October, when soils are least likely to be saturated. The season may be extended if early-spring and/or late-autumn conditions are dry or shortened in the event of abnormally dry spring conditions or early onset of autumn rains.

One new road, approximately 1,400 feet in length, is proposed to access a portion of Unit 30-8-7B, in lieu of reopening portions of previously decommissioned roads (Road No. 30-8-8.0 and a temporary spur) within the unit (Map 9 in Appendix A), which would eliminate the need to re-construct two stream crossings on the previously utilized mid-slope road.

The new road would originate at a switchback on Road No. 30-9-13.4, in the NW¼NW¼, Section 18, T. 30 S., R. 8 W. and pass through a pole-sized stand of timber owned by Roseburg Resources Company for approximately 200 feet before crossing onto BLM-administered lands. The road would fork approximately 100 feet across the section line with a short bump-out spur approximately 200 feet in length to the north and west. The main road would run approximately 1,000 feet to the northeast, tying into a previously decommissioned spur road. The new roads would be surfaced to provide all-season access for harvest and other management activities.

If the request for a crossing plat over private lands were not granted, the unit would be harvested using the system of decommissioned roads already present that were utilized for the previous thinning entry. This would require reopening the entire decommissioned portion of Road No. 30-8-8.0, a total of 3,740 feet or 0.71 miles in length, and re-constructing two stream crossings within the unit, rather than only reopening the first half of the road without the need to install any stream crossings. An additional spur road approximately 1,510 feet or 0.29 miles in length would also be reopened. These roads would be blocked, stream crossings removed, and running surfaces slash-mulched upon completion of logging and reforestation efforts.

Landings would be kept to the minimum size needed, using existing landings and roads to the greatest extent practicable. Construction of a new landing, located east of Road No. 28-9-25.1 to avoid location in the Riparian Reserve west of the road, is proposed to facilitate cable yarding of Unit 28-8-31A. This would require clearing of an estimated one acre of timber in a stand approximately 55 years old. The minimum amount of surfacing to provide for use would be applied.

Road Maintenance, Renovation and Improvements

Road maintenance, whether by the BLM or as a Purchaser requirement under a timber sale contract, would generally consist of blading and shaping road surfaces, brushing, cleaning culvert inlets, and spot surfacing with crushed aggregate.

Road renovation, at a minimum, would include replacement of failing cross drain culverts and culverts on small intermittent streams that are not fish-bearing. Appendix B provides a more detailed description of proposed renovation work and site-specific Best Management Practices that would be applied.

Road Decommissioning

In general, temporary spur roads would be decommissioned by construction of drain dips or waterbars, removal of any stream crossing structures and cross-drain culverts, and blocking to vehicular traffic by construction of a berm or placement of a barrier. In instances where deemed suitable, road beds may be subsoiled and/or covered with logging slash.

On inventoried roads anticipated to be needed for future management access, such as Road No. 28-8-20.1, decommissioning would be limited to construction of drain dips or waterbars, removal of any stream crossing structures and cross-drain culverts, and blocking the road to vehicular traffic by construction of a berm or placement of a barrier.

Best Management Practices

Best Management Practices would be applied in road construction, improvement, renovation, use, and decommissioning. The following list is representative and not intended to be all-inclusive of Best Management Practices (USDI/BLM 2012a) that may be implemented.

R 001 – Locate temporary and permanent roads and landings on stable locations, e.g., ridge tops, stable benches or flats, and gentle-to-moderate side slopes. Minimize construction on steep slopes, slide areas and high landslide hazard locations.

R 003 – Avoid locating roads and landings in wetlands, riparian management areas, floodplains and waters of the state. Avoid locating landings in areas that can contribute runoff to dry draws and swales.

R 007 – Design roads to the minimum width needed for the intended use as referenced in BLM Manual 9113.

R 008 – End-haul material excavated during construction, renovation, and/or maintenance where side slopes generally exceed 60 percent, and regardless of slope where side-cast material may enter wetlands, floodplains, and waters of the state.

R 023 – Effectively drain the road surface by using crowning, insloping or outsloping, grade reversals (rolling dips) and waterbars or a combination of these methods. Avoid concentrated discharge onto fill slopes unless the fill slopes are stable and erosion proofed.

R 028 – Divert road and landing runoff water away from headwalls, slide areas, high landslide hazard locations or steep erodible fill slopes.

R 029 – Design landings to disperse surface water to vegetated stable areas.

R 031 – Disconnect the road runoff to the stream channel by outsloping the road approach. If outsloping is not possible, use runoff control, erosion control and sediment containment measures. These may include using additional cross drain culverts, ditch lining, and catchment basins. Minimize ditch flow conveyance to stream through cross drain placement above stream crossing.

R 032 – Locate cross drains to prevent or minimize runoff and sediment conveyance to wetlands, riparian management areas, floodplains and waters of the state. Implement sediment reduction techniques such as settling basins, brush filters, sediment fences and check dams to prevent or minimize sediment conveyance.

R 036 – Armor surface drainage structures (e.g., broad based dips, leadoff ditches) to maintain functionality in areas of erosive and low strength soils.

R 037 – Discharge cross drain culverts at ground level on non-erodible material. Install downspout structures and/or energy dissipaters at cross drain outlets or drivable dips where water is discharged onto loose material, erodible soils, fills, or steep slopes.

R 044 – Provide for unobstructed flow at culvert inlets and within ditch lines during and upon completion of road construction prior to the wet season.

R 045 – Use temporary sediment control measures (e.g., check dams, silt fencing, bark bags, filter strips and mulch) to slow runoff and contain sediment from road construction areas. Remove any accumulated sediment and the control measures when work or haul is complete. When long term structural sediment control measures are incorporated into the final erosion control plan, remove any accumulated sediment to retain capacity of the control measure.

R 061 – Limit road and landing construction, reconstruction, or renovation activities to the dry season. Keep erosion control measures concurrent with ground disturbance to allow immediate stormproofing.

R 082 – Inspect closed roads to ensure that vegetational stabilization measures are operating as planned, drainage structures are operational, and noxious weeds are not providing erosion control. Conduct vegetation treatments and drainage structure maintenance as needed.

R 092 – Implement decompaction measures, including ripping or sub-soiling to an effective depth. Treat compacted areas including the roadbed, landings, construction areas, and spoils sites.

R 094 – On active haul roads, during the wet season, use durable rock surfacing and sufficient surface depth to resist rutting or development of sediment on road surfaces that drain directly to wetlands, floodplains and waters of the state.

R 095 – Prior to winter hauling activities, implement structural road treatments such as: increasing the frequency of cross drains, installing sediment barriers or catch basins, applying gravel lifts or asphalt road surfacing at stream crossing approaches, and cleaning and armoring ditchlines.

R 096 – Suspend commercial use where the road surface is deeply rutted or covered by a layer of mud or when runoff from the road surface is causing a visible increase in stream turbidity in the receiving stream.

Port-Orford-cedar

Port-Orford-cedar is known to be present throughout the Upper Middle Fork Coquille watershed. Since roads are primary vectors by which *Phytopthora lateralis* is spread, the following actions would be taken to minimize the likelihood of transporting infested soil.

- Road construction, renovation and decommissioning would be restricted to the dry season when the risk of spreading spores is least likely;
- All logging and road construction equipment would be steamed cleaned or pressure washed prior to move-in on contract areas, or prior to return if removed from the contract areas during the life of the contracts. Equipment cleaning has been shown to greatly reduce the risk of importing infested soil into unaffected areas; and
- Water taken from sources in the project area for use in road construction, road grading or dust abatement would be treated with a solution of Clorox bleach, to kill any *P. lateralis* spores that might be present.

D. Seasonal Wildlife Restrictions on Harvest Operations

Seasonal operating restrictions for the northern spotted owl would only apply to the portion of Unit 30-8-7B located to the north of Road No. 30-9-11.1. Specifically, operations within applicable disruption threshold distances (35 yards for heavy equipment operation and 65 yards for chainsaw operation) of known northern spotted owl sites or unsurveyed suitable habitat would be prohibited from March 1st to July 15th both dates inclusive. This restriction could be waived until March 1st of the following year if two years of protocol surveys covering all spotted owl habitat within the survey area indicate no resident single owls, territorial owl pairs, or pairs/two owls of unknown status and no activity centers are known to occur in the survey area and no barred owls are detected in the survey area then spot checks in the third and fourth years are not required (USDI/FWS 2012a).

Proposed Units 28-8-31A and B, and 29-7-31A and B are located in the Marbled Murrelet Restriction Corridor within Marbled Murrelet Management Zone 2. If surveys establish occupancy within 100 yards of a unit, the disruption threshold for heavy equipment and chainsaw operations, seasonal restriction would be applied to the unit or appropriate portions from April 1st to August 5th both dates inclusive. Afterwards, operations would be subject to Daily Operating Restrictions from August 6th to September 15th, both dates inclusive. These restrictions prohibit commencement of operations until two hours after sunrise and require operations to cease two hours before sunset. These restrictions would be waived if two years of surveys indicate no occupancy.

Units 30-8-7A and 30-9-27B are located in Marbled Murrelet Management Zone 2, but not within the Restriction Corridor. If marbled murrelet occupancy of adjoining stands is detected, operations would be subject to Daily Operating Restrictions from April 1st to August 5th, both dates inclusive.

There is suitable marbled murrelet nesting habitat just to the east of Unit 29-9-35C, and approximately 90 yards to the north of Unit 30-8-5C. Unit 29-9-35C has all-weather access, so seasonal restrictions would be adopted. The portion of Unit 30-8-7C that is within disruption thresholds would already be subject to seasonal restriction for the northern spotted owl through July 15th. Daily Operating Restrictions would be applied through August 5th, for the balance of the critical breeding period to avoid potential disturbance if marbled murrelets are present.

E. Hazardous Fuels Treatments

Post-treatment activity fuels surveys would be conducted and site-specific plans for fuels reduction treatments would be recommended. The Stereo Photo Series for Quantifying Forest Residues in the Douglas-fir Type of the Willamette National Forest (General Technical Report PNW-GTR-258, Ottmar, Hardy, Vihnanek May 1980) or the Stereo Photo Series for Quantifying Forest Residues in Coastal Oregon Forests (General Technical Report PNW-GTR-231, Ottmar, Hardy) would be used to help identify areas with increased fuel loads. Fuel reduction treatments would be conducted in selected areas to reduce the potential for human caused wildfire ignition, to reduce the potential for wildfire to cross property lines between BLM and private land, and to reduce both the intensity and severity of potential wildfires in the long term (compared to untreated fuels).

Fuel reduction treatments may include hand, machine, and landing pile construction; covering portions of piles with black plastic sheeting; and burning piles within treatment areas, along roads, property lines and at landings. Jackpot (spot) burning or swamper burning may be used individually or in combination in any harvest areas where fuel loading is heavy, the fire risk is determined to be high, or site preparation is required to help facilitate tree planting. Where jackpot burning is applied it is assumed that no more than 25 percent of the area of any individual unit would require burning.

Other treatment options include slash pullback, slashing, lopping and scattering, and firewood cutting. The BLM and operator may remove slash at landing areas to be used as mulch to cover roadbeds during stabilization or for utilization off site. If biomass removal were to occur in lieu of prescribed burning, only logging debris less than six inches in diameter that is accessible from existing roads and landings would be available for removal.

All prescribed burning would require a project level burn plan to be initiated and signed by the Authorized Officer prior to any prescribed burning activity. Burning would be conducted in accordance with the Roseburg District RMP, and a Coos Bay/Roseburg Fire Management Zone Fire Management Plan which is updated annually. The Oregon State Implementation Plan and Oregon Smoke Management Plan as administered by the Oregon Department of Forestry would be followed and would assure BLM compliance with the provisions of the Clean Air Act. Burning would be conducted under good atmospheric mixing conditions to lessen the impact on air quality in Smoke Sensitive Receptor Areas.

Recommended fuel treatments, grouping proposed units by probable sale configuration, are listed in Table 2.2 on the following page.

Table 2.2 Proposed Fuel Management Treatments

Township Range Section	Unit Number	Unit Acres	Jackpot Burning Acres	Lop and Scatter Acres	Slash Pullback Acres	Handpile Acres	Machine Pile Acres	Total Landing Piles
028S-08W-19	19A	21	5	0	0	0	0	4
028S-08W-29	29B	6	1	0	0	0	1	4
028S-08W-29	29C	9	2	0	0	0	2	4
028S-08W-29	29D	10	2	0	0	0	2	4
028S-08W-31	31A	4	1	0	0	0	0	1
028S-08W-31	31B	23	5	0	3	0	4	8
028S-08W-31	31D	3	1	0	6	0	3	2
028S-08W-31	31E	6	1	0	0	0	6	2
029S-08W-32	32A	57	14	0	0	0	0	8
030S-08W-05	05A	34	8	1	0	0	5	8
030S-08W-05	05B	17	4	1	0	0	0	5
030S-08W-05	05C	26	6	1	0	1	0	10
030S-08W-07	07A	25	9	0	0	0	8	10
Totals		**241**	**59**	**3**	**9**	**1**	**31**	**70**
Township Range Section	**Unit Number**	**Unit Acres**	**Jackpot Burning Acres**	**Lop and Scatter Acres**	**Slash Pullback Acres**	**Handpile Acres**	**Machine Pile Acres**	**Total Landing Piles**
029S-07W-25	25A	30	7	0	0	3	6	9
029S-07W-31	31A	8	2	0	0	0	0	2
029S-07W-31	31B	25	6	0	0	3	6	2
029S-07W-35	35A	81	20	0	3	2	3	15
Totals		**144**	**35**	**0**	**3**	**8**	**15**	**28**
Township Range Section	**Unit Number**	**Unit Acres**	**Jackpot Burning Acres**	**Lop and Scatter Acres**	**Slash Pullback Acres**	**Handpile Acres**	**Machine Pile Acres**	**Total Landing Piles**
030S-08W-07	07B	120	40	0	0	0	0	24
030S-08W-07	07D	49	12	0	0	0	2	12
030S-09W-27	27A	13	4	0	1	0	0	5
030S-09W-27	27B	33	0	0	0	0	0	6
Totals		**215**	**56**	**0**	**1**	**0**	**2**	**47**
Township Range Section	**Unit Number**	**Unit Acres**	**Jackpot Burning Acres**	**Lop and Scatter Acres**	**Slash Pullback Acres**	**Handpile Acres**	**Machine Pile Acres**	**Total Landing Piles**
029S-09W-35	35A	20	5	0	0	0	0	4
029S-09W-35	35B	33	7	0	0	0	0	11
029S-09W-35	35C	16	4	0	0	0	0	10
030S-09W-03	03A	103	25	55	0	0	55	16
030S-09W-03	03B	51	12	0	0	0	0	11
030S-09W-03	03C	13	3	0	0	0	0	5
030S-09W-03	03D	31	7	0	0	0	0	15
Totals		**267**	**63**	**55**	**0**	**0**	**55**	**72**
Total Acres/Piles		**867**	**217**	**58**	**13**	**9**	**103**	**217**

F. Reforestation

In stands in the Camas Valley area, grand fir is present in numbers surpassing historic representation in native stands, and it is expected that natural regeneration following harvest would largely consist of grand fir. To restore stand composition to more historic conditions and address concerns about changes in forest composition due to changing climatic conditions, stands would be replanted to an average density of approximately 400 trees per acre with a species mixture of approximately 75 percent Douglas-fir and 25 percent minor species, using genetically improved nursery stock where available. Minor conifer species may include Port-Orford-cedar, western redcedar, incense-cedar, ponderosa pine, and sugar pine as appropriate to individual site conditions.

Treatments to maintain survival and long-term dominance of tree species would be applied and could include mulching to reduce competition from grasses, shading, and protection from herbivory (browsing) by installation of tubing.

G. Noxious Weeds and Invasive Non-Native Plants

Preventative measures would be implemented that focus on minimizing the risk of introducing new weed infestations or spreading existing ones, and would include:

- Steam cleaning or pressure washing equipment used in logging and road construction to remove soil and materials that could transport weed seed or root fragments.
- Scheduling work in uninfested areas prior to work in infested areas.
- Seeding and mulching disturbed areas with native grass seed; or revegetating with native plant species where natural regeneration is unlikely to prevent weed establishment.
- Any new infestations would be treated and periodically monitored to determine whether further treatments or alternative treatments are indicated.

III. Resources not Present or Unaffected by the Alternatives

Areas of Critical Environmental Concern, prime or unique farmlands, parklands, wilderness, and Wild and Scenic Rivers are absent from the project area, and hence would be unaffected under any of the alternatives. Wetlands would be protected by establishment of Riparian Reserves.

IV. Issues Considered but not Analyzed in Detail

Native American Religious Concerns

None have been identified by the interdisciplinary team or through correspondence with local tribal governments.

Cultural and Historical Resources

Thirty-six cultural resource surveys have been conducted in the project area including CRS# 038523, 038603, 308604, 038907, 039104, 039211, 039303, 039307, SD9402, SD9405, SD9413, SD9505, SR0010, SR0101, SR0102, SR0104, SR0105, SR0118, SR0201, SR0205, SR0206, SR0303, SR0310, SR0403, SR0508, SR0604, SR0711, SR0713, SR1002, SR1003, SR1208, SR1209, SR 1506, SR9710, SR9815, and TY9405.

CRS# SR1506 recorded two sites within the vicinity of, but outside proposed harvest units. OR-10-322 consists of two rock engravings of dubious age, first identified in 1997 in association with another project (Kola's ridge Commercial Thinning). The etchings are located in a rock outcrop along a road accessing one of the units. Its position within the rock outcrop and upslope of the road limits the potential for any inadvertent impacts. OR-10-332 is a lithic scatter that straddles a road near another unit. The site has been heavily modified by the initial road construction and previous logging activities, and has the potential to be further impacted by the proposed timber harvest. Both sites will be formally evaluated in 2015 to ascertain if they are eligible for listing on the National Register of Historic Places. If eligible, they will be avoided; if not eligible, the sites will not be managed for conservation. In this way, no historic properties will be impacted, and the BLM will meet its Section 106 responsibilities under the guidance of the 2012 National Programmatic Agreement and 2015 State Protocol.

Environmental Justice

The proposed action is consistent with Executive Order 12898 which addresses Environmental Justice in minority and low-income populations. The BLM has not identified potential impacts to low-income or minority populations, internally or through the public involvement process.

Recreation

There are no developed recreation sites or facilities in the project area. Recreational activities are limited to those of a dispersed nature which may include off-highway vehicle use on existing roads and trails, hiking, hunting, rock climbing, and wildlife watching. Opportunities of this nature are abundant on Federal lands within the Roseburg District and on adjoining BLM and U.S. Forest Service administrative units.

Off-Highway Vehicle Use

Off-highway vehicle (OHV) use is limited to existing roads and trails by the ROD/RMP (p. 58). None of the proposed alternatives would affect current opportunities for OHV recreational use as new proposed roads would generally be sub-soiled and slash mulched, or water barred and slash mulched to discourage OHV use. It is recognized that unauthorized OHV can and does occur on the landscape. Timing and location of such activities cannot be reasonably foreseen, however, so the effects of the alternatives on this activity cannot be projected.

Visual Resources

Signal Tree Road (No. 29-9-36.0) is straddled by proposed Units 29-9-35B and 29-9-35C in the SW¼ of Section 35, T. 29 S., R. 9 W., W.M. The area is designated as Visual Resource Management (VRM) Class II land. VRM objectives (ROD/RMP p. 53) are for retention of the existing character of the landscape, with low level of change to the characteristic landscape. Management activities may be seen but should not attract the attention of the casual observer. Most users of this road segment would be individuals engaged in forest management activities. Other primary users would be hunters and special forest products collectors. Very little driving for pleasure occurs, and overall use of the road would be considered low.

An average vehicular speed of 30 miles per hour (mph) was used to determine the length of time the proposed harvest unit would be seen from the road. Under such a scenario, the units would be in sight for approximately 30 seconds. With VRM Class II objectives in mind, a 50-foot visual buffer would be established along either side of the road to screen the regeneration harvest units from view, so as not to attract the attention of the casual motorist.

Units Considered but not Analyzed in Detail

Units 28-8-29D, 28-8-31C, and 30-8-7C were dropped from further consideration as the establishment of Riparian Reserves effectively eliminated acres available for harvest.

Unit 30-9-23A was eliminated from further consideration because it is a small unit in a location isolated from any of the other proposed units, with a low estimated timber volume and difficult access.

Proposed Units 29-8-29A and 29-8-29B are under 60 years of age. These units were dropped due to age limitation as described in the RMP, eliminating the proposed road work necessary to access them.

V. Alternatives Considered but not Analyzed in Detail

A. Thinning in Lieu of Regeneration Harvest

As described on page 2 of this document, the purpose of the proposed action is to apply regeneration harvest to previously thinned stands in the General Forest Management Area, as provided for in the ROD/RMP. The stands under analysis have all been previously thinned in the past 8 to 17 years and are not suited to a second thinning entry.

Regeneration harvest is authorized under the ROD/RMP, and the stands are presently suitable for such an action. There is nothing in the ROD/RMP that requires us to conduct thinning elsewhere, and forgo regeneration harvest in stands suited for such.

B. Confine Harvest to Stands Under 80 Years of Age

As discussed on page 2, the ROD/RMP directs that scheduling of regeneration harvest should occur at culmination of mean annual growth increment at ages 80 to 110 years, but also authorizes harvest of stands as young as 60 years in order to develop a desired age class distribution across the landscape. The ROD/RMP places no upper age limitation on regeneration harvest in the Matrix allocations, and to do so would be an arbitrary decision given management direction for the land use allocations which are to be managed for permanent, sustainable timber production. Even so, of the 28 units proposed for harvest, all but three are age-class 60, 70 or 80 years. The three units that are age class 90 years total 54 acres in area, less than seven percent of the total harvest proposed.

C. Limit Harvest to Thinning

The stands selected for this project have already been thinned, and rethinning is not silviculturally appropriate. The lands are allocated for practices that include regeneration harvest, so a decision to do so is consistent with management direction.

In the past it has been suggested that timber harvest should be limited to thinning of plantations. Thinning levels on the Roseburg District, in the Matrix and reserves combined, were estimated to be 250 acres annually (UDSI/BLM, 2007 p. 84). Through fiscal year 2014, the Roseburg District had conducted thinning at a rate exceeding 370 percent of what was anticipated (USDI/BLM 2015 p. 2). This is not a sustainable practice, and without regeneration harvest in the Matrix allocations thinning opportunities will be insufficient to achieve the annual ASQ.

Chapter Three

The Affected Environment and Environmental Consequences

This chapter summarizes the current condition of specific resources present or with a reasonable potential to be present in the project watersheds that could be affected by the proposed project. It addresses anticipated short-term and long-term effects that may result from implementation of the alternatives, including those effects that are direct, indirect and cumulative.

The discussion is organized by resource, addressing the interaction of the effects of timber management with current baseline conditions of this environment. The analysis describes potential effects, how they might occur, and the incremental result of those effects, focusing on direct and indirect effects with a realistic potential for cumulative effects, rather than those of a negligible or discountable nature.

The Council on Environmental Quality (CEQ) provided guidance on June 24, 2005, as to the extent to which agencies of the Federal government are required to analyze the environmental effects of past actions when describing the cumulative environmental effect of a proposed action in accordance with Section 102 of the National Environmental Policy Act (NEPA). CEQ noted the "[e]nvironmental analysis required under NEPA is forward-looking," and "[r]eview of past actions is only required to the extent that this review informs agency decisionmaking regarding the proposed action." This is because a description of the current state of the environment inherently includes effects of past actions. Guidance further states that "[g]enerally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historic details of individual past actions."

The cumulative effects of the BLM timber management program on the Roseburg District have been described and analyzed in the PRMP/EIS (pp. 4-7 to 99), incorporated herein by reference.

I. Timber Resources

A. Affected Environment

The Olalla-Camas project area is located in Southwest Oregon, at elevations between 1,100 and 2,900 feet. Stands proposed for regeneration harvest range in age from 60 to 90 years, and substantial portions of all the stands were previously thinned between 1998 and 2008. The site index (King, 50-year) ranges from 70-127, and averages 103 (low site class III). Average total height of the dominant and codominant trees at a given age is the site index.

All of the stands, excepting Unit 28-8-19A, are dominated by small (11-21 inches DBH) to large (>21 inches DBH) Douglas-fir sawtimber. There are few older remnant trees that predate the current stands. Proposed Unit 28-8-19A is dominated by western hemlock (77 percent) whereas Douglas-fir makes up nine percent of the stand. Stand origin was by natural regeneration following natural disturbance or previous regeneration harvest. Since all of the stands were thinned in recent years, these are considered to be managed stands.

The stands are in the "understory reinitiation" phase of development as described by Oliver and Larson (1996). As the overstory trees grow older, growth of new vegetation appears on the forest floor. Plants and seedlings in this stratum do not grow rapidly in the limited sunlight and tend to be visibly distinct from older trees in the upper strata.

The project area is located within the Coast Range province approximately north of Highway 42 and the Klamath Mountain province south of Highway 42 (Franklin and Dyrness 1973). Major vegetation types include the western hemlock zone within the Coast Range province and the mixed conifer and mixed evergreen zone within the Klamath Mountains province. As a result of frequent natural disturbances in southwestern Oregon, the overstory of forests in the western hemlock series is typically dominated by Douglas-fir, a pioneer species.

Past cruise data in native stands within the Middle Fork Coquille watershed indicates that grand fir made up less than ten percent of total merchantable stems. Due to previous harvest methods, fire suppression, and the ability of grand fir to survive and grow in shaded conditions, regeneration in the stands proposed for harvest was largely grand fir, accounting for up to 50 percent stand composition in all but three units, with minor representation of western hemlock, western redcedar, incense-cedar, ponderosa pine, sugar pine, and Port-Orford-cedar. Hardwoods are represented by Pacific madrone and bigleaf maple along with lesser amounts of golden chinkapin and red alder.

Stand exams were conducted in 2014, excluding Riparian Reserves and unthinned areas, using the BLM Ecosurvey Stand Exam Program, to determine current conditions. Organon Forest Growth and Yield Model version 9.1 (Hann *et al.* 2005) for southwest Oregon was used to estimate future growth and development. Modeling results are summarized in Table 3.1. Stand ages were derived by sampling breast height ages of dominant trees. Total age was calculated, adjusting for age at breast height, based on site productivity class, and a simple average was used to establish stand age class.

Figure 3.1 Representative Photographs of Current Stand Conditions

28-8-29B

28-8-31B

29-7-31B

T29S-7W-35A

Table 3.1 Current Stand Attributes

Unit ID	Acres	Ten-Year Age Class[1]	Total Trees per Acre	Merchantable Trees >7" DBH per acre		Canopy Closure (%)[3]
				Trees per Acre	QMD (inches)[2]	
28-8-19A	21	90	234	84	16.7	85
28-8-29B	6	60	113	98	16.7	69
28-8-29C	9	60	113	98	16.7	69
28-8-29D	10	60	113	98	16.7	69
28-8-31A	4	80	66	51	21.0	55
28-8-31B	23	80	66	51	21.0	55
28-8-31D	3	70	84	69	19.5	67
28-8-31E	6	70	84	69	19.5	67
29-7-25A	30	60	190	70	16.8	63
29-7-31A	8	90	166	61	18.7	66
29-7-31B	25	90	166	61	18.7	66
29-7-35A	81	60	93	77	17.9	66
29-8-32A	57	60	75	60	16.4	52
29-9-35A	20	60	141	96	12.7	60
29-9-35B	33	60	146	55	20.4	62
29-9-35C	16	60	42	42	19.5	44
30-8-5A	34	70	79	49	22.2	61
30-8-5B	17	60	85	40	22.7	55
30-8-5C	26	60	207	57	20.3	66
30-8-7A	25	70	388	44	22.1	70
30-8-7B	120	60	122	70	17.6	61
30-8-7D	49	60	122	70	17.6	61
30-9-3A	103	60	102	69	19.0	67
30-9-3B	51	70	114	101	17.8	77
30-9-3C	13	60	183	78	16.5	66
30-9-3D	31	60	234	73	16.5	67
30-9-27A	13	70	95	50	18.0	52
30-9-27B	33	80	59	44	18.8	48

[1] Stand age from stand exam data collected in 2014.
[2] Quadratic Mean Diameter (QMD) is defined as the mean diameter of all stems measured at breast height (4.5')
[3] Canopy Closure – taken from the stand exam data analyzed in Organon, SWO v.9.1. Organon 9.1 adjusts calculated canopy cover for overlap by assuming that trees are randomly spaced. This adjustment underestimates canopy cover for regularly spaced, i.e. previously thinned stands. A conversion chart and equation was used for adjusting the 9.1 calculated estimates to reflect managed stand conditions.

Coarse Woody Debris (CWD)

Coarse wood includes downed wood, snags, and live trees with dead or broken tops or decay. Down wood and snag data for the project area is displayed in Appendix C.

Management direction for the matrix land use allocations specifies the retention of a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches diameter and 16 feet long. Where this cannot be met with existing coarse woody debris, merchantable material will be used to make up the deficit (ROD, p. 34). In addition to green tree retention management action/direction, retain green trees for snag recruitment where there is an identified, near term snag deficit (ROD, p. 34). Out of twenty-eight units comprising the Olalla-Camas proposal, eleven units have between 0.2 and 9.5 snags per acre with heights of 33 to150 feet and diameters of 10 to 60 inches.

Forest Health

Port-Orford-cedar are generally found in small numbers in mixed conifer stands which allows them to survive under shade more successfully and have a very limited natural habitat. They are affected by a root disease caused by the pathogen *Phytophthora lateralis,* present throughout the Upper Middle Fork Coquille and Olalla Creek-Lookingglass Creek watersheds. The disease spreads primarily by water-borne spores that germinate when they come in contact with roots of Port-Orford-cedar. Spores may also be transported in soil on logging equipment, by vehicles using unsurfaced roads, and by wildlife. Infection starts in the small roots, spreading into larger roots until the tree is girdled near the collar. Infection can also occur through wounds. It typically takes large trees two to four years to die after being infected.

The pathogen that causes Port-Orford-cedar root disease is not native, and no immunity to infection has been discovered, although three seed trees previously reserved in Unit 30-8-5A will continue to be reserved for their apparent resistance to the root disease. See Appendix D for the Port-Orford-cedar Risk Key for further information about Port-Orford-cedar within the project area.

Endemic diseases can be found, many of which can be mitigated post-harvest to ensure healthy new forests. Laminated root rot (*Phellinus weirii*) is a native pathogen that spreads by root to root contact between live, susceptible trees which include Douglas-fir and grand fir. Laminated root rot kills tree roots leaving the affected trees highly susceptible to windthrow. It is a natural part of many forest ecosystems (Thies and Sturrock 1995) that generally increases structural diversity by creating gaps, favoring shrubs and hardwoods, and contributing snag and downed wood habitat.

Dwarf mistletoe, a parasitic plant, infects western hemlock causing growth loss by diverting tree photosynthate into the formation of brooms, but rarely causes tree mortality.

Douglas-fir bark beetles are endemic in the project area. They feed on the cambium of live and very recently (1–2 years) dead trees. Eggs are laid under the bark of infested trees where the hatch and the larvae mature before emerging as adults. Douglas-fir trees weakened by root disease infection are more likely to be attacked by the beetle (Hadfield 1986). In stands under 100 years old, the risk of mortality to healthy green trees is low, even when beetle populations may be quite high.

Weather-induced mortality from wind and snow has been observed along the edges of aggregates and along the edges of untreated stands bordering harvested areas (Maguire *et al.* 2006). Since all of the forest stands proposed for harvest have been previously thinned over five years ago, the stands have had time to “acclimate” and potential retention trees are expected to be relatively wind-firm and substantial blow-down is not expected as a result of harvesting (Busby 2006).

The present age-class distribution of forest stands under the administration of the BLM in the project watersheds was derived from the relevant watershed analyses for the Upper Middle Fork Coquille, Olalla Creek-Lookingglass Creek and Clarks Branch-South Umpqua watersheds (USDI/BLM 1999a, 1998a and 1999b). With the exception of a variable retention harvest project in the Upper Middle Fork Coquille watershed analysis unit, no timber harvest, other than small acreages associated with reciprocal rights-of-way, has occurred in these watersheds over the past 15 years that would have altered age class distribution. These actions predate publication of the watershed analyses, the sole exception noted.

As a consequence, the watershed analyses provide a reasonable representation of present forest age classes on BLM-administered lands with the caveat that the stands have, on average, aged another 15 years from what is described resulting in a reduction in younger age classes, such that 0-10 and 10-20 10-year age classes are generally unrepresented, and an increase in older age classes, particularly in the 80-120 year range. Comparable data is not available from the East Fork Coquille watershed analysis, but given that the Roseburg District administers only 490 acres, 0.6 percent of the watershed area, harvest of an estimated 21 acres in this watershed would have largely undetectable and discountable effects on the age-class distribution of the estimated 45,424 acres under BLM administration.

Table 3.2 summarizes age class distribution. No adjustments were made for general aging of stands since age-class distributions were reported in watershed analyses 15 to 17 years ago, or the removal of 135 acres of 60 to 70 year-old stands associated with a recent variable retention harvest in the Upper Middle Fork Coquille watershed analysis unit. Consequently, forests in the 0 to 10 and 10 to 20 year age classes have nearly ceased to be represented on BLM-administered lands in the project watersheds.

Table 3.2 Age Class Distribution of BLM-Administered Lands in the Project Watersheds

	Acres/percent by Individual Watershed		
Age Class (years)	**Upper Middle Fork Coquille**	**Olalla Creek-Lookingglass Creek***	**Clarks Branch-South Umpqua**
Non-Forest	169/1	246/1	487/6
0 to 10	2,175/9	8,768/32	804/10
10 to 20	1,995/8		350/5
20 to 30	4,589/18		860/11
30 to 50	4,848/19	7,210/26	1,784/23
50 to 80	2,332/9		290/4
80 to 120	1,767/7	11,167/41	1,202/16
120 to 200	2,069/8		694/9
200+	6,021/23		1,209/16

*Age Class breakdown only available in intervals of 0 to 30, 31 to 80, and 80+ years

B. Alternative One (No Action) - Effects

Stand Development

Absent regeneration harvest or substantial natural disturbance, stands would continue to develop along current growth trajectories. Canopy cover and relative density in the previously thinned stands would continue to increase, with rates of change varying dependent on current stand structure, age, and site productivity.

Crowns of less competitive trees would continue to recede (Chan *et al.* 2006), with increasing suppression mortality and decreasing diameter growth as trees compete for water, nutrients, and sunlight (Oliver and Larson 1990). Non-suppression or irregular-mortality from insects, disease, windthrow, and stem breakage could occur across all crown classes at any age. As stands age, regular mortality declines and irregular mortality factors become more important (Oliver and Larson 1990). In the short-term, shrub density and cover would remain generally stable (Chan *et al.* 2006). Over the long-term, shrubs and shade-tolerant tree species, such as western hemlock, would gradually increase in numbers as the crowns of overstory trees recede and tree mortality allow increased light in the understory (Oliver and Larson 1990).

Forest habitat conditions would be principally influenced by the growth and mortality of overstory trees, as well as development of an understory tree layer. Understory conifer and hardwood tree and shrub vigor and survival would diminish as the overstory canopy closes (Chan *et al.* 2006; Cole and Newton 2009). In fifty years the stand structure class is expected to be a simple single-story condition (Chan *et al.* 2006; Cole and Newton 2009).

Because of the original stand harvest and development history along with the previous thinning treatment, the snag and down log component is generally lacking in these proposed units. It would likely take several decades for these stands to accumulate larger snags and down logs (>16 inches dbh) through suppression mortality or minor disturbance events.

Table 3.3 Alternative One-Predicted Attributes of Representative Stands at 50 Years in the Future

Unit ID	Total Stand Age[1]	Total Trees Per Acre	Merchantable Trees >7" DBH		Canopy Closure[3]
			Trees Per Acre	QMD[2] (inches)	
28-8-29B,C,D	110	90	87	23.7	79
28-8-31A,B	130	54	46	25.1	62
29-7-31A,B	140	121	83	17.5	72
29-7-35A	110	77	72	25.2	75
29-9-35B	110	103	50	19.4	71
30-8-5A	120	66	53	24.1	67
30-8-7B,D	110	81	64	23.0	71
30-9-3A	110	85	66	24.7	77

[1]Stand age from stand exam data collected in 2014.
[2]Quadratic Mean Diameter (QMD) is defined as the mean diameter of all stems measured at breast height (4.5')
[3]Canopy Closure – from the stand exam data analyzed in Organon, SWO v.9.1, adjusted for canopy overlap by assuming that trees are randomly spaced. This adjustment underestimates canopy cover for regularly spaced, i.e. previously thinned stands. A conversion chart and equation was used for adjusting the 9.1 calculated estimates to reflect managed stand conditions.

Consistency with the Purpose and Need for Action

This alternative would not meet the described purpose and need for action as it would not meet the statutory requirement for the Roseburg District to provide a predictable and sustainable supply of timber in support of logging and forest products manufacturing, at the local and regional scales. There would be no revenues generated to help support local county governments and social services, and return monies to the U.S. Treasury that defrays, in part, the cost of management of the Federal lands. The objective of development of a desired age-class distribution across the landscape would likewise not be furthered.

C. Alternative Two (Proposed Action) - Effects

Stand Development

Harvesting would change the current vegetation structure and composition to one resembling *early-seral* stage (ROD/RMP, p. 112). This is also known as the "stand initiation stage" (Oliver and Larsen 1996), where forest floor herbs, shrubs, advanced regeneration, buried seeds and roots are left behind.

The stand initiation stage, before the growing space is fully reoccupied and new stems quit initiating, is the time of very high numbers of plant species (Oliver et.al. 1985; Isaac 1940). The composite effects of harvest types and distribution suggest that over the next 50 years, many attributes found in unmanaged mature and old-growth forest stands would be maintained or created, with the stand structure trending from stand-establishment-with-structural-legacies to mature-multiple-canopy structure.

Dispersed retention trees would provide short and long-term live and dead structural legacies. Mortality of dispersed retention trees has been quantified by several recent studies (Buermeyer and Harrington 2002; Busby *et al.* 2006; Maguire *et al.* 2006; Garber *et al.* 2011). On an annualized basis these studies report mortality rates ranging from about 0.6 to 2.2 percent for dispersed retention trees within the range of retention levels expected for the proposed project. Causes of mortality include wind-throw, wind-topping, and logging damage. Based on these studies, a mortality rate for dispersed retention trees of ten percent per decade for the first two decades is assumed, with estimated rates of three percent per decade in subsequent years (Lewis and Pierle 1991). It is expected that coarse woody debris and dispersed green would meet or exceed RMP requirements, adding considerable structural complexity to the regenerated stands.

Surviving trees would be expected to maintain pre-harvest basal area growth rates (Garber *et al.* 2011) or exhibit a short-term decrease (North *et al.* 1996). Increased growth rates in low density mature trees following harvest begins within the range of about five to 25 years post-harvest (Latham and Tappeiner 2002). Areas of dispersed retention would follow a developmental sequence similar to that reported by Schoonmaker and McKee (1988) for similar clearcut sites in the western Cascades.

The harvest units would be managed for full site occupancy to maximize future timber volume, with reestablishment through a combination of natural regeneration and replanting.

Natural regeneration alone has often proven undependable for reforestation in a prompt manner (Stein 1955). However, some natural regeneration is likely to survive within the harvested units on undisturbed areas (Dyrness 1973). Establishment of natural regeneration from adjacent stands and dispersed retention trees is likely, but not considered a reliable regeneration option for meeting reforestation goals (Ketchum and Tappeiner 2005). Additionally, natural regeneration would primarily be grand fir which is not considered desirable.

Planted commercial conifer species would enhance the potential for the development of a conifer dominated forest stand (Tappeiner *et al.* 2007), and provide the opportunity to create a more diverse species composition. Planting with a mixture of 75 percent Douglas-fir and 25 percent cedars and pines should result in more adaptive stand conditions in response to drought, fire, etc. Mortality rates of planted conifers would be expected to range between 15 to 30 percent in the first three to four years following planting, then substantially decline after that. Regeneration growth rates substantially less than those found with clearcut harvesting would be expected due to the effects of competition for light, moisture and nutrients from dispersed retention (Acker *et al.* 1998; Lam and Maguire 2011).

Areas dominated by grand fir are less resistant to disturbance by insect attack and wildfire. Targeting grand fir for removal would move stand composition closer to levels found in natural stands based upon historic representation. Substitution of Douglas-fir, cedars and pines in comparable diameter classes would help achieve the desired stand species composition.

Figure 3.2 illustrates typical post-harvest conditions in a regeneration harvest with dispersed retention. Table 3.4 describes anticipated stand condition at 50 years post-harvest.

Figure 3.2 Regeneration Harvest with Dispersed Retention

Table 3.4 Alternative Two – Predicted Attributes of Representative Stands at 50 Years Post-Harvest

Unit ID	Total Trees Per Acre	Merchantable Trees >7" DBH		Canopy Closure
		Trees Per Acre	QMD (inches)	
28-8-29B,C,D	239	206	12.2	90
28-8-31A,B	240	180	10.5	83
29-7-31A,B	244	154	9.8	79
29-7-35A	236	183	12.3	89
29-9-35B	240	186	10.5	83
30-8-5A	237	193	10.9	85
30-8-7B,D	240	203	11.7	89
30-9-3A	238	204	12.4	90

Individual species growth would differ based on inherent growth capability and differences in response to shading and root competition from retention trees and other vegetation, and herbivory (Harrington 2006). Growth rate reductions of regeneration compared to full potential would be in the range of 30 to 50 percent based on the amount and distribution of green-tree retention in individual units (Di Lucca and Goudie 2004). Non-tree vegetation is also assumed to grow at rates below full potential caused by shading, and competition with other vegetation.

At the project scale, approximately 753 acres of forest stands 60 to 80 years old, and 114 acres of stands 80 to 90 years old would be converted to age class 0 to 10. This would amount to a reduction in 60 to 80 year old stands to 15,711 acres, a reduction of approximately 4.5 percent; and a reduction in 80+ year old stands to 24,015, a reduction of approximately 0.5 percent.

Consistency with the Purpose and Need for Action

This alternative would meet the purpose and need for action, generating an estimated 15 to 18 million board feet of timber for manufacturing into a variety of forest products, supporting logging and forest products manufacturing at the local and regional scales, consistent with the statutory responsibility of the Roseburg District. Revenues generated would help support local county governments and social services, and return monies to the U.S. Treasury to partially defray the cost of Federal land management.

The desired age-class distribution for lands managed by the Roseburg District depicted in the PRMP/EIS (Chapter 4-26 & 27) reflects the entire land base managed by the District. As no regeneration harvest is scheduled or authorized in Riparian Reserves and Late-Successional Reserves, only regeneration harvest in the Matrix Allocations and the Little River Adaptive Management Area provide the opportunity to create early (0-10 years) and mid (20-40 years) stages of forest succession, in the early. As described on page 25, forests in the 0 to 10 and 10 to 20 year age classes have nearly ceased to be represented on BLM-administered lands in the project watersheds. The regeneration harvest of approximately 870 acres would be consistent with the purpose and need because it would create forest stands in the 0-10 year age-class although it would only represent a contribution of approximately 0.2 percent at the scale of the entire Roseburg District.

II. Wildlife

A. Affected Environment

1. Threatened and Endangered Species

Federally-threatened northern spotted owl (*Strix occidentalis caurina*)

Habitat requirements and conditions

The northern spotted owl generally inhabits forests older than 80 years of age that provide habitat for nesting, roosting and foraging (NRF). Stands fulfilling all three of these needs are referred to as suitable habitat.

Suitable habitat typically consists of: multi-layered, multi-species canopies dominated by large overstory trees greater than 20 inches, diameter breast height; canopy cover of 60 to 80 percent; open spaces within and below the canopy of the dominant overstory; trees with large cavities and bole or crown deformities; numerous large snags; and large amounts of down wood (Thomas *et al.* 1990, USDI/FWS 1990, Courtney *et al.* 2004).

Younger forest stands (40 to 79 years old) usually lack habitat components suitable for nesting. These stands may provide some roosting and foraging opportunities and can provide connectivity between suitable habitat patches and facilitate dispersal (Courtney *et al*. 2004, USDI/FWS 2011a). Dispersal habitat is defined as conifer-dominated forest stands with canopy closure exceeding 40 percent, and an average diameter breast height of 11 inches or greater (Thomas *et al.* 1990). Dispersal habitat is essential to the movement of juvenile and non-territorial (e.g. single birds) northern spotted owls, enabling territorial vacancies to be filled, and for providing adequate gene flow across the range of the species (USDI/FWS 2011a). The units proposed for treatment range in age from 60 to 90 years-old and have all been previously thinned such that canopy cover has been reduced, thereby limiting these stands to a principal function as dispersal habitat.

A **known northern spotted owl** site is defined as a location with evidence of continued use. Habitat condition in the vicinity of a northern spotted owl site is generally assessed by evaluating available suitable and dispersal habitat at three analytical scales: home range, core area, and nest patch.

The **Home Range** is represented as a circle centered on a nest site, representing the area assumed to be used for nesting, roosting, and foraging when occupying the site. Home ranges frequently overlap, and habitat may be shared by adjacent resident and dispersing northern spotted owls. Home range size varies by physiographic province. In the Klamath Province a home range has a radius of 1.3 miles, encompassing approximately 3,340 acres, while in the Oregon Coast Range Province the radius is 1.5 miles encompassing approximately 4,523 acres.

The minimum suitable habitat threshold considered essential to maintain northern spotted owl life functions is 40 percent of total home range acres (USDI/FWS 2008b, USDI/FWS 2011a), in this analysis 1,336 acres for the Klamath Province and 1,900 acres for the Coast Range Province. Only habitat conditions on BLM-managed lands are considered to contribute to the viability of northern spotted owl home ranges. Private forest lands were not considered, since they are not expected to provide any more than dispersal habitat in the long term.

Thirteen proposed harvest units overlap nine northern spotted owl home ranges. Table 3.5 illustrates that available suitable habitat (NRF) is below viability thresholds in all nine home ranges. It is likely that resident northern spotted owls are relying on dispersal habitat to provide foraging opportunities and facilitate connectivity between suitable habitat patches.

The **Core Area** is an area of approximately 500 acres, represented by a 0.5-mile radius circle centered on the nest tree (or activity center), most heavily used area during the nesting season. Core areas are defended by territorial northern spotted owls and generally do not overlap the core areas of other home ranges. The minimum suitable habitat threshold considered essential to maintain northern spotted owl life functions is 50 percent of total core area acres (USDI/FWS 2008a, USDI/FWS 2011a). All nine sites that overlap the proposed harvest units have core areas that are below viability thresholds (Table 3.5). Portions of five proposed units provide dispersal habitat that may be used as foraging habitat within three different core areas (Table 3.5).

The **Nest Patch** is located within the core area and is represented by a circle 300-meter in radius encompassing about 70 acres centered on the nest tree (or activity center). Management activities in NRF habitat within a nest patch are considered likely to affect the reproductive success of nesting northern spotted owls (USDI/FWS 2008a, USDI/FWS 2011a). Table 3.5 illustrates that none of the sites have 100 percent NRF habitat in the nest patch.

Table 3.5 Current Habitat Conditions in Northern Spotted Owl Home Ranges in the Project Area[1,2,3,4]

Owl Site Number (IDNO)	Province	Home Range Habitat Acres (%)		Core Area Habitat Acres (%)		Nest Patch Habitat Acres (%) [4]	
		NRF	Dispersal	NRF	Dispersal	NRF	Dispersal
0255O	Klamath	719 (21)	647 (19)	30 (06)	148 (30)	9 (13)	16 (22)
2208B	Coast	441 (10)	962 (21)	58 (12)	88 (18)	37 (53)	14 (20)
1915O	Klamath	1182 (35)	113 (03)	214 (43)	0 (00)	52 (75)	0 (00)
1981O	Klamath	280 (08)	983 (29)	102 (20)	188 (38)	44 (62)	4 (06)
2097B	Klamath	403 (12)	879 (26)	68 (14)	108 (22)	0 (00)	0 (00)
2097C	Klamath	265 (08)	614 (18)	23 (05)	0 (00)	0 (00)	0 (00)
2098D	Klamath	573 (17)	586 (17)	154 (31)	0 (00)	48 (69)	0 (00)
2383O	Klamath	541 (16)	670 (20)	125 (25)	220 (44)	32 (46)	38 (54)
4588B	Klamath	807 (24)	630 (19)	196 (39)	62 (12)	60 (85)	0 (00)

[1] Includes known northern spotted owl sites with a resident single or pair detected in the past 5 years.
[2] Nesting, Roosting, Foraging (NRF) and Dispersal Habitat conditions on BLM lands only, with percent shown in parenthesis. Home Range includes Core Area and Nest Patch acres; Core Area acres include Nest Patch acres.
[3] Three northern spotted owl sites with harvests occurring within Core Area or Nest Patch are in **bold type.**
[4] The two sites with zero habitat acres in the Nest Patch are centered on private timber lands

Occupancy status

Northern spotted owls have been the subject of extensive survey efforts in the project area since 1985, during which northern spotted owls have been captured and color-banded to facilitate visual confirmation of resident northern spotted owls during future surveys. Several historic northern spotted owl sites have been located in the vicinity of the proposed units.

For this analysis, only nine northern spotted owl sites (Table 3.5) have had confirmation of a resident single or pairs of northern spotted owls within the last five years, and are considered potentially active. Table 3.6 displays the most recent occupancy status for these sites, with only four sites having confirmed occupancy in the past three years (2012-2014). Northern spotted owl sites with no confirmation of occupancy in the past three years may be vacant. Confirmation of color-bands has shown that one resident northern spotted owl pair has moved between two northern spotted owl sites (2097B to 2097C), and a pair has recently moved away from another site (1915B).

Table 3.6 Dispersal Habitat removal resulting within northern spotted owl home ranges

Owl Site Number (IDNO)	Proposed Unit that May Affect Site [1]	Critical Habitat Subunits	Most Recent Year Occupied by Pair (P) or Single (S) [2]
0255O	29-7-25A	KLW-1	NSO: 2010-P BO: 2012-S
	29-7-35A	KLW-1	
2208A	28-8-29B	N/A	NSO: 2014-P BO: 2012-S
	28-8-29C	N/A	
	28-8-29D	N/A	
1915O	29-7-35A	KLW-1	NSO: 2009-P BO: 2012-S
1981O	30-8-5A	KLW-1	NSO: 2012-P BO: None
	30-8-7A	KLW-1	
	30-8-7B	KLW-1	
	30-8-7D	KLW-1	
2097B	29-7-25A	KLW-1	NSO: 2009-P BO: 2010-S
	29-7-35A	KLW-1	
2097C	29-7-25A	KLW-1	NSO: 2014-P BO: None
2098D	29-7-25A	KLW-1	NSO: 2011-P BO: None
	29-7-35A	KLW-1	
2383O	30-9-27A	KLW-1	NSO: 2010-S BO: 2014-S
	30-9-27B	KLW-1	
4588B	30-8-5C	KLW-1	NSO: 2012-P BO: 2013-P

[1] Harvest units (or portions thereof) may affect more than one IDNO and should not be double counted.
[2] Most recent year of occupancy in Core Area of site by northern spotted owls (NSO) and barred owls (BO) within past 5 years. Not all sites received equal survey effort.

Prey

Woodrats and many other prey species for the northern spotted owl, such as red-backed voles, rabbits, Douglas squirrels, chipmunks, and deer mice are primarily associated with early-and mid-seral forest habitat (Maser *et al.* 1981, Sakai and Noon 1993, Carey *et al.* 1999).

Flying squirrels are associated with stands possessing high canopy cover, large trees, snags, coarse woody debris, understory cover, and availability of fungi (Wilson 2008). Red tree voles (discussed under Survey and Manage), are also associated with older forest stands having large trees, high canopy cover, and cavities or defects that provide hiding cover (Huff *et al.* 2012, USDI/FWS 2011c). Because the proposed harvest units have been previously thinned, and many of these units currently support a diverse tall shrub community with scattered hardwood species, it is likely that these units also support a higher abundance of early-seral associated prey species, particularly woodrats. While low numbers of flying squirrels and red tree voles may also be present in many of these proposed units (or portions of units), the previous thinning harvest has likely reduced the abundance of these arboreal rodents (Wilson and Forsman 2013).

Northern spotted owl Critical Habitat

In 2012, the U.S. Fish and Wildlife Service published a revised version of critical habitat for the northern spotted owl (USDI/FWS 2012b), identifying four critical habitat units (CHUs) with multiple subunits on the Roseburg District. Seventeen of the 28 proposed harvest units (Table 3.6) totaling approximately 690 acres are located in the Klamath West subunit 1 (KLW-1) south and southeast of Camas Valley. KLW-1 has a total of 147,326 acres (74,082 on Roseburg District BLM), and is primarily intended for demographic support for the overall population, for connectivity north-south and east-west between subunits, and as an important corridor between the Oregon Coast Range and the Western Cascades Province (USDI/FWS 2012b). The proposed harvest units currently provide dispersal quality habitat that is recognized as a primary constituent element of critical habitat for northern spotted owls in this KLW-1.

Principle threats to the northern spotted owl

The two main threats to the northern spotted owl's continued survival are habitat loss (from timber harvest and catastrophic fire), and competition from the barred owl for habitat and prey (USDI/FWS 2011a).

Lint (2005) indicated that the Northwest Forest Plan recognized wildfire as an inherent part of managing northern spotted owl habitat in certain portions of the northern spotted owl's range. This report noted that loss of northern spotted owl habitat did not exceed the rate expected under the Northwest Forest Plan, and that habitat conditions were no worse, and perhaps better than expected. In particular, the percent of existing northern spotted owl habitat removed by harvest during the first decade was considerably less than expected (Lint 2005).

Courtney *et al.* (2004) also identified the primary source of habitat loss as catastrophic wildfire. Although the total amount of habitat affected by wildfires has been small, there is concern for potential losses associated with uncharacteristic wildfire in a portion of the species range. Courtney *et al.* (2004) noted that the risk to northern spotted owl habitat from uncharacteristic stand replacement fires is sub-regional, confined to the dry eastern and to a lesser extent the southern fringes of the northern spotted owl range. Wildfires accounted for 75 percent of the natural disturbance loss of habitat estimated for the first decade of Northwest Forest Plan implementation. Courtney *et al.* (2004) also indicated that models of habitat growth suggested significant in-growth and development of habitat throughout the federal landscape.

The barred owl (*Strix varia*) is considered a threat to the northern spotted owl because it is a direct competitor for prey and habitat (Courtney *et al.* 2004, USDI/FWS 2011a). Growing evidence suggests that northern spotted owl populations decline in areas where barred owls move into their range (FWS 2011a, Dugger *et al.* 2011, Weins *et al.* 2014).

Modeling by Dugger *et al.* (2011) examined loss of suitable habitat (stands greater than 100 years old) within the core area of a northern spotted owl site, and found that "the risk of local extinction of resident northern spotted owls increases as the percent of available habitat decreases. The risk of local extinction increases at a faster rate if barred owls are present in the core area." Barred owls appear to be well distributed in the project vicinity, and in the past five years have been detected within the Core Area of five northern spotted owl sites (Table 3.5), although not all sites have received equal survey effort.

Federally-threatened marbled murrelet (*Brachyramphus marmoratus*)

Marbled murrelet habitat requirements and conditions

Marbled murrelets are small seabirds that feed on small fish near shore, and fly inland to nest in trees of older coastal forests. Suitable nesting habitat is usually found in older forest stand with canopies dominated by large overstory trees, an abundance of large mossy branches, dwarf mistletoe brooms, natural depressions on large limbs, or old stick nests that can serve as platforms for egg laying (Lank et. al. 2003, Hamer and Nelson 1995). Availability of platform trees is critical for nesting (McShane *et al.* 2004, USDI/FWS 2011b). The quality and abundance of trees with platforms and the number of platforms per tree are more apparent in stands over 150-years-old, but they may be present in younger stands. Some proposed harvest units have scattered older trees that may have suitable structure (platforms with surrounding cover), but are unlikely to provide suitable nesting habitat because the number and distribution of such trees is below thresholds outlined in the Residual Habitat Guidelines (USDI/BLM 2012b).

Marbled murrelet occupancy in the project area

All but six of the proposed harvest units are stands less than 80 years old which usually indicates a lack of any suitable nesting structure that would trigger the need for marbled murrelet surveys. Because portions of some units have scattered older and larger legacy trees, surveys for marbled murrelets have previously been conducted within or adjacent to 15 of the proposed harvest units (Table 3.7, p. 34), but none of these surveys detected any marbled murrelet use or occupancy of the stands or areas in immediate proximity to the stands. Because of the presence of scattered trees with potential suitable structure or adjacent suitable habitat that would require a seasonal restriction on harvest operations, pre-harvest surveys would be conducted for six proposed units. Because the stands to be surveyed have all been thinned and exhibit reduced canopy cover and few scattered legacy trees, the likelihood that these stands would currently support marbled murrelet occupancy is considered low.

Marbled murrelet Recovery Plan and Critical Habitat

The recovery plan for the marbled murrelet (USDI/FWS 1997) identifies six recovery zones along the coast of Washington, Oregon, and northern California. Oregon Coast Recovery Zone 3 extends 35 miles inland. In Oregon, there are two marbled murrelet management zones. Management Zone 1 is coincident with Recovery Zone 3. Management Zone 2 is located 35 to 50 miles inland. All proposed harvest units are located in Management Zone 2 and of these, as identified in Table 3.7, nine and a portion of a tenth are located within the Zone 2 Restriction Corridor. Although marbled murrelets generally nest within 28 miles of the coast (Lank *et al.* 2003), surveys from 1993 to present have identified nine occupied murrelet sites in Management Zone 2 in this project vicinity (within 3 miles of proposed units). Critical Habitat was designated for the marbled murrelet in 1996 (USDI/FWS 1996), and revised in 2011 (USDI/FWS 2011b), but none of the proposed units are within marbled murrelet critical habitat.

Table 3.7 Marbled Murrelet Survey History and Survey Needs

Unit ID	Age	Survey History [1]	Habitat Status in Unit [2]	Adjacent Habitat (<100yds)	Within Restriction Corridor [3]	Surveys Needed [4]
28-8-19A	90	2000-2001 ND	Few Trees	None	No	No
28-8-29B	60	2001-2002 ND	None	None	YES	No
28-8-29C	60	2001-2002 ND	None	YES	YES	2015-16
28-8-29D	60	2001-2002 ND	None	None	YES	No
28-8-31A	80	2001-2002 ND	Scattered	YES	YES	2015-16
28-8-31B	80	2001-2002 ND	Scattered	YES	YES	2015-16
28-8-31D	70	2001-2002 ND	None	None	YES	No
28-8-31E	70	2001-2002 ND	None	None	YES	No
29-7-31A	90	2003-2004 ND	None	None	YES	Yes
29-7-31B	90	2003-2004 ND	None	YES	YES	Yes
29-8-32A	60	1998-1999 ND	None	None	Partial	No
30-8-5A	70	1999 ND	None	None	No	No
30-8-5B	60	1999 ND	None	None	No	No
30-8-7A	70	None	Scattered	YES	No	2015-16
30-8-7B	70	2001-2002 ND	None	YES	No	No
30-8-7D	70	2001-2002 ND	None	YES	No	2015-16
30-9-27B	80	None	None	YES	No	2015-16

[1] Survey history compiled from agency database for years noted; ND= no murrelet detections.
[2] Four units are noted as having a few or scattered trees that may have potential nesting structure.
[3] Some units fall within a Marbled Murrelet Restriction Corridors in Management Zone 2 where management considerations are identical to those applicable to Management Zone 1.
[4] Surveys needed reflects anticipated seasons when pre-disturbance protocol surveys would be conducted.

Federally proposed threatened, Fisher (*Pekani pennanti*)

The fisher is a medium-sized carnivore in the weasel family, historically present in the forests of California, Oregon, and Washington (USDI/FWS 2014a). Occurrence of fishers at a regional scale is associated with low- to mid-elevation coniferous, and mixed conifer/hardwood forests with large diameter trees, coarse downed wood, and singular features of large snags, tree cavities, or deformed trees). Young and mid-seral forests may be suitable for use if complex forest structural components are maintained in sufficient numbers (USDI/FWS 2014a).

The U.S. Fish and Wildlife Service issued a proposal to list the West Coast distinct population segment (DPS) of the fisher as a threatened species under the Endangered Species Act on October 7, 2014 (Federal Register 79:60419-60443). At this time, the Service has found the designation of critical habitat as “not determinable” for the West coast DPS of the fisher.

The proposed project area lies within the coastal Oregon sub-region of the proposed DPS, outside of the areas with known populations of fishers. Over the past 20 years, no high reliability fisher detections have occurred in the coastal Oregon sub-region of the DPS (north of the Rogue River and west of Interstate 5), leading the Service to conclude that fishers are likely extirpated from this sub-region (USDI/FWS 2014a, USDI/FWS 2014b).

This EA will not address impacts to the fisher because this species is likely extirpated from the project area, and the proposed harvest units generally lack suitable habitat structure because of stand ages and the fact that the stands were previously thinned and possess minimal numbers of snags and down logs.

2. BLM Special Status Species

BLM Special Status Species policy requires that Bureau Sensitive Species be addressed in environmental assessments and that the agency promote conservation to reduce the likelihood and need for listing pursuant to the Endangered Species Act. The Oregon/ Washington State Director's Special Status Species list (www.fs.fed.us/r6/sfpnw/issssp/agency-policy) was last updated in November 2011. Some species covered by this program are also designated for management under the Survey and Manage program.

Twenty-five special status wildlife species are known or suspected within the Roseburg District. Fifteen are eliminated from further discussion (Appendix D, Table D.1) because the project area is outside their accepted range, the species has not been documented on the Roseburg District, suitable habitat is not present, or Riparian Reserves would provide adequate protection. Federally threatened wildlife species (northern spotted owl and marbled murrelet) and proposed threatened species (fisher) are also special status species discussed in the previous section.

The **American peregrine falcon** is also recognized as a Bird of Conservation Concern by the U.S. Fish and Wildlife Service (USDI/FWS 2008b). Peregrine falcons usually nest on cliff ledges and rock outcrops but will infrequently use old nests made by common ravens or other raptors (White *et al.* 2002). There is one known nest site just over one mile from Unit 28-8-31A. Unit 28-8-19A is the only proposed unit that has a rocky outcrop within one-half mile, but there is no known occupancy in that location

Fringed myotis, Pacific pallid bat, and Townsend's big-eared bat are insectivores found in the Pacific Northwest (Verts and Carraway 1998), and documented in the project area. Hibernacula and roost sites include caves, mines, buildings, large snags and hollow trees (Weller and Zabel 2001, Lewis 1994, Fellers and Pierson 2002). No caves or mines are known to be present which would serve as hibernicula, but some proposed units contain remnant trees and snags that may provide roosting opportunities.

These bats forage in open areas, including forest edges and roads (Christy and West 1993), along streams and in riparian zones (Cross and Waldien 1995, Verts and Carraway 1998, Fellers and Pierson 2002). Ponds, marshy areas, and other riparian areas provide high quality foraging habitat. Because of the previously thinning and low to moderate development of deciduous shrubs and a hardwood understory, the units are unlikely to support abundant populations of insects that bats feed upon.

Purple martins are also recognized as a "Priority Species" by Partners in Flight (Altman and Alexander 2012). They forage on a variety of insects while in flight (Tarof and Brown 2013) over a variety of habitats, from open shrub/grass areas to old-growth forests. They nest solitarily or colonially in nest boxes, and other man-made structures (Marshall *et al.* 2003) and in cavities in snags in a wide range of decay stages. Nest sites are generally within 1.5 to 3 miles of water in open areas isolated from forest stands by distances of 600 feet or more. There are no reported nesting sites adjacent to the proposed units and none of the units currently provide suitable nesting habitat.

The Oregon shoulderband snail (*Helminthoglypta hertleini*) and Chace sideband snail (*Monadenia chaceana*) are both Bureau Sensitive Species. The Chace sideband snail is also a Category B species in the Survey and Manage Program. The Oregon shoulderband snail was previously a Survey and Manage species, but that designation was removed in 2003. These two snail species have similar habitat requirements, appearing to be associated with forested rocky areas, rocky soil conditions, and open talus slopes in dry conifer and mixed conifer/hardwood forest communities as well as oak communities. Where rocky substrates are limited, these snails have been found associated with accumulations of down wood. These snails may also utilize the surrounding forest areas for foraging and dispersal during moist, cool conditions (Duncan 2004; Duncan 2005).

Between 1998 and 2010, there were 334 mollusk survey visits in the four project watersheds, covering 4,655 acres, which resulted in detection of ten Oregon shoulderband snail sites and two Chace sideband snail sites. This includes 71 surveys, covering about 1,125 acres, conducted within or adjacent to (<0.5 miles) the project units where neither of these snail species were detected. Outside of these watersheds, there are numerous detections for both snail species (over 150 sites of both species on BLM and Forest Service lands) farther east and south, in the Western Cascades Province.

Pre-disturbance surveys are not required for the Oregon shoulderband snail, and because the Chace sideband snail is a Survey and Manage Category B species, pre-disturbance surveys are not required (not practical).

3. Survey and Manage Species

Following a 2014 court ruling which vacated the 2007 ROD to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines, BLM policy currently provides for utilizing the December 2003 Survey and Manage Species list (to include the red tree vole), (www.blm.gov/or/plans/surveyandmanage/ guidance.php) when evaluating Survey and Manage species concerns within NEPA documents. The only wildlife species that may be affected by the proposed action are the Chace sideband snail, discussed above, and the Oregon red tree vole.

The Oregon red tree vole is a small arboreal rodent endemic to moist coniferous forests of western Oregon and extreme northwest California (Verts and Carraway 1998; USDI/FWS 2011c). This species feeds primarily on Douglas-fir needles and has been found to be closely associated with late-successional and old-growth (LSOG) forests. Red tree voles appear to have limited dispersal capabilities and there is concern for isolation of populations due to loss and fragmentation of LSOG habitat (USDI/FWS 2011c).

The project area lies in the Mesic Survey Zone (Huff *et al*. 2012), outside of the boundary for the North Oregon Coast distinct population segment identified as a candidate for Endangered Species Act protection in October 2011 (USDI/FWS 2011c). Pre-disturbance surveys are required if suitable habitat is present and if the proposed harvest action would cause a “significant negative effect on the species habitat or the persistence of the species at the site" (Huff *et al.* 2012).

Forest stands conditions trigger protocol surveys if quadratic mean diameter is greater than 18 inches breast height, canopy closure exceeds 60 percent, and there are two or more super-dominant trees per acre greater than 80 years of age (Huff *et al*. 2012). Super-dominant trees typically have crowns that extend above the general stand canopy with large limbs, palmate branch clusters, cavities, broken tops, forked trunks, multiple leaders, or any structure that can support and provide cover for nests (Huff *et al.* 2012).

Red tree voles are often found in younger forest stands, especially if there are nearby patches of LSOG forests (Swingle 2005, USDI/FWS 2011c). While there is uncertainty about the importance of young forest stands for red tree voles (Swingle 2005), such young stands typically lack the abundance of forest canopy structures that can support and conceal red tree vole nests and are unlikely to contribute to population persistence.

Most of the proposed harvest units currently lack suitable habitat conditions to support red tree vole persistence, but research efforts and agency strategic surveys conducted in 2001 and 2002 documented red tree vole presence in 11 of the proposed harvest units (Table 3.8), finding:

- Two inactive nests in Unit 28-8-19A which did not require protection;
- Two nests, one active nest in Unit 30-9-27B which was buffered, the second in Unit 30-9-27A which was inactive; and
- Red tree vole presence, including active nests, in Units 28-8-29B, C and D, Units 28-8-31A, B and D, and Units 30-8-7B and D. At the time the previous thinnings were implemented, the red tree vole had been removed from Survey and Manage by the 2004 Survey and Manage ROD, and management of active sites was not required.

Surveys of the aforementioned sites were conducted in the spring of 2015, but none of the active nest trees from 2001 and 2002 could be relocated, as the previous thinnings likely displaced or eliminated red tree voles from those units.

Surveys in Unit 30-8-7A identified three confirmed nest trees and five unconfirmed trees to be climbed. Active sites would be managed in accordance with ROD/RMP requirements.

Table 3.8 Proposed Harvest Unit Attributes and Red Tree Vole Survey History

Unit ID	Age	QMD[1]	Canopy Cover[2]	Super-dominant Trees[3]	Survey Need[4]	RTV Survey History
28-8-19A	93	16.7	75	Yes	Verify	Two trees in unit with presence 2001
28-8-29B	55	16.7	63	No	Verify	Five trees in unit with presence 2001
28-8-29C	55	16.7	63	No	Verify	Two trees in unit with presence 2001
28-8-29D	55	16.7	63	No	Verify	Three trees in unit with presence 2001
28-8-31A	77	21.0	57	Yes	Verify	Three trees in unit, 4 trees adjacent
28-8-31B	77	21.0	57	Yes	Verify	One RTV tree at edge of unit
28-8-31D	74	19.5	56	No	Verify	Three trees in unit with presence 2002
28-8-31E	74	19.5	56	No	No	No known presence 2001
29-7-25A	65	16.8	83	No	No	
29-7-31A	85	18.7	60	No	No	
29-7-31B	85	18.7	60	No	No	
29-7-35A	60	17.9	65	No	No	
29-8-32A	62	16.4	42	No	No	
29-9-35A	57	12.7	48	No	No	
29-9-35B	64	20.6	66	No	No	
29-9-35C	63	19.5	40	No	No	
30-8-5A	70	22.2	63	No	No	
30-8-5B	58	22.7	67	No	No	
30-8-5C	60	20.3	50	No	No	
30-8-7A	72	22.1	85	Yes	Clearance	
30-8-7B	65	17.6	61	Yes	Verify	over 60 trees with RTV presence in 2001
30-8-7D	65	17.6	61	Yes	Verify	10 trees with RTV presence 2001
30-9-3A	62	19.0	51	No	No	
30-9-3B	67	17.8	64	No	No	
30-9-3C	62	16.5	61	No	No	
30-9-3D	56	16.5	76	No	No	
30-9-27A	80	18.8	64	No	No	One RTV tree <50m out of unit
30-9-27B	73	18.0	48	No	No	One RTV tree in unit south end

[1] Quadratic mean diameter of merchantable trees within the stand. Units with a QMD >= 18 inches are shaded, and may, in part, trigger a need to survey red tree voles.

[2] Canopy cover percentage estimated from stand exam data. Units with Canopy Cover >= 60% are shaded and may, in part, trigger a need to survey red tree voles.

[3] Super-dominant trees which were detected in only a few stands based on review of aerial photos, LIDAR imagery, and field visits. Units with these trees may, in part, trigger vole surveys.

[4] Survey Need includes: Clearance= pre-disturbance surveys for one unit that meets survey protocol requirements (Huff *et al.* 2012); and, Verify= revisiting prior nest tree locations in thinned units that do not currently trigger protocol surveys.

4. Land Birds

All of western Oregon lies within the Northern Pacific Forests Bird Conservation Region (USDI/FWS 2008b). Within this region there are several species of land birds which have been exhibiting downward population trends for several years and some appear to be vulnerable to forest management actions. These species of concern have been recognized by the U.S. Fish and Wildlife Service as "Birds of Conservation Concern" and "Game Birds Below Desired Condition" (USDI/FWS 2008b). Additionally, within Oregon and Washington, the Partners in Flight program recognized several land bird species as "Priority Species" and "Focal Species" (Altman and Alexander 2012).

There are 41 land bird species (Appendix D, Table D.2) expected to occur in the South River Resource Area which have been recognized as a species of concern (Table 3.9). Twenty-five of these species have a high or moderate likelihood of occurring within or adjacent to the proposed harvest units. Incidental observations made within and adjacent to the proposed units have confirmed the presence of 14 of these species during the breeding season.

Table 3.9 Land Bird Species of Concern and Likelihood of Occurrence in the Project Area

Land Bird Species Group	Within SRRA [1]	Likelihood of occurrence in Project Units [2]			
		High	Moderate	Low	Not Present
Recognized Species of Concern [3]	41	16	9	12	4

[1] Land bird species that are likely to occur within the South River Resource Area during the breeding season.
[2] Likelihood that a species occurs in the project area based on literature review and incidental field observations.
[3] Recognized species of concern include: Birds of Conservation Concern and Game Birds Below Desired Condition as recognized by U.S. Fish and Wildlife Service (USDI/FWS 2008b); and Focal Species and Priority Species as recognized by Partners in Flight (Altman and Alexander 2012).

The bald eagle and golden eagle are recognized as species of concern, subject to protection under the Bald and Golden Eagle Protection Act of 1940 (as amended). Both may be incidentally observed in the project vicinity, but are unlikely to be affected by the proposed harvest because of a lack of suitable habitat in the vicinity and the distance to known nesting sites (beyond one mile).

B. Alternative One (No Action) - Effects

There would be no immediate change to current forest stand conditions and no direct effects to wildlife species on BLM-administered lands. Barring disturbance such as windthrow or fire, stand development processes would continue unaltered. Habitat conditions would be influenced by the growth and mortality of overstory trees, and development of an understory tree layer. Because of past management, snags and down logs (> 16 inches in diameter) are generally lacking and it would likely take decades to accumulate them through suppression mortality or minor disturbance events.

Private lands make up about 58 percent of the area within 1.3 miles of the proposed units, and the major influence on wildlife species would be management on 40-to 50-year harvest rotations, which typically includes dense replanting and herbicide applications to control competing vegetation. It is expected young forest stands will not provide enduring, high quality early-successional habitat as a consequence and that, additionally, late-seral forests on private timber lands will be converted to early-seral forest over the next two decades and provide little or no support to wildlife dependent on older forest habitat.

1. Threatened and Endangered Species

Northern Spotted Owl

Effects to habitat and occupancy

No habitat modification would occur that could affect the viability of home ranges or core areas of resident northern spotted owls in the project area. Stand development processes such as increasing canopy cover, development of larger overstory trees, and understory development would begin to provide suitable habitat conditions within 30 years, increasing habitat availability on the landscape and improve core area conditions for some resident northern spotted owl sites.

Effects to prey

Populations of small mammals that favor mature, closed-canopy forest would likely increase, although population of species such as the northern flying squirrel and red-backed voles would lag as they are closely associated with large snags and down logs currently lacking in most of the units, and only expected to gradually increase over time. Increasing overstory canopy cover would eventually shade out many of the tall shrubs and hardwood species that provide important habitat components for early-seral associated mammal species, particularly woodrats.

Effects to Critical Habitat

There would be no loss of dispersal habitat or effect on the function of subunit KLW-1.

Effects to the principal threats to the northern spotted owl

As discussed above, the two principle threats to the northern spotted owl are habitat loss (from timber harvest and catastrophic fire), and competition from the barred owl for habitat and prey. The implications for large-scale wildfires are addressed in the Fuels Management, Fire Risk, and Air Quality section of this environmental assessment.

There would be no direct effect on barred owls and the threat that they pose. Barred owls are expected to continue to occupy some historic northern spotted owl home ranges. Given the ability of the barred owl to out-compete the northern spotted owl for habitat and prey, and greater fecundity of the barred owl (Wiens et al. 2014), it is expected that they would come to occupy additional territories in the vicinity such that competitive interactions with northern spotted owls could increase and displacement of additional northern spotted owls is likely.

Marbled Murrelet

Effects to marbled murrelet habitat and occupancy

There would be no direct effect on marbled murrelet habitat conditions within the proposed units in the absence of any timber harvest. In the absence of any harvest operations there would be no possibility for disruption of marbled murrelets that may occupy adjacent suitable habitat. Over time, development of the current stands would provide for the growth of larger overstory trees, canopy stratification and increasing forest canopy that would provide cover, and development of epicormic branches and other platforms suitable nesting habitat (≥30 years), increasing nesting opportunities for the marbled murrelet at the landscape scale.

2. BLM Special Status Species

There would be no direct effect on any special status species.

No change in the condition of the known **peregrine falcon** aerie would occur, and no detectable changes in prey abundance would be anticipated.

No disturbance of large down wood or rocky soils and substrate would occur which would potentially affect the **Oregon shoulderband** and **Chace sideband snails**.

Roosting opportunities for the three bat species (**fringed myotis, Pacific pallid bat**, and **Townsend's big-eared bat**), would be unchanged in the short-term, and would be expected to improve over time as development of larger overstory trees with deeply furrowed bark, large snags, and increased numbers of tree cavities would provide additional roosting opportunities.

The stands would remain unsuitable as nesting habitat for **purple martins** as they lack trees with cavities for nesting and are sufficiently distant from bodies of water such that occupancy might be expected.

3. Survey and Manage Species

There would be no direct effect on the **red tree vole.** Recovery of forest structural conditions including development of larger overstory trees, increased canopy cover, and development of epicormic branch platforms would eventually provide better habitat conditions to support red tree vole populations (Huff *et al*. 2012).

4. Land Birds

There would be no direct effect to any land bird species as the present availability of habitat important to individual species would remain generally constant in the near term. Over time, maturation of the stands would favor those species dependent on older forests, at the expense of those species that are adapted to more open, early-successional communities and conditions.

C. Alternative Two (Proposed Action) - Effects

Timber harvest and associated activities would alter the existing forest structure in the proposed harvest units as described in the Timber Resources section. Wildlife species are most likely to be effected by the following direct and indirect changes to forest habitat conditions at the stand level:

- Immediate conversion of approximately 870 acres from conifer-dominated forest, to open early-successional patches interspersed with an average retention of nine large green conifer trees per acre.
- Disturbance and loss of some existing snags and large down wood resulting from felling, yarding, road construction and post-harvest fuels reduction.
- Recruitment of new snags and large down wood from incidental green tree loss during harvest, and post-harvest as a result of mechanical damage, insects, disease, and windthrow.
- A change in the context of coarse woody material from low amounts within a previously thinned mid-seral conifer forest, to moderate amounts within open early-successional patches.

- Creation of high quality early-successional habitat patches that persist for less than 25 years, and incorporate a mosaic of grass-forb habitat, diverse tall shrubs and hardwood species, snags, down logs, and conifer saplings.
- Eventual recovery of closed canopy, young conifer-dominated stands (<25 years), having at least 1.2 hard snags per acre, at least 120 linear feet of down logs per acre, and up to nine green trees per acre scattered within the units.

Retention of coarse woody debris and green trees within the proposed harvest units would meet or exceed RMP requirements, and would add structural complexity to the open early-successional habitat patches created by harvest. It is possible that the harvest units would suffer some amount of post-harvest windthrow that would convert some of the nine green trees per acre to snags and down logs, but given the wind firmness of the previously thinned stands, the risk of windthrow would be considered low.

1. Threatened and Endangered Species

Northern Spotted Owl

No effects to the northern spotted owl from disturbance would be anticipated, as seasonal restrictions would be applied, when and where appropriate (see Chapter Two, EA p. 15). Potential effects would be limited to those associated with habitat modification.

Effects to northern spotted owl habitat and occupancy.

The proposed harvest action would remove approximately 870 acres of conifer dominated stands, up to 90 years old, which predominantly function as dispersal habitat for northern spotted owls. Post-harvest, the units would be expected to retain a portion of the existing snags and down logs, some newly created snags and down logs, an average of nine large green conifers per acre, a recovering shrub and hardwood component, and naturally seeded and planted conifer seedlings. It is anticipated that some of the green retention trees may be damaged during harvest operations, or blown over in the first five years post-harvest. The function of the stands as habitat for the northern spotted owl would be reduced from dispersal habitat to a habitat capable condition until canopy recloses within the next 25 years and the stands once again function as dispersal habitat within 35 to 40 years.

The nine northern spotted owl sites affected by the proposed action would experience only minor reductions in the percentage of available dispersal habitat, primarily occurring at the periphery of those home ranges (Table 3.10). No suitable habitat would be removed. Because the stands proposed for harvest are less than 100 years old and were previously thinned, resident northern spotted owls are less likely to rely on them compared to the older forest habitats (Dugger *et al.* 2011, Weins *et al.* 2104). A minor reduction in dispersal habitat outside of the core area is not expected to affect the viability of the home ranges of resident northern spotted owls.

Harvest would result in the loss of dispersal habitat within the core area of northern spotted owl sites 0255O, 1981O, and 2097B (Table 3.10) which currently have less than 50 percent suitable habitat (i.e. habitat-limited sites) in the core areas. Harvest of Unit 30-8-7B would remove approximately one acre of dispersal habitat within the nest patch of site 1981O (Table 3.10) and an additional acre at the edge of the nest patch. While dispersal habitat is less essential to site viability than suitable habitat, dispersal habitat can provide important connectivity between adjacent patches of suitable habitat, and likely provides some foraging opportunities that can support occupancy and reproduction (Dugger *et al*. 2011, Schilling *et al*. 2013).

Table 3.10 Harvest Effects of Proposed Action on Northern Spotted Owl Sites

Owl Site Number (IDNO)	Unit ID [1]	Removed by Harvest		Available Post-Harvest	
		NRF	Dispersal	NRF	Dispersal
1981O	30-8-7B	0	1	44	3
0255O	29-7-35A	0	58	30	90
1981O	30-8-7A	0	16	102	172
	30-8-7B	0	66	102	122
	30-8-7D	0	18	102	170
2097B	29-7-25A	0	10	68	98
0255O	29-7-35A	0	33	719	614
	29-7-35A	0	27	719	620
2208A	28-8-29B	0	7	441	955
	28-8-29C	0	11	441	951
	28-8-29D	0	11	441	951
1915O	29-7-35A	0	3	1182	110
1981O	30-8-5A	0	38	280	945
	30-8-7A	0	9	280	974
	30-8-7B	0	59	280	924
	30-8-7D	0	34	280	949
2097B	29-7-25A	0	23	403	856
	29-7-35A	0	85	403	794
2097C	29-7-25A	0	1	265	613
2098D	29-7-25A	0	27	573	559
	29-7-35A	0	6	573	580
2383O	30-9-27A	0	13	541	657
	30-9-27B	0	25	541	645
4588B	30-8-5C	0	21	807	609

Harvest actions that result in greater fragmentation of a home range and core area would further isolate existing suitable habitat patches and thereby reduce survival and reproduction due to increased energetic costs from increasing home range size, and increase the likelihood of interference competition with barred owls (Courtney *et al*. 2004, Dugger *et al*. 2005, Schilling *et al*. 2013).

Because of the currently low percentage of available suitable habitat on BLM-managed lands (Table 3.5) and the lack of any suitable habitat on intermingled private lands, the proposed harvest within the core areas of these habitat-limited sites would further impair their viability and the three northern spotted owl sites are unlikely to persist on the landscape (USDI/BLM 2013).

Effects to northern spotted owl prey.

The proposed harvest would displace prey species such as flying squirrels and red tree voles that favor closed canopy forest conditions. However, populations of prey species such as woodrats and brush rabbits are expected to increase in numbers post-harvest due to development of open early-seral conditions (Carey and Wilson 2001). This could boost local prey availability if the increasing numbers of these small mammals move into adjacent forest edges and interior forest stands where they become available for capture (Carey et al. 1992, and Ward et al. 1998).

Effects to northern spotted owl Critical Habitat.

Removal of 646 acres of dispersal habitat within Critical Habitat subunit KLW-1 would represent less than one percent of the portion of the subunit within the Roseburg District. Proposed harvest units are scattered within a localized area that includes 6,375 acres of BLM-administered lands in close proximity (i.e., BLM parcels within affected sections and adjoining sections). Currently 89 percent (5,650 acres) of the BLM-administered lands in this localized area provide dispersal quality or better habitat for northern spotted owls (i.e. mid-seral conifer-dominated stands >40 years old). The proposed harvest would not impair the overall intended function of the subunit because the localized area would still retain 78 percent dispersal habitat conditions post-harvest, and would continue to support for dispersal and connectivity between subunits.

Effects to the principal threats to the northern spotted owl

As with the Alternative One (No Action), it is expected that barred owls would continue to occupy some historic northern spotted owl home ranges. Given the ability of the barred owl to out-compete the northern spotted owl for habitat and prey, and the greater fecundity of the barred owl (Wiens *et al.* 2014), it is expected that barred owls would come to occupy additional territories in the vicinity of the proposed units, such that competitive interactions with northern spotted owls would continue and displacement of additional northern spotted owls is likely. For northern spotted owl sites where harvest units would reduce dispersal habitat within a core area or nest patch (Table 3.10), the probability of loss of resident northern spotted owls is increased if barred owls are also present within the core area (Dugger *et al.* 2011).

Marbled Murrelet

The proposed action would not result in any disturbance to marbled murrelets. There are six proposed units (see Table 3.7) where pre-disturbance surveys would ensure that potential noise disruption would be avoided. Three proposed units with adjacent or nearby suitable nesting habitat would still be operable with the application of seasonal restrictions or daily operating restrictions on road construction and harvest operations (see p. 16) to eliminate the risk of noise disruption to murrelets that may be occupying adjacent unsurveyed habitat.

Effects to marbled murrelet habitat and occupancy

No suitable nesting habitat would be modified by the proposed timber harvest, and no Critical Habitat overlaps the proposed harvest units, so there would be no effects on Critical Habitat. No currently known marbled murrelet sites would be affected, and if any pre-disturbance surveys were to detect occupancy behavior within or adjacent to the proposed harvest units, then any occupied habitat would be reserved from harvest, and restrictions on the timing of harvest actions adjacent to newly established occupied habitat would ensure that there would be no effects to marbled murrelets.

2. BLM Special Status Species

Since the closest known nesting site of the **American peregrine falcon** is more than one mile from any of the proposed harvest units, it is unlikely that harvest actions would disrupt breeding activities, and no seasonal restriction on operations would be necessary.

The proposed action would have no direct effect on the **Oregon shoulderband** snail and **Chace sideband** snail. Suitable habitat is largely absent, and extensive survey efforts previously undertaken did not detect either species within or adjacent to proposed harvest units.

The proposed action is unlikely to have any direct effect on **Townsend's big-eared bats**, **Pacific pallid bats** or **fringed myotis**. There are no known communal roosts, nurseries, or hibernacula in the proposed harvest units and these species are generally uncommon in the project vicinity.

The proposed action would have no direct effect on **purple martins** as there are no reported nest sites in the project vicinity and none of the proposed harvest units provide suitable nesting habitat.

With the exception of the two snail species, these BLM Sensitive Species may indirectly benefit from the post-harvest conditions that would provide open early-successional habitat patches that could boost local songbird abundance as prey for falcons, and create diverse shrub and hardwood habitat with large trees and snags that may increase the abundance of flying insects in close proximity to roost sites for bats and nesting sites for purple martins.

3. Survey and Manage Species

The proposed action may directly affect red tree voles if they are present in any of the proposed harvest units. Red tree voles can be found in younger forests (Swingle 2005, USDI/FWS 2011c) and previous surveys have detected them in some proposed units (prior to the previous thinning harvest), it is possible that the proposed action could remove nest trees and displace or eliminate red tree voles within some of the proposed harvest units. However, it is unlikely that the proposed action would affect persistence of red tree voles in the affected watersheds, because:

- All of the proposed harvest units have been previously thinned and at present are unlikely to provide habitat conditions to support red tree vole populations (USDI/FWS 2011c, Wilson and Forsman 2013);
- Planned surveys (see Table 3.8) would identify any active red tree vole sites to be managed in accordance with the 2001 Survey and Manage ROD for Category C species (USDA/FS and USDI/BLM 2001a);
- Older forest stands in the affected watersheds would adequately provide for red tree vole population persistence (Huff *et al.* 2012, USDI/FWS 2011c); and,
- Red tree voles are known to be common in older forest stands in the affected watersheds and well distributed in the Mesic Survey Zone that encompasses the project area (Forsman *et al.* 2004, Swingle 2005, GeoBOB survey data USDI/BLM 2013b).

4. Land Birds

The proposed action could directly affect some individual land bird species by removing conifer-dominated forest stands that may be used for nesting and foraging. The resulting creation of open early-successional habitat patches would also be favorable to other land bird species (Hagar and Friesen 2009). At the scale of the Northern Pacific Forests Bird Conservation Region, this proposed action would have no discernable effects on populations of land bird species that are associated with mid-seral/mature forest habitat because:

- Mid-seral forest habitat is currently abundant on BLM lands in the vicinity (see discussion of Effects to Northern Spotted Owl Critical Habitat Units); and,
- The species of landbirds most closely associated with mid-seral forest (e.g. hermit warbler, winter wren, Wilson's warbler) are widely distributed in the Oregon Coast Range, and among the most common species in Pacific Northwest forests (Altman and Alexander 2012, Marshall *et al.* 2003).

III. Botany

A Affected Environment

An inventory of Bureau Special Status, and Survey and Manage vascular plant, lichen, bryophyte and fungal species in the project area was accomplished through; review of existing survey records and spatial data; evaluation of species-habitat associations and the presence of suitable or potential habitat; and past field clearances combined with present-day field reconnaissance and inventories utilizing intuitive-controlled surveys, in accordance with survey protocols for the specific groups of species. All activities associated with the proposed timber harvest would occur within previously thinned forest stands previously surveyed for Bureau Special Status and Survey and Manage species. Additionally, surveys were conducted on May 27, 28, 29 and on June 17 and 18, 2014.

Two populations of the Federally-threatened Kincaid's lupine (*Lupinus oreganus var. kincaidii*) known to occur in the Olalla Creek-Lookingglass Creek watershed, but no road construction or timber harvest are proposed in the subwatersheds in which they are located.

One Bureau Sensitive vascular plant, Oregon bensonia (*Bensoniella oregano*) is known to occur in proposed Unit 30-9-3A in a seasonally-wet meadow dominated by slough sedge (*Carex obnupta*) and young conifer regeneration. Oregon bensonia is a federal species of concern and is listed by Oregon Biodiversity Center as an Oregon candidate species (ORBIC 2013).

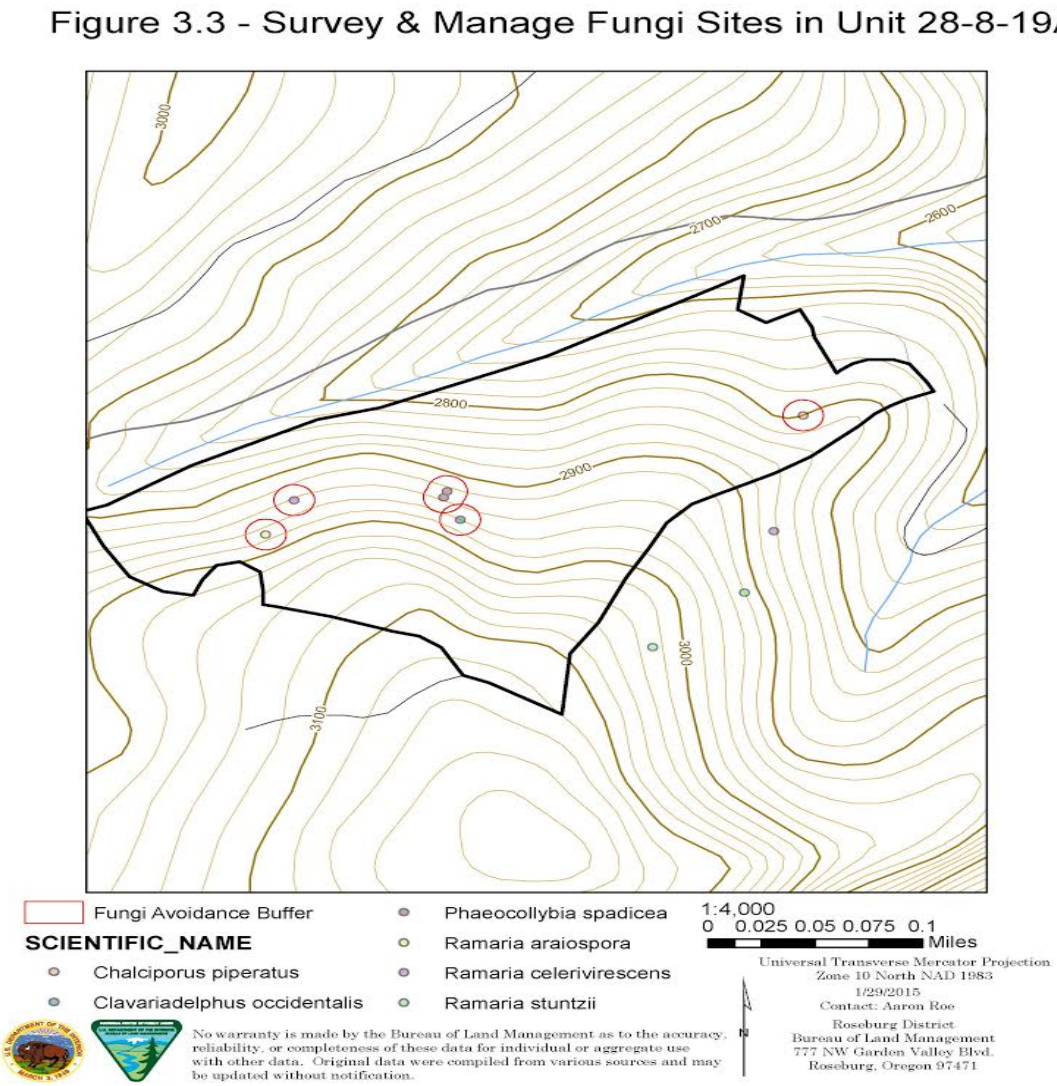
Other botanical species listed by ORBIC that occur within proposed harvest units, but which are not considered Bureau Special Status species include *Carex gynodynama* (ORBIC list 4), and *Senecio triangularis* var. *angustifolius* (ORBIC list 3), both occurring in association with the Oregon bensonia site described above. In addition to these two species, a dung moss (*Tayloria serrata*, ORBIC list 3) was previously reported in proposed Unit 30-8-5A, but is likely no longer extant as the substrate supporting it would have decomposed many years ago.

There are 165 Category B Survey and Manage fungal species considered rare, for which pre-disturbance surveys are not considered practical. To avoid inadvertent loss, the 2001 S&M ROD (Standards and Guidelines, pp. 9 and 25) states that for project decisions issued after fiscal year 2011, equivalent-effort surveys will be conducted in old-growth forest if strategic surveys were not completed. Proposed harvest units avoid forest stands that could be considered old-growth.

Previous survey efforts identified three Survey and Manage fungal species (*Rickenella swartzii*, *Ramaria stuntzii*, and *Otidea leporina*) in the proposed harvest units. The *Rickenella swartzii*,site occurs within the Oregon bensonia site described above. The *Ramaria* and *Otidea* sites were identified in proposed Unit 28-8-19A. A pin lichen, *Chaenotheca furfuracea*, was located at multiple sites in proposed harvest units in Section 3, T. 30 S., R. 9 W. on overturned rootwads. Protection is not required.

Additional surveys, described above, in proposed Unit 28-8-19A identified one site each of *Chalciporus piperatus*, *Clavariadelphus occidentalis*, *Phaeocollybia spadicea* and *Ramaria araiospora*, and two sites occupied by *Ramaria stuntzii*, as illustrated in Figure 3.3.

Fig. 3.3 Survey & Manage Fungi Sites in Unit 28-8-19A



B. Alternative One (No Action) - Effects

Under this alternative, no road construction or timber harvest activities would be undertaken which would have the potential for affecting habitat in which previously identified Bureau Sensitive, or Survey and Manage botanical and fungal species were identified. The species would, however, be indirectly affected by natural successional processes that may or may not provide for the long-term persistence of the isolated populations. In the case of the Oregon bensonia site, encroachment by shrubs and conifer saplings has led to a decline in the numbers of plants within the population, and without management of this competing vegetation and an opening of canopy to allow more sunlight the populations at Oregon bensonia site will continue to decline in numbers and vigor.

C. Alternative Two (Proposed Action) - Effects

The Oregon bensonia site in Section 3, T. 30 S., R. 9 W. would be protected from disturbance during harvest operations by exclusion of the site from the timber sale unit as was previously done when the stand was thinned. The *Rickenella swartzii*,, *Senecio triangularis* var. *angustifolius*, and *Carex gynodynama* sites would be similarly protected within the Oregon bensonia site.

For the Survey and Manage fungal species identified in proposed Unit 28-8-19A, a 50-foot diameter no-cut buffer would be centered on each site. Logging corridors would be sited in a manner that maintains a minimum of 25-foot or first green tree avoidance area, unless this would result in a safety risk, cause unacceptable damage to other resources as determined by the contract administrator, or preclude the location of landings, yarding corridors or roads essential to harvest operations. Where a 25-foot avoidance area is unfeasible, infrastructure location would require site specific approval by the contract administrator in consultation with the field office botanist.

As designed, and in consideration that the sites are on a north-facing slope not subject to intense solar exposure, implementation of the proposed harvest would not reduce the probability of fungi site persistence. Avoidance would protect the extant populations and occupied substrate from physical damage and changes in microclimate would be minimized by adhering to buffer distances around verified occupied habitat (Heithecker and Halpern 2007).

The proposed regeneration harvest would convert existing forest conditions into early-successional conditions which may or may not support undiscovered special status species the proposed harvest units. Likewise, species not practical to survey for, or sites not located by previous surveys may or may not be affected. Scattered retention trees, snags and down woody debris would, however, continue to provide habitat and a refuge for bryophyte, lichen, and mycorrhizal fungal species for future dispersal into the young conifer stands as they develop.

IV. Noxious Weeds and Non-Native Invasive Plants

A. Affected Environment

The following noxious weeds and non-native invasive plant species are documented in the Olalla-Camas Regeneration Harvest project areas mainly along existing road rights-of-way; Armenian blackberry (*Rubus armeniacus*), bull and Canadian thistles (*Cirsium vulgare* and *C. arvense*), meadow knapweed (*Centaurea xmoncktonii*), Scotch broom (*Cytisus scoparius*), St. John's wort (*Hypericum perforatum*), and tansy ragwort (*Senecio jacobaea*).

These species are all classified by the Oregon Department of Agriculture as type "B" designated weeds. Type"B" designated weeds are weeds of economic importance which are regionally abundant, but which may have limited distribution in some counties. Where implementation of a fully integrated statewide management plan is not feasible, biological control shall be the main control approach.

All of the noxious weeds species that are known to occur within the proposed project area are regionally abundant and are widespread throughout western Oregon. A fully integrated statewide management plan has not been implemented for any of these species. The Roseburg BLM District has an integrated weed control plan in place for the abatement of noxious weed species and is active in its control and management of Oregon listed noxious weeds.

B. Alternative One (No Action) - Effects

In the absence of any proposed timber harvest, actions taken to contain, control and eradicate existing infestations of noxious weed and non-native invasive plants would still be implemented under the *Roseburg District Integrated Weed Control Plan* (USDI/BLM 1995b). These actions include inventory of infestations, assessment of risk for spread, and application of control measures in areas where other management actions are proposed or planned. Control measures may include release of biological control agents, mowing, hand-pulling, and limited use of approved herbicides.

BLM herbicide application treats individual plants. Application methods are limited to truck-mounted sprayers, backpack and hand sprayers, and wick wipers. Time and location of application is also restricted based upon forecast weather conditions, proximity to live water and riparian areas, and proximity to residences or other places of human occupation.

Existing right-of-ways within the project areas would continue to be maintained for vehicular use through road maintenance activities such as: applying additional rock, grading roadways, mowing competing vegetation, culvert replacement, pulling ditches and reshaping the roadway. Roads would continue to be utilized by forestry workers and members of the public for recreational activities. However, without any new human caused disturbances (road construction, road renovations, timber falling, timber yarding etc.) in the proposed project area the established noxious weed populations would remain at a low level. The number of individual noxious weed species known from within the project area would increase slightly following regularly scheduled road maintenance activities but still remain at a low level.

C. Alternative Two (Proposed Action) - Effects

Exposed mineral soil creates environments favorable for the establishment of non-native plant species. Aspects of road construction and timber harvest that create exposed mineral soil provide for an increased risk for the establishment of non-native plant species.

Any adverse effects from the establishment of known noxious weeds within or near the project area are not anticipated, and the risk for the long-term establishment of these species and consequences of adverse effects on this project area is considered low because;

1) Project design features would be incorporated into the project to keep the amount of exposed mineral soil minimized (i.e. sowing grass seed),
2) The size of the projects on a landscape scale are localized,

3) The implementation of the Roseburg District Integrated Weed Control Plan allows for early detection of non-native plant species which allows for rapid control,
4)Any new infestations would be treated and periodically monitored to determine whether additional or alternative treatments are deemed necessary,
5) Generally these species persist for several years after becoming established but soon decline as native vegetation increases in density and size within the project areas, and
6) There are no other Oregon listed noxious weed species that are anticipated to be introduced and become established with the implementation of this project and design features.

V. Fish, Aquatic Habitat, and Water Resources

A. Affected Environment

1. Fish Species

Native species documented in the Middle Fork and East Fork Coquille watersheds include sea-run and resident coastal cutthroat trout (*Oncorhynchus clarki*), Oregon Coast (OC) winter steelhead and resident rainbow trout (*Oncorhynchus mykiss*), OC fall and spring Chinook salmon (*Oncorhynchus tshawytscha*), OC coho salmon (*Oncorhynchus kisutch*), Pacific lamprey (*Entosphenus tridentatus*), speckled dace (*Rhinichthys osculus*), and sculpin species (*Cottus spp.*). Resident trout are present in the Middle Fork Coquille River and several tributaries that include Twelvemile Creek, Bingham Creek, Day Creek, Noah Creek, Lake Creek and lower Estes Creek.

Sea-run and resident coastal cutthroat trout, OC winter steelhead and resident rainbow trout, OC fall and spring Chinook salmon, OC coho salmon, Pacific lamprey, speckled dace, sculpin species, and Umpqua chub (*Oregonichthys kalawatseti*) are documented in the Olalla Creek-Lookingglass Creek and Clarks Branch-South Umpqua watersheds. Resident trout are also present in Rice Creek and Olalla Creek.

Federally-Threatened Species

On February 12, 2008, the National Marine Fisheries Service (NMFS) published a Notice of Intent proposing to list the OC coho salmon as a threatened species under the Endangered Species Act. The listing became effective on May 12, 2008. Critical habitat was designated concurrent with species listing (NMFS 2008).

In the Middle Fork Coquille River, upstream migration by OC coho salmon is blocked by Bradford Falls near the mouth of Bear Creek, which is approximately two miles downstream from the nearest proposed harvest unit. There is a single crossing over occupied reaches of the Middle Fork Coquille River on the Slater Creek Road. In the East Fork Coquille River, upstream migration of OC coho salmon is blocked at Brewster Canyon, more than 15 miles downstream of the project area. In the Olalla Creek-Lookingglass Creek and Clarks Branch-South Umpqua watersheds, OC coho salmon are present in Olalla Creek and Rice Creek, respectively.

Bureau Sensitive Species

The Umpqua chub is found predominantly in larger order streams and rivers throughout the Umpqua River basin (Markle *et al.* 1991). Umpqua chub have been documented in Olalla Creek approximately nine miles below the project area. This is also the nearest population in proximity to Rice Creek (Simons 2008).

Umpqua chub generally occupy slow flowing habitats typically associated with vegetation (Simons 2008). Scattered individuals may occasionally occur closer than the Olalla population including the mainstem South Umpqua River; however, habitat conditions in the project area streams (rocky and swift flowing) are unlikely to support individual chubs or populations.

OC winter steelhead trout are found concurrent with OC coho salmon habitat in Olalla Creek and Rice Creek (StreamNet 2012). In the Coquille River system OC winter steelhead trout are believed to occupy an additional two miles of the Middle Fork Coquille River above Bradford Falls, lower Twelvemile Creek, and an additional 6.2 miles of the East Fork Coquille River (BLM 1999; StreamNet 2012) beyond that accessible to OC coho salmon.

2. Aquatic Habitat, Critical Habitat and Essential Fish Habitat

Habitat conditions for sediment, large woody debris, shade and pools were derived from data compiled by Oregon Department of Fish and Wildlife (ODFW, 2000a through 2000h) aquatic habitat surveys on the Middle Fork Coquille River, six tributaries to the Middle Fork Coquille River, and the East Fork Coquille River in proximity to the project areas. Additional information on conditions in these watersheds was also derived from the Camas Valley 2011 Harvest Plan Environmental Assessment (USDI/BLM 2013c). No recent ODFW aquatic habitat surveys were located in proximity to project area streams in the Olalla Creek-Lookingglass and Clarks Branch-South Umpqua watersheds, but the South River Commercial 2009 Environmental Assessment (USDI/BLM 2010a) provides information on general aquatic conditions.

Sediment and substrate

The availability of quality spawning substrate, characterized by gravel and small cobbles relatively free from embedded sediment, is important to resident and anadromous salmonid productivity. Spawning habitat suitability varies with the amount, size and quality of substrate. Bedload fine sediment can fill interstitial spaces within redds reducing oxygen flow to eggs or forming an armor that prevents emergence of alevins (Waters 1995). Accumulation of fine sediment can also reduce availability of macroinvertebrate prey affecting salmonid growth and survival (Suttle *et al*. 2004). Suspended fine sediment in the water column can affect visibility, foraging ability and breathing capacity in fish (Waters 1995).

Substrates in the few fish-bearing streams adjacent to proposed units in the Upper Middle Fork Coquille and East Fork Coquille watersheds are dominated by cobbles and large gravel. Some fine sediment is present but did not appear to reduce the quality and quantity of spawning habitat for resident cutthroat trout. Low gradient depositional reaches had higher accumulations of silt and sediment, with some entrainment in riffle habitats. In the Olalla Creek-Lookingglass Creek and Clarks Branch-South Umpqua watersheds, substrates consist of cobble and gravel. Visual surveys indicated moderate to high availability of spawning substrate. Embedded sediments were present in many reaches, however, and the overall quality of spawning habitat was deemed fair.

In-stream Functional Wood

Large woody debris plays an important role in stream morphology. In headwater streams it can capture and store sediment, control channel morphology, form deep scour pools and retain gravel substrate (Bilby and Ward 1989). In higher order fish-bearing streams, wood captures and retains gravel substrates suitable for spawning and creates backwater and pool habitat during a range of stream flows (May and Gresswell 2003).

Wood can be delivered to streams by mass wasting and bank erosion, or from episodic events like landslides and blow-down (Hassan *et al*. 2005). Adjacent riparian stands and hill slopes in steeper, confined valleys astride headwater streams contribute greater amounts of large wood (Reeves *et al*. 2003). Absent large episodic debris flows, wood is retained for longer periods of time in headwater streams (May and Gresswell 2003). Large wood breaks down or is transported out of mainstem reaches over time and, absent a source of future recruitment of large wood from riparian stands, larger fish-bearing reaches may become depleted of habitat forming wood.

Small adjacent fish-bearing reaches generally had large volumes of small functional wood derived from adjacent stands. Overall, there were few larger pieces capable of trapping and storing gravel and creating deep pool habitat suitable for rearing juvenile fish. In larger fish-bearing reaches, the occurrence of large wood was infrequent.

Pool habitat

Pools are important rearing habitat for juvenile salmonids, both during low flow months when high stream temperatures stress fish, and during high flow events when off-channel pools provide refuge habitat. Salmonids are generally found in greater densities (Roni 2002) and maintain larger sizes (Rosenfeld *et al.* 2000) in deep pool habitats.

Creation and maintenance of pool habitat is a function of channel slope, sediment, functional in-stream wood, and stream flows (Montgomery *et al.* 1995). .

Habitat Access

As described above, natural barriers are present on the Middle Fork Coquille and East Fork Coquille Rivers that restrict access, to varying degrees, to habitat for anadromous fish species in the upper reaches of these watersheds. Access for migrating fish can also be restricted at stream crossings where culvert outlet jumps exceed six inches or the outlet pool depth is less than 1.5 times the height of the jump. Adults are capable of jumping in excess of four feet, but upstream migration by juveniles is often prevented. Culverts sized less than bank-full width or installed on gradients over one-half percent can also limit fish passage by accelerating water velocities within pipes (Watershed Professionals Network 1999). Throughout the project watersheds there are culverts on private and federally-controlled roads that potentially block access by resident and anadromous fish to historically occupied habitat.

Critical Habitat and Essential Fish Habitat

As previously discussed, critical habitat for OC coho salmon was designated in the final Federal Register notice of the listing of the OC coho salmon as threatened. Critical habitat for OC coho salmon is present in Rice Creek and Olalla Creek downstream of proposed timber harvest units in the Clarks Branch-South Umpqua and Olalla Creek-Lookingglass Creek watersheds.

The Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Federal Register 2002) designated Essential Fish Habitat for fish species of commercial importance. Essential Fish Habitat consists of streams and habitat currently or historically accessible to OC Chinook and OC coho salmon, and in Rice Creek and Olalla creek is coincident with critical habitat designated for OC coho salmon.

3. Water Resources

Varying with elevation, the project area receives between 40 and 90 inches of rain annually and has a mean 2-year precipitation event of 1.6 inches in a 24-hour period (N.O.A.A. Precipitation-Frequency for Oregon, Atlas 2, Vol. 10). Most runoff is associated with winter storm events. Peak stream flow events are concentrated in the months of October through April when Pacific storm fronts are strongest. With little or no snow pack and infrequent rainfall, stream flow in the summer is typically a fraction of winter levels and many headwater channels retreat to subsurface flow. At more than 40 miles from the Pacific coast and east of the Coast Range, fog and fog drip are not major contributors to the hydrology of the project area.

Terrain ranges from approximately 1,400 to 2,800 feet in elevation, marked by generally steep slopes with flatter ridge tops and valley bottoms. Approximately 160 acres of the proposed harvest acreage is located above 2,500 feet in elevation, which is considered the transient snow zone in the Southern Oregon Coast Range (Grant *et al.* 2008). Harvest areas above this elevation are considered vulnerable to extreme storm events because they are susceptible to rapid melt off of the transient snow pack that may lead to large flood events. Higher elevation harvest acres are split between three of the 6th field subwatersheds in the project area (Table 3.11) but do constitute enough area in any individual subwatershed to create vulnerability to the extreme weather events.

Using data from the 2008 FEIS (USDI/BLM 2008a, Chapter 3, p. 357), the predicted amount of "open acres" with less than 30 percent crown cover) in each subwatershed for 2016 is listed in Table 3.11. The analysis did not include open agricultural lands in the lower portions of the watersheds. The analysis determined that all the watersheds were at a low risk for peak flow increases due to the existing level of harvest in the rain-dominated hydroregions.

LIDAR flight information from 2008-2012 and Google Earth data from 2013 was used to determine the existing extent of "open" acres for all the project subwatersheds (Table 3.11), in order to predict potential changes to peak flows in response to the proposed regeneration harvest.

Table 3.11 Open Acres of Subwatersheds in the Transient Snow Zone

6th Field Subwatershed	Acres above 2,500 Feet	Percent of Total Watershed
Lost Creek- East Fork Coquille	21	0.16
Headwaters Middle Fork Coquille	103	0.32

Grant *et al.* (2008) developed a process to help determine potential effects to peak flows from forest practices, examining both site scale (<500 square kilometer) and basin scale (<10,000 square kilometers). The process differs between rain-dominated and transient snow zone dominated watersheds. All of the watersheds in this analysis are primarily rain-dominated. Using his envelope curve for rain-dominated watersheds, Grant determined that if the predicted change in peak flow was less than 10 percent it would be undetectable due to natural variability. His analysis determined that a rain-dominated watershed needed to have over 45 percent of its land base in an "open" condition to result in a peak flow increase above the detection limit of 10 percent.

The majority of streams associated with the proposed harvest units are first-order perennial tributaries, characterized as Rosgen type-A (Rosgen 1996), intermittent source channels with a 4 to 10 percent gradient, low width/depth ratio, and low sinuosity. Stream channels are typically narrow with moderate to steep side slopes, becoming more sinuous as the stream gradients approach 4 percent.

The Middle Fork Coquille River, Lake Creek, and Rice Creek are all fish-bearing fourth-order Rosgen B/C channels (Rosgen 1996) with gradients between 2 and 4 percent, a higher degree of sinuosity, and good connection to valley floodplains. The project area also contains small isolated (less than 1 acre) wet areas, identified in the previous commercial thinning entries and buffered out of the treatment areas. The project units are generally located near the drainage divides of six separate 6th-field subwatersheds. Table 3.12 describes the relevant data for the 6th-field subwatersheds used in this analysis.

Table 3.12 Characteristics of the five subwatersheds in the Analysis Area

Watershed	Size (acres)	Road Density (miles/square mile)	WOPR "open acres" (%)	Existing "open acres" (LIDAR, %)	Existing Peak Flow Increase (%)
Lost Creek – East Fork Coquille River	12,950	5.58 (4.7% of watershed)	11.5	14.7	<10
Headwaters Middle Fork Coquille River	31,518	4.93 (4.2% of watershed)	10.4	27.9	<10
Twelve Mile Creek	24,167	5.69 (4.8% of watershed)	10.3	16.2	<10
Olalla Creek	17,115	3.85 (3.2% of watershed)	13	28.0	<10
Rice Creek-South Umpqua River	16,979	9.16 (7.8% of watershed)	17.5	33.0	<10

Water Quality

Beneficial uses of these waters include salmonid spawning and rearing, and utilization by resident fish and other aquatic life. Other beneficial uses include domestic supply, irrigation, livestock watering, recreation, and storage. There are four registered water rights for domestic use that are located within one mile of the proposed units. Portions of the analysis area are within the drinking water source areas for the cities of Coquille, Myrtle Point and Winston, Oregon.

Additional recognized beneficial uses of the stream-flow in the project area include livestock and wildlife watering, recreation, and aesthetic value. Best Management Practices described in Appendix B would be implemented to eliminate and/or minimize potential impacts to beneficial uses of the project watersheds.

All of the project watersheds are listed by the Oregon Department of Environmental Quality (ODEQ) on the Clean Water Act 303(d) list (ODEQ 2008) for exceeding year-round stream temperature as core cold water habitat for fish. Table 3.13 displays the watershed, listing parameters and the extent of the listed areas.

Table 3.13 Listed Parameters of the five subwatersheds in the Analysis Area

Watershed	303(d) Listed parameters (2010 List)	Extent of Listing
Lost Creek – East Fork Coquille River	Biological Factors, Dissolved Oxygen, pH, Sediment, and Temperature	Below BLM Lands Mile 0.0 to 26.2
Headwaters Middle Fork Coquille River	Various Parameters including: Dissolved Oxygen, pH, Sediment and Temperature	Includes BLM Lands Mile 0.0 to 39.6
Twelve Mile Creek	Sediment, Temperature	Includes BLM Lands Mile 0.0 to 10.2
Olalla Creek	Biological Factors, Dissolved Oxygen, pH, Numerous Metals, Sediment, Temperature	Includes BLM Lands Mile 0.0 to 21.8
Rice Creek-South Umpqua River	Temperature	Includes BLM Lands Mile 0.0 to 6.8

In 2006, the ODEQ completed the Umpqua Basin Total Maximum Daily Load (TMDL), approved by the U.S. Environmental Protection Agency (EPA) on April 12, 2007. In 1994, the ODEQ completed the Coquille River TMDL, approved by the EPA on July 3, 1996. Approved actions in these basins include implementation of federal land management activities provided that BMPs and project design features are implemented to prevent exceedance of the TMDL.

During field review, perennial stream channels were observed to be mostly stable and functional with sediment levels within the expected range for the stream type. Turbidity concerns were noted where road ditches were directly connected to stream channels, and recommended road repairs and renovation were noted. Some channel reaches contain large amounts of in-stream wood that provide sediment depositional areas. Other channels contain sections of discontinuous flow where water went subsurface, which also serve as sediment depositional areas.

No stream-specific temperature data was available for this analysis. Stream shading varies between dense canopy cover by conifers to open canopy at flatter reaches on the larger channels. The majority of the proposed harvest units are located on either north or east facing slopes, which are considered low energy absorption slopes due to low sun angles. The exception to this are the units located in the upper headwaters of the Middle Fork Coquille River, which are located on flat or south facing aspects.

B. Alternative One (No Action) - Effects

1. Fish Species

There would be no BLM-authorized road construction, renovation or decommissioning, and no timber harvest and log hauling. Although periodic maintenance on BLM-administered roads would be conducted, runoff and sediment generated from roads with poor drainage, blocked cross-drains, and/or inadequate surfacing would continue to affect aquatic habitat conditions. Stream crossings over fish habitat would be expected to deliver sediment during heavy winter freshets under background conditions, which combined with existing watershed conditions and activities on privately managed land would continue to indirectly affect fish and aquatic habitat.

2. Aquatic Habitat, Critical Habitat and Essential Fish Habitat

Sediment and substrate

There would be no potential new sources of sediment and no direct effects on spawning substrates in fish-bearing streams in the analysis area. Spawning substrates would continue to be indirectly affected by runoff and sediment generated from roads with poor drainage, blocked cross-drains, and/or inadequate surfacing. Lacking regular maintenance and periodic renovation, poorly-surfaced forest roads would contribute small but unquantifiable amounts of sediment to stream network at road crossings which would be stored locally in channels with adequate wood and depositional areas. Over time, some of this sediment could reach fish-bearing streams and become entrained in spawning gravels.

In-stream Functional Wood

There would be no direct effects on the availability of large and small wood for recruitment into stream reaches on BLM-administered lands, as there would be no management actions that would remove trees from within wood recruitment zones. Over time, periodic reductions in large and small wood may occur as it decays and is flushed from streams during high flow episodes. At the same time, Riparian Reserves adjacent to these streams will provide sources of wood to replenish what is lost, and augment amounts of in-stream functional wood in streams where it is deficient.

Pool habitat

Existing pool habitat would not be directly affected. Over time, however, pool habitat would be lost as existing in-stream wood is flushed through the system and new habitat is created by wood recruited into streams from adjacent Riparian Reserves.

Habitat Access

Absent road construction involving the installation of stream crossings, or road renovation involving the replacement of stream crossings there would be no potential for creating new barriers to fish passage that would restrict access to available stream habitat.

Existing natural barriers would continue to preclude access to some anadromous species and improperly designed, installed or functioning stream crossings elsewhere in the watersheds would continue to preclude utilization of historically accessible spawning and rearing habitat.

Critical Habitat and Essential Fish Habitat

There would be no direct effects to critical habitat for OC coho salmon, or Essential Fish habitat, although both would be indirectly affected by existing upstream and downstream conditions and unrelated land management activities on both Federal and private lands within the watersheds.

3. Water Resources

The potential for peak flow effects varies for different stream types (Grant *et al*., 2008). The 2008 FEIS (p. 758) indicates that high gradient cascade and step-pool streams, characteristic of nearly all of the streams in the analysis area, have little potential to affect sediment transport and peak flow enhancement. Exceptions are the Middle Fork Coquille River and some higher order stream reaches on Holmes and Twelvemile Creeks.

The 2008 FEIS (pp. 755 and 757) found none of the subwatersheds in the project area to be susceptible to peak flow enhancement, whether in the rain-dominated hydroregion or rain-on-snow dominated hydroregion. Without changes in vegetative cover, there would be no change in canopy interception of precipitation, or in the magnitude or rate of surface water runoff and delivery to the stream network that could influence peak flows.

Existing roads and landings may modify storm peaks by reducing infiltration, which would allow more rapid surface runoff. Roads may also intercept subsurface flow and surface runoff, and channel it more directly into streams (Ziemer, 1981). Statistically significant increases in peak flows have only been shown when roads occupy at least 12 percent of the watershed (Harr *et al*., 1975). Road densities in the project subwatersheds range from 3.2 percent to 7.8 percent of the land base, and no perceptible increase in peak flows would be expected. Absent any timber harvest or road work/use, no additional disturbance to flow paths would occur.

Stream temperatures in reaches within or adjacent to proposed harvest units would be maintained as these areas are well-shaded by timbered Riparian Reserves. Streams disturbed by past management activities would continue to evolve toward more stable conditions. Stream reaches that are currently thermally impaired, principally due to reduction and removal of riparian canopy on privately-managed timber and agricultural lands, are likely to remain so.

Routine road maintenance would not fully correct existing sediment problems associated with culvert failures, erosion of unsurfaced roads, and failure of road cuts and fills. This would be most prominent on roads that are infrequently used and not subject to regular maintenance.

As existing roads and drainage structures age they become more susceptible to degradation and risk of failure, particularly during major winter storm events. Some road and culvert failures would result in direct sediment inputs into the stream network, the amount varying with the severity of storm events, and condition, stability and proximity of roads or culverts to a stream.

C. Alternative Two (Proposed Action) - Effects

1. Fish Species

The principal direct effect to fish would be associated with sediment, as effects of the proposed action on aquatic habitat would primarily be indirect in nature. Under some circumstances, timber harvest and log hauling can result in the addition of fine sediment to streams, causing temporary increases in turbidity. Fine sediment that becomes embedded in spawning substrates can indirectly affect fish by reducing survival of eggs and alevin still buried in gravel. Elevated turbidity may also reduce foraging ability, impair breathing by clogging gill membranes, and increasing overall stress levels (Waters 1995).

In general, road surfaces in proximity to OC coho salmon and OC steelhead trout are located on gentle topography with ditch lines, cut banks, and fill slopes that are typically well-vegetated. A limited number of short road segments are in close proximity to habitat occupied by OC coho salmon and OC steelhead trout, where direct short-term connections of road surface runoff to streams may occur during heavy rainfall events. Table 3.14 describes road surfacing, proposed season of timber haul, numbers of stream crossings, proximity to resident and anadromous fish-bearing stream reaches, and other parameters.

Wet season haul could occur over OC coho salmon designated Critical Habitat where the Slater Creek Road crosses the Middle Fork Coquille River and where the Rice Creek Road parallels or crosses the lower reaches of Rice Creek, with potential sediment and turbidity impacts to habitat occupied by OC coho salmon. Wet season hauling would also occur over OC steelhead trout habitat on the Middle Fork Coquille River, Twelvemile Creek, and Rice Creek with similar potential sediment and turbidity impacts. Implementation of project design features and BMPs such as cessation of hauling ahead of major storm events, suspension of hauling when road surfaces become saturated and ditch line run-off is sediment-laden, and the installation of sediment control measures such as hay bales and silt fences would minimize these effects.

Sediment delivery would generally occur during heavy winter freshets when background turbidity levels are already elevated, minimizing the relative increase in turbidity. OC coho salmon and OC steelhead trout may experience short-term effects as a result of proposed wet season hauling due to localized increase in turbidity in stream channels. In general, fish would be expected to move away from high turbidity areas to areas of low turbidity, or reduce physical activity during periods of elevated turbidity (Bjornn and Reiser 1991). Small amounts of sediment could also be deposited in substrates reducing spawning habitat quality.

Proposed road construction and disposal of activity fuels post-harvest would occur entirely outside of Riparian Reserves, and have no mechanism for transporting sediment to streams or potentially affecting fish. Road renovation would be seasonally restricted to the dry season, and any sediment that may be generated during the onset of autumn rains would be unlikely to affect fish downstream as intermittent stream channels along the haul route generally have steep gradients with high sediment storage capacity sufficient to retain any small amount of sediment generated from crossings (2008 FEIS, p. 758).

In instances where reopening of previously roads involves the installation of stream crossings, such as on Road No. 29-8-35.1, work would be restricted to the dry season and the crossing would be removed and the road decommissioned prior to the onset of autumn rains. The same would apply if a decision were made to reopen Road No. 30-8-8.0 in its entirety, rather than construct a new road to access the southwest corner of Unit 30-8-7B in a ridgetop location. This activity would be unlikely to affect fish as the amount of sediment that might be generated would be small, and as noted above, intermittent stream channels such as are found in the project area generally have steep gradients with high sediment storage capacity. Additionally, none of these temporary crossings are located within 175 feet of fish-bearing stream reaches, and none are located in areas occupied by OC coho salmon.

Table 3.14 provides a general description of system roads that would comprise haul routes for the timber harvest proposed in this environmental assessment. In addition to things such as length, type of surfacing, numbers and types of stream crossings, it also describes seasonality of use. While surfaced roads are sometimes designated for dry season haul, this does not reflect unsuitability for wet season haul, but rather the harvest methods that would be applied in proposed units that would haul over the roads. If a unit is designated for dry-season harvest because yarding would be accomplished principally or entirely with ground-based equipment, wet season hauling would not be an available option. Should, however, a purchaser propose to surface a temporary spur to cable yard a unit, then wet season hauling would be allowable.

Table 3.14 Description of the Proposed Haul Routes

Haul Rd#	P,A,N[1]	Length (miles)	Season of Use[2]	Number of Crossings Over:				Prox. To Resident Fish (ft)	Prox. To LFH (ft)
				Fish		Other Peren.[3]	Inter.[4]		
				Bridge	Culvert				
28-8-18.0	P	1.21	Y		1	1	1	0	80,200
28-8-19.1	A	0.19	Y					6,250	83,800
28-8-19.9	A	0.16	Y					6,250	83,800
28-8-20.1	N	0.46	D					3,575	81,125
28-8-29.2	A	0.57	Y			1	1	1,000	81,775
28-8-29.3	N	0.11	D					275	81,050
28-8-31.0	N	0.15	D					550	74,425
28-8-31.1	A	0.27	D	1				0	72,000
28-8-31.2	P	0.36	Y			1		150	71,675
28-8-31.5	N	0.18	D					650	75,575
28-9-25.1	P	0.56	Y					200	73,825
29-7-24.0	A	2.47	Y	1	4	1	5	0	0
29-7-25.2	A	0.82	Y				2	1,900	2,200
29-7-36.0	A	0.65	Y					4,100	4,500
County Rd. 38	A	0.56	D		1			0	0
30-7-5.0	A	0.69	D			1	1	325	325
30-7-8.0	A	2.82	D			5	5	925	925
29-7-31.4	A	0.13	D					2,700	2,700
29-9-35.1	A	0.43	Y					2,775	18,600
29-9-36.0	P	4.20	Y				4	125	9,975
30-9-3.0	A	0.83	Y			1	2	4,350	11,625
30-9-4.2	A	0.14	Y					9,975	9,975
29-8-29.2	P	4.11	Y		1	1	4	0	37,150
29-8-31.0	A	0.56	Y					4,300	41,125
29-8-31.5	N	0.43	D				1	7,000	38,175
30-8-17.1	A	0.96	Y				1	14,750	30,600
30-8-17.3	A	1.23	Y					9,525	25,500
30-8-18.0	A	0.62	Y					10,050	26,000
30-8-18.2	A	0.20	Y					7325	23,300
30-8-4.1	A	0.05	Y					2,275	32,675
30-8-4.2	A	0.14	Y					16,150	32,675
30-8-5.2	A	0.96	Y					6,925	22,875
30-8-8.0	A	0.87	Y				2	8,950	24,900
30-8-9.1	A	4.14	Y			2	13	11,775	27,700
30-9-11.0	A	3.80	Y	5		1	6	0	7,275
30-9-11.1	A	2.91	Y			2	6	225	12,325
30-9-13.4	A	0.51	Y					6,400	22,350
30-9-17.0	A	5.73	Y	1		6	14	0	0
30-9-23.3	A	2.36	Y		1	5	3	0	28,725
30-9-24.0	A	1.32	Y		1	2	2	0	21,650
30-9-27.2	A	0.58	Y					4,000	32,125

1. Road surface types: P=Paved, A=Aggregate, N=Natural Surface
2. Season of Use: Y=Year Round, D=Dry season (generally May 15 to Oct 15).
3. Peren. = Perennial Stream
4. Inter. = Intermittent stream

2. Aquatic Habitat, Critical Habitat and Essential Fish Habitat

Sediment and substrate

Timber felling and yarding would have no observable or measurable effect on stream sedimentation. With two exceptions discussed below, all felling activities would occur in upland areas, outside of Riparian Reserves that are one to two site potential tree heights in width, dependent on the nature of the individual stream. Vegetated buffers that are greater than 33-feet in width have been shown to be effective at trapping and storing sediment (Rashin *et al.* 2006).

Timber in adjacent upland stands would be felled away from Riparian Reserves to protect and maintain their physical integrity. Should a tree fall into the Riparian Reserves, the Contract Administrator would make a determination on whether the tree or portion thereof can be removed without undue risk of creating circumstances that could result in erosion and stream sedimentation. Skyline yarding systems would be capable of maintaining a minimum of one-end log suspension, and ground-based harvest would be conducted on existing skid trails to the greatest degree practicable to minimize soil disturbance. New trails for ground-based harvest would be pre-designated and would be laid out in a fashion that would minimize the area subject to soil displacement and not direct surface run-off toward stream channels. Non-compacted forest soils in the Pacific Northwest have very high infiltration capacities and are not effective in transporting sediment overland by rain splash or sheet erosion (Dietrich *et al*. 1982). These measures would assure that soil erosion and potential sediment transport are minimized and would not affect adjacent or downstream aquatic habitat and spawning substrates.

Any trees felled in Riparian Reserves for tailholds, a practice considered unlikely and one that would be discouraged, would be left on site for potential in-stream recruitment. In the case of Unit 28-8-31A which would require cable-yarding across an intermittent stream to a landing located on the east side of Road No. 28-9-25.1, any trees cut to clear pre-designated yarding corridors would be felled toward the stream and left on site for potential in-stream recruitment.

Pre-designated full suspension yarding corridors over stream channels in unit 28-8-31A is more than 450 feet upstream from fish habitat. Full-suspension of logs, up to and including the use of a standing skyline and slack-pulling carriage, would reduce potential for any surface disturbance that could lend to erosion and generation of sediments. Sediment reaching streams more than 300 feet from fish habitat would be expected to assimilate into bedload and not have detectable affects to fish habitat (Duncan *et al.* 1987). The small increase in turbidity which may be generated in the winter following dry season yarding over streams would be undetectable against background turbidity where fish reside, thus impacts to fish and aquatic habitat would be undetectable.

As previously described, proposed road construction and disposal of activity fuels post-harvest would occur entirely outside of Riparian Reserves, and have no mechanism for transporting sediment to streams or potentially affecting fish. Road renovation would be seasonally restricted to the dry season, and any sediment that may be generated during the onset of autumn rains would be unlikely to affect fish downstream as intermittent stream channels along the haul route generally have steep gradients with high sediment storage capacity sufficient to retain any small amount of sediment generated from crossings (2008 FEIS, p. 758).

In instances where reopening of previously roads involves the installation of stream crossings, work would be restricted to the dry season and crossings would be removed and the roads decommissioned prior to the onset of autumn rains. This would apply if a decision were made to reopen Road No. 30-8-8.0 in its entirety, rather than construct a new road to access the southwest corner of Unit 30-8-7B in a ridgetop location. This would be unlikely to affect fish as the amount of sediment that might be generated would be small, and as noted above, intermittent stream channels such as are found in the project area generally have steep gradients with high sediment storage capacity. Additionally, none of these temporary crossings are located within 175 feet of fish-bearing stream reaches, and none are located in areas occupied by OC coho salmon.

The majority of road renovation would be a minimum of 175 feet from stream reaches occupied by resident or anadromous fish, and would primarily consist of brushing, ditch reconstruction, surfacing, and grading (Table 3.14). The nearest stream crossing replacement on a primary haul road, in relation to resident fish habitat, is at least 1,325 feet upslope and would have no effect on occupied downstream reaches.

Given the distance to inhabited stream reaches, restriction of road maintenance to the dry season when very few of the stream crossings on the roads would be passing water, well-vegetated ditch lines, and the capacity of steeper gradient intermittent stream channels to capture and store small amounts of sediment generated at stream crossing (2008 FEIS, p. 758), any sediments generated by road renovation actions would be unlikely to have any effect on downstream spawning substrates.

The majority of the proposed harvest units and the roads that would be utilized for timber hauling are located outside of valley bottoms near the ridge lines. Most of the haul roads are either paved or surfaced with aggregate.

The use of unsurfaced roads, which would include temporary spur roads, would be restricted exclusively to the dry season as indicated in Table 3.14. Dry-season hauling would neither generate nor deliver sediment to live stream channels, because absent substantial precipitation there would be no mechanism for moving fine sediment from road surfaces into ditch lines and potentially into nearby stream channels.

Where haul routes are paved, there is no mechanism for sediment to be generated or carried to adjacent stream channels. Gravel-surfaced haul routes could contribute small amounts of fine sediment to stream channels at stream crossings at a time of year that sediment is being transported downstream by high winter flows. Under such circumstances small amounts of sediment could become entrained in substrates in fish-bearing reaches, slightly reducing spawning habitat quality.

Wet-season haul on aggregate-surfaced roads where stream crossings are in excess of 100 feet from occupied fish habitat, resident or anadromous, would not be likely to result in sediment reaching the occupied habitat as buffer distances greater than 100 feet would be expected to capture any sediment generated from hauling (Burroughs and King 1989, Corbett and Lynch 1985, Swift 1985, Belt *et al.* 1992, Sweeney and Newbold 2014).

Likewise, any sediment generated by wet-season hauling at stream crossings more than 300 feet from any occupied fish habitat would be captured in the channel bedload prior to reaching occupied fish habitat and have undetectable affects to fish habitat (Duncan *et al.* 1987).

There are eight culvert crossings over fish-bearing streams where all-weather haul is proposed. The road approaches to these crossings are located on flat aggregate-surfaced road segments with well-vegetated ditchlines. There are also eight bridge crossings with aggregate-surfaced approaches and low-gradient, well-vegetated ditchlines that span occupied fish habitat. Low gradient roads, approaching streams crossings, with heavily-vegetated ditch-lines have limited potential to transport sediment (Luce and Black 1999). Transport of road sediments onto the bridge decks is evident under existing conditions and would be expected with wet season hauling, as relief scuppers drain directly into to streams below. By implementation of renovation and design features that would include re-sloping crossing approaches and placing brush wattles or hay bales over bridge scuppers during wet-season haul only short segments of road in immediate proximity to these crossings may directly input road runoff into the streams during heavy precipitation episodes.

In order to further reduce potential of road runoff, the following project design features would be used:

- Active haul would be suspended during or prior to forecasts of substantial rain or if the haul route becomes adversely impacted;
- Straw bales, Terra tubes or similar sediment trapping devices would be placed in ditches above flowing streams if the ditch is observed carrying sediment-laden water;
- District fisheries and hydrology staff would monitor and inspect the haul route during use and make additional recommendations for sediment reduction.

In-stream Functional Wood

Studies on landslides and debris flows found that small headwater streams are important sources for downstream wood recruitment to larger streams (Reeves *et al.* 2003). There would be no effect from timber harvest on the availability of small and large functional wood as full Riparian Reserves would be established on all streams within or adjacent to proposed harvest units. Identified areas of slope instability would be excluded from the harvest areas and incorporated into Riparian Reserves maintaining them as source areas for wood deposition.

Loss of coarse and large woody debris due to timber harvest can alter the stability and quality of aquatic habitat (Chamberlin *et al.* 1991, Beechie *et al.* 2000). Effectively all deadwood recruitment to streams occurs within a site potential tree height of the stream channel (Murphy and Koski 1989; Robison and Beschta 1990; Van Sickle and Gregory 1990; McDade *et al.* 1990; Meleason *et al.* 2002). Based on the established Riparian Reserve widths, functional in-stream wood recruitment rates would not be affected by the proposed harvest.

Any trees felled in Riparian Reserves for tailholds, a practice considered unlikely and one that would be discouraged, would be left on site for potential in-stream recruitment. In the case of Unit 28-8-31A which would be cable-yarded across an intermittent stream to a landing east of Road No. 28-9-25.1, any trees cut to clear pre-designated yarding corridors would be felled toward the stream and would, likewise, be left on site for potential in-stream recruitment. A slight increase to in-stream wood recruitment is possible; but the magnitude is indeterminate and would be unlikely to have any detectable effects on aquatic habitat at local or broader watershed scales.

Proposed road construction and disposal of activity fuels post-harvest would occur entirely outside of Riparian Reserves, and have no mechanism for transporting sediment to streams or potentially affecting fish. Road renovation would be seasonally restricted to the dry season, and any sediment that may be generated during the onset of autumn rains would be unlikely to affect fish downstream as intermittent stream channels along the haul route generally have steep gradients with high sediment storage capacity sufficient to retain any small amount of sediment generated from crossings (2008 FEIS, p. 758).

In instances where reopening of previously roads involves the installation of stream crossings, work would be restricted to the dry season and the crossing would be removed and the road decommissioned prior to the onset of autumn rains. This activity would be unlikely to affect fish as the amount of sediment that might be generated would be small, and intermittent stream channels such as are found in the project area generally have steep gradients with high sediment storage capacity. Additionally, none of these temporary crossings are located within 175 feet of fish-bearing stream reaches, and none are located in areas occupied by OC coho salmon.

Proposed road renovation would have no effect on in-stream wood recruitment. Roadside brushing would be limited to the removal of small woody plants that would serve no function as in-stream wood. Equipment operation associated with the replacement of cross drain culverts and dilapidated stream crossing culverts would be limited almost exclusively to the cleared road prism. The size of material that would be removed to facilitate stream crossing replacements would not be of sufficient size to alter channel processes or contribute to the formation of in-stream structures and pool habitat.

Timber hauling on an existing network of roads would have no mechanism for affecting the availability of functional in-stream wood. Based upon the timing of prescribed burning during periods of wet weather and their location outside of Riparian Reserves, these fuel treatments would likewise have no mechanism for affecting the availability of functional in-stream wood.

In-stream wood recruitment on federal lands is increasing as the stands mature within Riparian Reserves (Reeves *et al.* 2006). Analysis conducted in the 2008 FEIS indicated increased that trends in in-stream wood recruitment on all Western Oregon BLM administered Riparian Management Areas. Overall, in-stream wood recruitment was considered likely to continue to improve over the next 100 years. An assessment of Oregon Forest Practices indicated on non-federally administered forest lands roughly 94 percent of the riparian network would be considered inadequately stocked for future recruitment of in-stream wood (IMST 1999). Based on the various policies currently being applied to coastal Oregon forest lands, however, "the amount of riparian area with large and very large conifer trees is projected to increase significantly" (Spies *et al.* 2007) which would contribute towards large wood recruitment.

Pool habitat

As with the No Action alternative, the proposed timber harvest would have no direct effect on pool habitat. There would be no timber harvest in Riparian Reserves. All existing down wood would be reserved under contract provisions and any trees which might require felling in Riparian Reserves to facilitate yarding corridors would be retained on-site for potential future in-stream recruitment. Pool habitat would be indirectly affected over time, however, as existing in-stream wood decays or is otherwise flushed through the system by high-flow events, and as new pool habitat is created by the future recruitment of wood into stream channels from adjacent Riparian Reserves.

Habitat Access

Timber harvest and hauling, and prescribed burning possess no mechanism by which habitat access would be affected. None of the proposed road construction of renovation includes the installation of new stream crossings or replacement of stream crossing culverts on fish-bearing streams which could result in conditions impassable to fish and other aquatic organisms.
In the event that full reconstruction of Road No. 30-8-8.0 and a previously decommissioned spur road in Unit 30-8-7B is undertaken, in lieu of construction of new access into the southwest corner of the unit, this would have no effect on habitat access as the headwaters of the two streams that would be crossed are intermittent and not fish-bearing, and the stream crossings would be removed following the completion of harvest.

Critical Habitat and Essential Fish Habitat

Potential effects to critical habitat for OC coho salmon would be singularly associated with potential generation and delivery of sediments to streams during wet-season haul. With measures described above (p. 63), effects would be negligible in magnitude and confined to the immediate vicinity of stream crossings, and of short duration. Critical habitat would continue to be indirectly affected, however, by existing watershed conditions and management actions on Federal and private lands unrelated to the proposed action.

Freshwater EFH for Chinook and coho salmon consists of four major components, (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration corridors; and (4) adult migration corridors and holding habitat (PFMC 2014).

Freshwater EFH depends on lateral (e.g., floodplain, riparian), vertical (e.g., hyporheic) and longitudinal connectivity to create habitat conditions for spawning, rearing, and migration including: (1) water quality (e.g., dissolved oxygen, nutrients, temperature); (2) water quantity, depth, and velocity; (3) riparian-stream-marine energy exchanges (4) channel gradient and stability; (5) prey availability; (6) cover and habitat complexity (e.g., LWD, pools, aquatic and terrestrial vegetation); (7) space; (8) habitat connectivity from headwaters to the ocean (e.g., dispersal corridors, floodplain connectivity), (9) groundwater-stream interactions and (10) substrate composition (PFMC 2014). Construction and operations of logging roads, creation of barriers, and removal of stream side vegetation associated with timber harvest can adversely impact Essential Fish Habitat (Hansen *et al.* 2003).

The site of proposed construction of 1,400 feet of new road in Unit 30-8-7B in a ridge top location more than three miles from the extent of OC coho salmon distribution in the Middle Fork Coquille River, and no effects to EFH would occur.

Proposed wet season hauling in proximity to EFH on the Middle Fork Coquille River and Rice Creek may result in sediment transport which could reach EFH and result in effects to water quality, water depth, prey, and spawning substrates. Generally sediment delivery would occur during heavy winter freshets when background turbidity levels are already elevated, minimizing the relative increase in turbidity.

The only connection to the Middle Fork Coquille River would be at the Slater Creek Road crossing. As described above (p. 63), implementation measures such as regrading of bridge approaches, ditching out road surface and ditchline flow onto undisturbed slopes, and installation of wattles over bridge scuppers would reduce potential sedimentation to negligible levels not discernible from background sediment levels.

On the Rice Creek Road, the road surface is shaped such that the majority of surface run-off is directed to ditchlines along the road opposite to the stream location. This runoff is then ditched off into forested areas such that the potential input of sediment into Rice Creek is small and localized.

Small amounts of sediment reaching these waterways may become entrained, locally reducing water depth and spawning habitat quality in EFH but is likely to be flushed during periods of high flow. Increases in turbidity could reduce primary production and invertebrate abundance affecting availability of slower moving prey species (Hicks *et al.* 1991), but highly mobile prey, such as small fish, would be expected to move away from areas of high turbidity to areas of low turbidity (Bjorn and Riser 1991).

3. Water Resources

Flow

Increases in mean annual water yield following the removal of vegetation have been documented in numerous studies (Bosch *et al.* 1982). Vegetation intercepts precipitation and through the process of photosynthesis evapotranspirates water that might otherwise become runoff. Thus, it can be assumed that the proposed timber harvest would likely result in a small increase in water yield and a small increase in summer base flow, in correlation with the removal of a portion of the conifer overstory in the watersheds (Grant *et al.* 2008).

This analysis assumes no hydrologic recovery from past harvest analyzed in the 2008 FEIS, that current level of harvest activity on private lands remains the same, and that all acres proposed for harvest in connection with this project would have less than 30 percent crown cover, post-implementation. LiDAR based acres used in the analysis include agricultural lands at the lower elevations of the subwatersheds.

Table 3.15 Harvest Related Peak Flow Predictions by 6th Field Subwatershed

Sub-Watershed	Existing Regeneration Harvest Acres (LiDAR)	Proposed Regeneration Harvest (Acres)	Proposed Gas Pipeline (Acres)	Timber Sale Change in Peak Flow (Percent)	Cumulative Change in Peak Flow (Percent)
Lost Creek – East Fork Coquille River	1,897	21	0	1	<10
Headwaters Middle Fork Coquille River	8,807	489	76	<1	<10
Twelve Mile Creek	3,924	215	0	<1	<10
Olalla Creek	4,792	33	57	<1	<10
Rice Creek-South Umpqua River	5,603	111	53	<1	<10

Using the peak flow estimation method developed by Grant *et al.* (2008), adding the acres of proposed timber harvest to existing open areas, the open condition in each of the subwatersheds in the project area increased no more than one percent, an increment that is below the detection level established by Grant. With the cumulative effects of the acres of right-of-way clearing for the proposed Pacific Connector Gas Pipeline also factored in. all of the project subwatersheds remained below the 10 percent detection threshold for peak flows identified by Grant *et al.* Increases in peak flow can also occur when roads and other impermeable areas occupy more than 12 percent of a catchment scale watershed (Harr *et al.* 1975). As illustrated in Table 3.12 (p. 55), road densities in the project subwatershed range from a low of 3.85 mi/mi ^{2} or 3.2 percent of the total area of the Olalla Creek subwatershed, to a high of 9.6 mi/mi ^{2} or 7.8 percent of the total area in the Rice Creek-South Umpqua River subwatershed. As no discernible changes in peak and base flows are anticipated no alterations to stream conditions and aquatic habitat would be anticipated downstream.

The only permanent proposed road construction is in the Twelvemile Creek subwatershed where road density is currently 5.69 mi/mi ^{2}, occupying 4.8 percent of the total subwatershed area. The construction of an estimated 1,400 feet (0.26 miles) of permanent road, located more than 400 feet from any stream and unconnected to the stream network, would increase road density to approximately 5.70 mi/mi ^{2}, representing an increase in roaded area of 0.12 percent of the subwatershed area, both undetectable against the 12 percent threshold describes by Harr *et al.*

All proposed road renovation is located more than 175 feet away from fish bearing streams, and given the dispersed nature of cross-drain installation and/or replacement, no detectable changes in stream flows or effects on fish and aquatic habitat would be anticipated. Timber hauling has no causal mechanisms to alter flows, and with road renovations and seasonal restriction on hauling on unsurfaced roads, no measurable effects from sediment would be anticipated.

As there would be no prescribed burning within Riparian Reserves, there would be no change in soil permeability and infiltration rates, and no increase in run-off or alteration of stream flows which might otherwise affect stream conditions, fish and aquatic habitat.

Temperature

The establishment of Riparian Reserves would maintain all primary and secondary stream shade and exceed the widths recommended to maintain a minimum of 80 percent effective shade described in the 2008 FEIS (Chapter 3, p. 338, Figure 3-77). Timber harvest outside of Riparian Reserves would not result in any alteration of primary and secondary shade, and no changes in stream temperature would be anticipated.

Cable harvest of Unit 28-8-31A would require the use of yarding corridors through the Riparian Reserve on the east side of the unit. These corridors would be pre-designated and limited to 20-feet in width to minimize the number of trees that would require cutting, and hence the amount of canopy cover that would be removed. The stream over which the timber would be yarded is non-fish-bearing and intermittent. It does not pass water in the summer months when stream temperatures are most susceptible to change. Consequently, any temperatures changes would likely be indiscernible and would not affect fish downstream from the site.

Proposed road construction would not have any effect on stream temperature as the new road proposed in Unit 30-8-7B would be located more than 400 feet from two intermittent headwater streams, and Riparian reserves 180-feet in width on either side of the streams would maintain existing primary and secondary shade at the site.

If a decision were made to reopen Road No. 30-8-8.0, this too would have no effect on stream temperatures as a road bed already exists and the installation of temporary crossings on two intermittent streams would not involve or require the removal of any trees that presently provide shade, and because intermittent streams would not be transporting any surface flow in the summer months that could result in heating of stream reaches further down the drainage.

All proposed renovation is located more than 175 feet away from fish bearing streams, and given the limited amount and small size of vegetation that would be cut back along roads, and the dispersed nature of cross-drain installation and/or replacement, no detectable changes in stream temperature would be anticipated. Timber hauling has no causal mechanism by which stream temperatures would be affected.

All fuels reduction activities would be undertaken in the upland areas of the proposed harvest units in the autumn or winter months, following a period of precipitation. Under these circumstances, no effect on vegetation in Riparian reserves would be expected, and no effect on stream temperatures would occur.

Turbidity

No effects to streambank and channel stability would be anticipated as Riparian Reserves established on all streams would prevent disturbance, and streamside vegetation would maintain stability. The areas within Riparian Reserve also have high surface roughness which can function to disrupt overland flow and precipitate sediment before it can reach streams. Ground-based yarding would be limited to the dry season when soils are less susceptible to compaction which might lead to reductions in soil permeability and an increased propensity for runoff.

Upon completion of harvest, all compacted trails, including skid trails from previous entries, would be tilled or subsoiled (ROD/RMP, p. 62), except for rocky areas or areas of shallow, skeletal soils with high cobble and gravel content. Part of the subsoiling process may also include placing available logging slash, other organic debris, and some adjacent topsoil, for protective cover and the addition of nutrients and soil microbes for maintaining soil productivity. Tilling and slash-mulching of skid trails would promote infiltration of precipitation and out-slope drainage of any runoff, preventing water from accumulating and running down skid trail surfaces in volumes sufficient to cause erosion. Although some small amounts of localized erosion would be expected in the first year or two after timber harvest the eroded material would not be expected to move far from its source and would precipitate out in vegetated areas adjacent to the trails.

No road construction would occur within Riparian Reserves, and with the following noted exception, no felling or yarding would occur within Riparian Reserves where the potential for soil disturbance would exist. In the single instance in which yarding through a Riparian Reserve is proposed, trees felled to clear yarding corridors would be left where felled and full suspension of logs over the stream would eliminate the risk of creating circumstances where runoff could be channeled into the stream and result in sedimentation.

The reopening and use of temporary roads, skidding and yarding corridors and the mechanical removal of trees are all unlikely to increase sedimentation. Logging residues function much like mulch, reducing rain splash and runoff that could result in erosion. Areas with steep and unstable slopes in close proximity to streams would be excluded from harvest and incorporated into nearby Riparian Reserves so that the risk of mass wasting and sedimentation is unlikely.

The proposed road construction would be located in upland areas outside of Riparian Reserves and disconnected from the drainage network so that no potential for sedimentation would exist. All other haul roads haul roads would be renovated prior to timber harvest. Although renovation would have potential minor and short-term effects associated with brushing, ditch and crown reshaping, surfacing and culvert installation the work would provide for better drainage and road surface conditions resulting in better dispersion of runoff onto forested slopes and less erosion that could result in stream sedimentation.

Prescribed burning would not be expected to give rise to stream sedimentation and increased stream turbidity. The majority of logging residues, in the form of limbs and tree tops, would remain dispersed across the harvest areas and left untreated. No burning would occur within Riparian reserves. Where large concentrations of activity fuels are located along skid trails, along roads and at landings, it would be piled and covered, then burned in late fall or early winter. Pile and landing burning could create small areas of exposed soil with reduced permeability that are more susceptible to erosion, but burning under conditions of high soil and duff moisture would be expected to reduce extent and degree of these effects. Burn piles would occupy small areas surrounded by larger unburned areas capable of absorbing runoff and precipitating any sediment transported away from the burn areas. Revegetation of the burned areas would be expected within one to two growing seasons. Consequently, it would not be expected that any substantial erosion would occur and that any sediment generation would be negligible and undetectable again normal background levels.

Timber harvest would not be expected to generate measurable surface erosion, and the seasonal restriction on timber haul over unsurfaced roads during wet weather would effectively eliminate this as a potential source of sediment. Consequently, the proposed harvest would not be expected to cumulatively affect water quality downstream from the project areas.

VI. Soils

A. Affected Environment

The soil characteristics of each subwatershed unit are displayed below in Table 3.16. All of the listed soil types have a low resistance to compaction.

Table 3.16 Soil Characteristics of the five subwatersheds in the Analysis Area

6th Field Subwatershed	Major Soil Type	Off-Road Erosion Hazard	Harvest Equipment Operability	Soil Degradation Susceptibility
Lost Creek – East Fork Coquille River	Silt Loam	Severe	Poor	High
Headwaters Middle Fork Coquille River	Silt Loam – Silty Clay Loam	Slight-Moderate	Moderate	Moderate
Twelve Mile Creek	Clay Loam	Slight-Severe	Moderate	Slight
Olalla Creek	Clay Loam	Moderate	Moderate	Slight
Rice Creek-South Umpqua River	Clay Loam	Severe-Moderate	Poor	Slight

Silty loams and Silty/Clay loams are the predominant soil types in the project areas. Specific soil series include Digger – Bohannon, Honeygrove, Windy Gap Silt Loam, Windy Gap Clay Loam, Preacher-Bohannon gravely clay loam and Windy Gap- Bellpine complex. Soil properties were observed in the field and descriptions were obtained from the web-based USDA-NRCS Soil Survey[6].

1. Soil Displacement and Compaction

All of the proposed harvest units were previously thinned. It is anticipated that similar harvest methods used in the previous intermediate entries would be utilized again. Moderate to heavily-compacted soils still exist in scattered skid trails in the analysis area that date back to the original tractor logging that was done as early as the 1940s.

The major management concern is sensitivity of soils to displacement and compaction when moist or wet, , with a corresponding reduction in soil site productivity, and an accompanying reduction in infiltration rates that may lead to increased run-off and surface erosion. Soils with a higher proportion of clay are especially sensitive to compaction when ground-based equipment is allowed to operate when the soil is moist. On steeper slopes, typically greater than 35 percent, runoff rates and the risk for erosion are higher for exposed soil.

Existing skid trails and old haul roads are generally less than 12 feet in width, so the stands remain fully occupied. Existing rocked and paved road surfaces are stable. Table 3.12 provides the existing road density of each watershed. Some sections of natural-surface roads exhibit signs of limited surface erosion where surface water accumulates and runs down the compacted road surface. Some reshaping of the road crown, installation of water bars, or other drainage work would correct these problem areas

2. Slope Stability and Erosion Hazard

Soils on steep to very steep slopes are classified as fragile due to slope gradients. These sites may be subject to unacceptable soil and organic matter losses due to surface erosion or mass soil movements resulting from forest management activities. In Section 7, T. 30 S., R. 8 W., there are two small slope failures, each less than one-third of an acre in size on steep to very steep slopes. The areas are partially to mostly vegetated with standing conifers within or adjacent to the slide perimeters.

B. Alternative One (No Action) - Effects

1. Compaction and Erosion Hazard

There would be no direct effects on any soils in the project area, as there would be no soil displacement or compaction associated with road and landing construction, cable yarding or ground-based yarding.

There would be no potential loss in site productivity, although compacted soils on existing skid trails and skid roads would still experience localized effects and would recover slowly absent subsoiling, especially at depths below six inches (Amaranthus *et al.* 1996; Powers *et al.* 2005).

[6] http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm, accessed October 1, 2014

2. Slope Stability and Erosion Hazard

Absent any surface disturbance associated with yarding activities, there would be no potential for destabilization of steep slopes within proposed harvest units and in close proximity to streams, although the potential for mass wasting in association with a meteorological or geological event would always exist .

C. Alternative Two (Proposed Action) - Effects

1. Compaction and Erosion Hazard

Monitoring of ground-based operations from 2000 through 2011, which included the use of rubber-tired skidders, tractors, and harvester/forwarder systems, has shown that with the application of appropriate project design features and Best Management Practices, the areal extent of soil displacement and compaction ranged from three to nine percent of the ground-based harvest area (USDI/BLM 2001, 2005, 2007, 2008a, 2008b, 2009, and 2011b; per. obs. W. Fong, December 2011). In general, the effects included compaction deeper than four inches, and/or soil displacement deeper than the organic-enriched surface layer. The extent varied with the equipment used, number of passes over individual trails, terrain, access routes, climatic conditions, and operator skill.

The initial severity of compaction and the amount of soil displacement can be reduced when slash and small logs are left in the skid roads and the total number of passes is less than ten. Operating only when soils are dry and soil strength is high would reduce the crushing of individual soil aggregates and resulting depth of compaction, whereas multiple passes on moist or wet soil usually results in heavy compaction.

Project design features and Best Management Practices include dry season operations, pre-designation of skid trails, limiting ground equipment to slopes less than 35 percent, and keeping equipment out of seeps and wet meadows. These and other applicable measures would be applied to minimize soil displacement and compaction, and maintain soil productivity.

Upon final harvest, all compacted trails, including skid trails from previous entries, would be tilled or subsoiled (ROD/RMP, p. 62), except for rocky areas or areas of shallow, skeletal soils with high cobble and gravel content. This would reduce soil bulk density and provide some soil aeration which would contribute to growth of both natural conifer regeneration and planted seedlings. Sub-soiling would also help prevent runoff and erosion by increasing infiltration capacity. Part of the subsoiling process may also include placing available logging slash, other organic debris, and some adjacent topsoil, for protective cover and addition of nutrients and soil microbes for maintaining soil productivity.

Tilling and slash-mulching of skid trails would promote infiltration of precipitation and out-slope drainage of any runoff, preventing water from accumulating and running down skid trail surfaces in volumes sufficient to cause erosion. Although some small amounts of localized erosion would be expected in the first year or two after timber harvest the eroded material would not be expected to move far from its source and would precipitate out in vegetated areas adjacent to the trails.

Both uphill and downhill cable yarding would cause localized disturbance characterized by duff and mineral soil displacement in the yarding corridors, and in some instances displacement of the subsoil. Monitoring has shown that application of appropriate project design features and Best Management Practices limits the areal extent of ground affected to less than three percent (USDI/BLM 2008a, 2008b, and 2009; personal observations, W. Fong, December 2011). This includes areas disturbed within yarding corridors, landings, and equipment areas.

Skyline yarding usually results in light compaction of a corridor less than four feet in width. The extent of displacement would be dependent on site conditions, the volume of timber yarded over any given haulback road, topography, and operator/equipment factors. The greatest disturbance would generally occur within 100 to 150 feet of landings where individual haulback roads merge. Soil displacement and compaction averaging three inches in depth would be expected in yarding corridors, with isolated areas of higher compaction to a depth of six inches possible. This is especially true for this type of project where logs are relatively small and there would be adequate slash on the ground in the corridors to yard over. Measurable long term effects on site productivity from this type of disturbance are minimal.

Based on Weyerhaeuser Company studies (Miller *et al.* 1996), the estimated reduction in growth rate for trees on moderate to severely compacted soils is 15–30 percent during the first 10–20 years. As trees become established, the effect on growth from soil compaction and displacement becomes less pronounced and growth rates may approach that of trees on similar, undisturbed sites. This is especially true where the areas of compaction and displacement tend to be in narrow strips as is the case with skyline yarding trails and small landings. If topsoil loss, displacement, and compaction are severe or more broadly based in areal extent, then the effects would be more pronounced and longer lasting.

Studies by Weyerhaeuser Company (Miller *et al.* 1996) and USDA Pacific NW Research Station (Ares *et al.* 2007) indicate that negative effects from compacted soil on growth of young trees become negligible within 8-12 years of planting. Effects from top soil loss or displacement may be of more long-term concern than the associated compaction.

Ground-based yarding areas may be machine piled along primary skid trails or at landings to reduce activity fuels. Activity fuels would be machine-piled in a manner that is consistent with restrictions on ground-based harvest operations. There would be no dozer piling. Machinery would be restricted to existing skid trails or existing roads outside of Riparian Reserves.

In cable yarding areas, machine piling of activity fuels would occur at landings and potentially along roads. Machinery would build the piles from the roadway or landing surface which would not influence the area of soil compaction in the harvest units.

Displacement of duff and topsoil into piles would be avoided to the greatest extent practicable (USDI/BLM 2001, Fiscal Year 2000).

Construction of ridgetop, all-weather roads to provide access to Unit 30-8-7B would not result in any measurable erosion as the road would be constructed in a gentle ridgetop location and would be surfaced with rock. Existing haul roads would be renovated prior to harvest to bring them into a more useable and erosion resistant conditions to support timber haul. This renovation would not increase the amount of non-forested land susceptible to erosion. The road renovation and improvements would provide better drainage and road surface conditions resulting in less road surface erosion. On unsurfaced and temporary roads, operations would be restricted to the dry season, and these roads would be winterized if carried over to the following operational season.

Temporary roads would be decommissioned which could include removal of any drainage structures, subsoiling to improve infiltration, and slash mulching to reduce the potential for splash erosion and runoff. .

2. Slope Stability and Erosion Hazard

Areas with steep and unstable slopes within proposed harvest units and in close proximity to streams would be excluded from harvest and incorporated into nearby Riparian Reserves. This would preclude any surface disturbance in association with timber harvest activities that could increase the risk of mass wasting and sedimentation to adjacent streams.

Prescribed burning would not be expected to result in measurable increases in erosion. The majority of logging residues, in the form of limbs and tree tops, would remain dispersed across the harvest areas and left untreated. No burning would occur within Riparian reserves. Where large concentrations of activity fuels are located along skid trails, along roads and at landings, it would be piled and covered, then burned in late fall or early winter. Pile and landing burning could create small areas of exposed soil with reduced permeability that are more susceptible to erosion, but burning under conditions of high soil and duff moisture would be expected to reduce extent and degree of these effects. Burn piles would occupy small areas surrounded by larger unburned areas capable of absorbing runoff and precipitating any sediment transported away from the burn areas. Revegetation of the burned areas would be expected within one to two growing seasons. Consequently, it would not be expected that any substantial erosion would occur.

III. Fuels Management, Fire Risk, and Air Quality

A, Affected Environment

1. Air Quality

The major source of air pollutants within the Olalla-Camas analysis area would be associated with wildfire starts; resource management activities that include prescribed burning (jackpot (spot), hand, machine, and landing piles)); fossil fuel combustion form logging and timber hauling; and dust from the use of natural-surfaced roads.

The city of Roseburg and the Umpqua Valley experience periods of air stagnation. When this occurs cold air often becomes trapped near the valley floor with slightly warmer air aloft, creating conditions known as temperature inversions that trap and concentrate air pollutants near the ground. Winter temperature inversions contribute to high particulate levels, often due to wood burning and fossil fuel combustion for home heating. Stagnant periods contribute to increases in ozone levels causing deterioration of local air quality. The State of Oregon has designated Roseburg and Coos Bay as Smoke Sensitive Receptor Areas.

2. Fire Hazard and Risk

Fire is a natural disturbance process common in the analysis area. Fire effects are influenced by forest type, fire frequency, fire duration, and fire intensity (Van Wagner 1965). These effects vary with forest type, depending on fuel type, fuel structure, topography, and weather. Fire can influence vegetative species, composition, age, and structure, successional pathways, nutrient cycling, fish and wildlife habitat, and insect and disease vulnerability.

Wildfires within the analysis area have been primarily human-caused. Wildfire risk from humans is higher than compared to lightning because the analysis area is accessible to the general public via paved and rocked roads year around. Dry lightning occurrences (lightning that that has no accompanying moisture) during the summer months varies year to year, but is still rare in Southwest Oregon compared to other parts of the country. Within the Oregon Department of Forestry's Southern Oregon Area - Roseburg District - Central Unit over the last ten years, an average of four fire starts per year are attributed to lightning while eighteen are attributable to humans. The average size of the lightning fires is approximately a half acre. The average size of the human caused fires is approximately 5 acres in size (ODF 2013).

The Olalla-Camas analysis area is located within Douglas County, Oregon. Douglas County completed fourteen Community Wildfire Protection Plans (CWPPs) beginning in September 2004. These plans have been ongoing with the most recent iteration completed in June 2013. Within the analysis area, Camas Valley/Tenmile, Upper Olalla, and Willis Creek have been identified as "Communities at Risk" in Oregon. Land within a one-mile buffer of local fire district boundaries was identified for CWPP treatment areas.

The BLM does not manage any land within the buffers of the Upper Olalla and Willis Creek CWPPs, but several proposed harvest units fall within the one-mile buffer of the Camas Valley/Tenmile CWPP. Wildfire risk reduction projects were identified for the CWPP and include fuel reduction treatments such as mechanical clearing and thinning, harvesting, mowing, chipping, cutting, piling and prescribed burning where appropriate. Collaboration is essential to meet the objectives of the HFRA, so fuel treatments that would reduce the likelihood of wildfire starts on federal land spreading to private land and eventually "Communities at Risk" would help the county to meet the goals of their CWPP.

3. Fire Regime and Condition Class

The Olalla-Camas project vicinity occurs within the Pacific Northwest Forested landscape and potential natural vegetation groups in the area are both dry and moist Douglas-fir-western hemlock (Table 3.17).

Table 3.17 Modeling Predictions of Fire Regimes for the Project Area

Vegetation Community (Potential Natural Vegetation Group)	Fire Severity*	Fire regime characteristics			
		Percent of fires	Mean interval (years)	Minimum interval (years)	Maximum interval (years)
Douglas-fir western hemlock (dry mesic)	Replacement	25%	300	250	500
	Mixed	75%	100	50	150
Douglas-fir western hemlock (wet mesic)	Replacement	71%	400		
	Mixed	29%	>1,000		
	Mixed	7%	>1,000		
	Mixed	13%	50		
	Surface or low	82%	8		

*Fire Severities
Replacement: Any fire causing greater than 75 percent top removal of a vegetation-fuel type, resulting in general replacement of existing vegetation; may or may not cause a lethal effect on the plants.
Mixed: Any fire burning more than 5 percent of an area, but does not qualify as replacement, surface, or low-severity fire. These includes mosaic and other fires that are intermediate in effects.
Surface or low: Any fire causing less than 25 percent upper layer replacement and/or removal in a vegetation-fuel class but burns 5 percent or more of the area.

The Fire Regime classifies the role fire would play across the landscape in the absence of recent human intervention. The area falls within two different Fire Regimes:

- Fire Regime III is characterized by a moderate to low fire return interval of mixed severity and, and in this area is primarily associated with south and west facing slopes. More than 75 percent of fires are characterized as mixed or low severity for this fire regime.
- Fire Regime V is characterized by a low fire return interval with a high severity and in this area is primarily associated with north facing slopes. More than 70 percent of fires are characterized as stand replacement.

The average fire return interval has increased following the advent of fire suppression in 1910.

The Condition Class classifies the degree of departure from the natural fire regime. Timber stands in the analysis area generally fall within Condition Class 2 or 3. Forest management on both public and private lands in the Olalla-Camas area has altered the natural forest composition and structure, creating large tracts of even-aged, overstocked stands, young plantations and clearcuts.

- Condition Class 2 indicates that fire regimes have been moderately altered from their historical range.
- Condition Class 3 indicates that fire regimes have been significantly altered from their historical range.

Management of the surrounding private land affects the Condition Class to such an extent that actions within the Olalla-Camas analysis area are unlikely to change the Condition Class rating across the landscape.

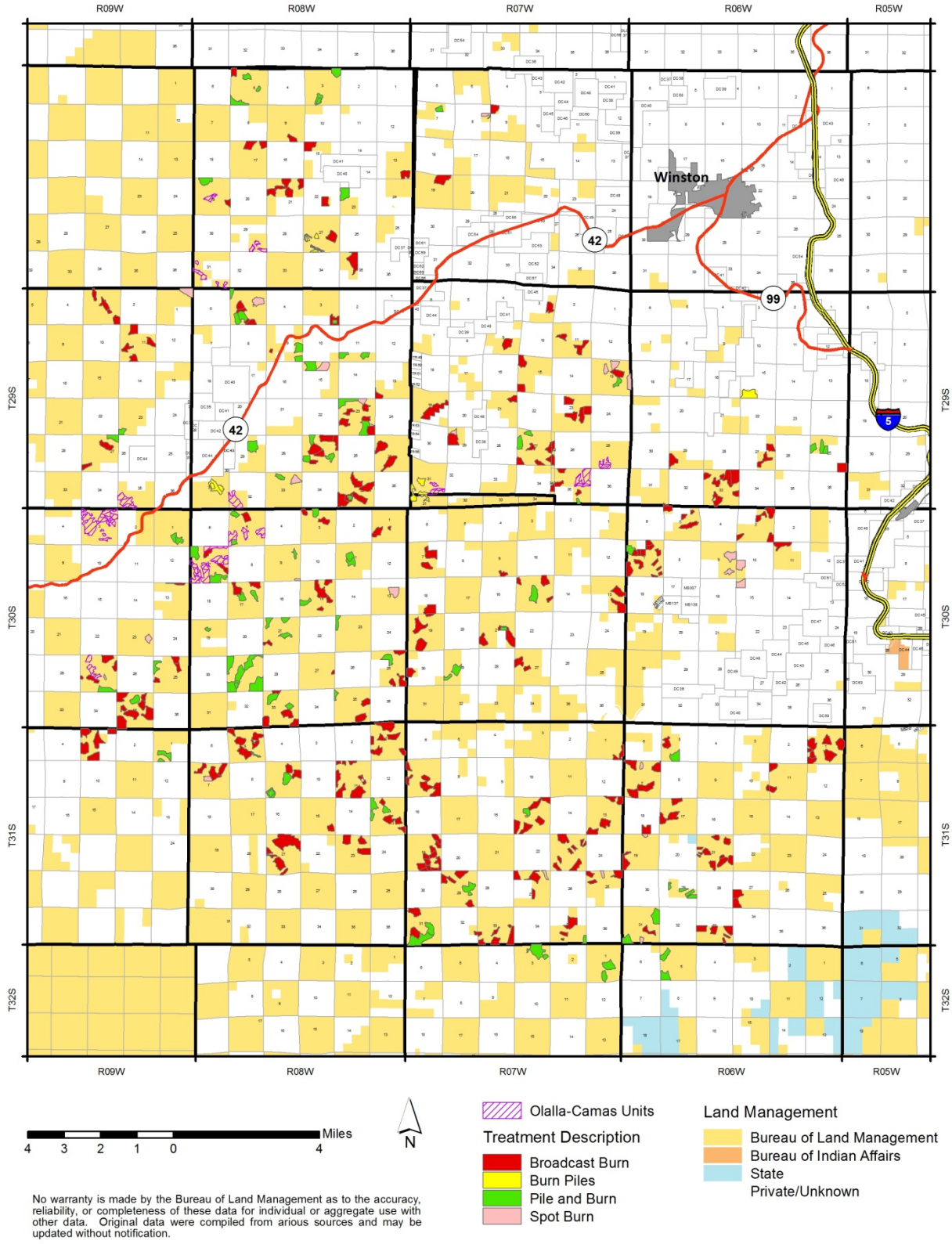
4. Fire History

The early fire history of the Olalla-Camas analysis area is not well documented. Although it is known that Native Americans burned along the coastal strip and headlands and in the interior valleys of western Oregon, to what extent this burning extended into the Oregon Coast Range foothills and up river corridors is not specifically known.

Large fire disturbance post-settlement and into the 1900s is fairly well documented. In 1929 there was a 1000+ acre fire in the vicinity of Camas Valley, and 1951 saw the 15,574-acre Hubbard Creek fire just to the north of the analysis area.

Aerial photos dating from the 1950s and 1960s show that many clearcut harvests occurred prior to the organization of the BLM in the 1930s, and 1940s. These harvests continued under the auspices of the BLM from 1946 through the early 1990s. Clearcut units of this period were often broadcast or spot burned, both for hazard reduction and site preparation prior to tree planting. BLM records indicate that upwards of 7,000 acres within the analysis area were broadcast burned, and upwards of 1,000 acres were treated by spot burning or pile burning. Figure 3.4 - Prescribed Burning Within the Olalla-Camas Analysis Area illustrates the location of previously burned units in relation to the proposed harvest units.

Figure 3.4 Previous Broadcast Burning Within the Olalla-Camas Analysis Area



B. Alternative One (No Action) - Effects

1. Air Quality

Under No Action there would be no road construction or timber hauling, and no regeneration harvest which might create the need for prescribed burning and, therefore, no localized effects to air quality associated with BLM management. However, as the timber stands continue to grow, and suppression mortality increases due to increasing stand densities, the stands would become more susceptible to a stand replacement fire event which would result in poor air quality associated with the high volume of smoke produced.

2. Fire Risk

The current risk of a fire start in the analysis area would remain low. There would be a gradual increase in the coarse woody fuel load as stress-induced mortality within the stands increases. Ladder fuel densities would increase as trees are suppressed in the understory and shade tolerant species seed in. The potential for a wildfire would continue to increase as the stands near the maximum fire return interval and the condition class departs further from the natural fire regime.

C. Alternative Two (Proposed Action) - Effects

1. Air Quality

Prescribed burning would result in short-term impacts to air quality, persisting one to three days within one-quarter to one mile of the proposed harvest units. Prescribed burning would comply with the provisions of the Clean Air Act as project-level Prescribed Fire Burn Plan would be required that adheres to smoke management and air quality standards. The burn plan would comply with the Coos Bay-Roseburg Fire Management Zone Fire Management Plan.

All burning would be coordinated with the local Oregon Department of Forestry office in accordance with the Oregon State Implementation Plan and Oregon Smoke Management Plan. The potential for smoke from prescribed fire to intrude into Smoke Sensitive Receptor Areas (SSRA) would be low because burning would be done when the prevailing winds are blowing away from SSRAs and under atmospheric conditions that favor good vertical mixing so that upper-level atmospheric winds disperse smoke and particulate matter.

The volume of activity fuels within the project areas from previous commercial thinning and the projected volume following regeneration harvest would be approximately 44,000 tons. Prescribed fire treatments proposed for approximately 335 acres, or 40 percent of the harvested acres, would remove approximately 16,000 tons. If jackpot burning proved infeasible because of weather conditions or other issues, approximately 115 acres could be treated with a combination of hand, machine, and landing pile burning resulting in short-term impacts to air quality similar to that described above. None of the proposed treatment units are close enough to public highways to affect motorist safety.

There would be no cumulative effects to air resources, as the direct and indirect effects from the projects would be local and of short duration. No other effects to air quality in the project areas would be anticipated. Based on past experience with jackpot (spot) burning, and pile burning within this habitat type and adherence to smoke management plans, there are no expected cumulative effects on air quality from the planned fuels treatments.

2. Fire Risk

Following harvest, all of the proposed harvest units would see a short-term (1-5 year) increase in fire ignition potential because of the increase in fine dead fuels. The fuel load and risk of a fire start would increase and would be greatest during the first year following treatment when needles dry but remain attached to tree limbs. The ability to control a fire would decrease during this period.

Fuels treatments would be applied in strategic locations. Roads that see high levels of public use, BLM-administered lands adjacent to private properties, and yarding residues at landings would be targeted to reduce the volume of activity fuels. Regeneration harvest would break up the vertical continuity of fuels, while fuels treatments such as hand and machine piling, lopping and scattering, slash pullback, and jackpot (spot) burning would break up the horizontal continuity. This would decrease both the amount of potential ladder fuels and the canopy bulk density.

The current relative density of the proposed harvest units averages approximately 30 percent. A relative density of 35–45 percent or lower has been identified as the point where canopy bulk density is unlikely to sustain a high intensity crown fire (Agee 1996). The silvicultural prescription, which would leave an average of nine large conifers per acre, would reduce stand relative densities to approximately one percent, well below the range at which crown fire would be sustainable.

Modeling predictions for fire behavior based on the Anderson 1982 fuel models would move the regeneration harvest stands from a Fuel Model 8 (Closed timber litter) to Fuel Model 11 (Light logging slash), or Fuel Model 12 (Medium logging slash).

Following treatment, the containment of wildfires at less than 10 acres in size should continue to be attainable and the ability to successfully control wildfires in the fuels treatment areas would remain high. For the short-term (1-5 years), the fire risk would increase in all of the harvest areas, however with decreased crown density and the reduction in ladder fuels, fire starts would be expected to remain limited to surface fires which can be successfully controlled.

Decreasing activity fuels in strategic locations such as along roads and property lines would reduce the potential for human-caused ignitions and provide areas with lower fire intensity, rates of spread and flame lengths where fire can be successfully controlled by initial attack resources.

The risk from an increase in fuel loading and resultant fire hazard would be short-term (1–5 years), and strategically placed fuels treatments would further reduce this risk. At a watershed scale, the regeneration harvest of approximately 870 acres would have very little effect on fire intensity or starts, while the reduction in forest canopy and ladder fuels would reduce the risk of crown fire in the long term (greater than five years).

IV. Carbon Storage and Release

A. Affected Environment

Secretarial Order No. 3226 (amended 2009) directs all Departments to "consider and analyze potential climate change impacts when undertaking long-range planning exercises." The 1994 PRMP/EIS (USDI/BLM 1994, Appendix V, p. 217) considered climate change as part of long-term planning efforts for western Oregon. Although the 1994 PRMP/EIS recognized the possibilities of increased incidence of wildfire, insect outbreaks, shifting range of species, and forest species composition, it found the body of science was not unanimous about the extent or rate of global warming nor the probable effect on forest ecosystems in western Oregon" (PRMP/EIS Chapter 4-7).

The 2008 FEIS (pp. 488-490), incorporated by reference, described current information on predicted changes in regional climate, concluding that the regional climate has become warmer and wetter with reduced snowpack, and that continued change is likely.

Forster *et al.* 2007 (pp. 129-234), incorporated here by reference, reviewed scientific information on greenhouse gas emissions and climate change, and concluded that human-caused increases in greenhouse gas emissions have likely exerted a substantial warming effect on global climate. Literature, however, has not yet defined any specifics on the nature or magnitude of any cause and effect relationship between greenhouse gases and climate change.

The U.S. Geological Survey, in a May 14, 2008 memorandum (USDI/USGS 2008) to the U.S. Fish and Wildlife Service, summarized the latest science on greenhouse gas emissions and concluded that it is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. Although it is not speculative that changes in the affected environment will occur due to climate change, it is not possible to reasonably foresee the specific nature or magnitude of the changes (USDI/BLM 2008a, p. 488). Given this uncertainty, this analysis is focused on calculating gas emissions and storage, in the context of carbon release and sequestration.

Even though a causal link between the Olalla-Camas project and specific climate change effects cannot be assigned, the amount of carbon released or stored under the alternatives analyzed can be estimated.

Forests fix and store carbon through photosynthesis and release carbon through respiration and decay, affecting atmospheric concentrations of carbon dioxide which thereby affect global climate. Values in this analysis, in terms of carbon stored and released, are generally expressed as tonnes, the unit of measure most commonly used in scientific literature to express carbon storage and release. One tonne of carbon is equivalent of 3.67 tons of carbon dioxide (EPA 2005).

Previous studies have estimated total annual global emissions of carbon dioxide (CO_2) at 25 billion tonnes (Denman *et al.* 2007), with estimated U.S. emissions of 6.9 billion tonnes of CO_2 (EPA, 2010; Table 2-3). In 2008, fossil fuel combustion accounted for 94.1 percent of CO_2 emissions in the U.S. (EPA, 2010; Executive Summary p. 6).

Land use, land use change and forestry nationally resulted in a net sequestration of 940 million tons of CO_2 in 2008 (EPA, 2010; Table 2-3). Forest management in the U.S., alone, resulted in net CO_2 sequestration of 792 million tonnes (EPA, 2010; Table 2-9), an offset of approximately 11 percent of total U.S. CO_2 emissions.

The 2008 FEIS (p. 221) estimated that on lands managed by the BLM in western Oregon and on the Klamath Falls Resource Area of the Lakeview District there are 222 million tonnes of carbon stored in live trees. The amount of carbon stored in other than live trees (includes shrubs, brush, snags, woody debris, and organic carbon in the soil) was estimated at 95 million tonnes (2008 FEIS, p. 222).

Uncertainty associated with all estimates of carbon flux in this analysis is projected to be quite high (circa 30 percent: USDI/BLM 2008a, p. 538). Estimates of the magnitude and direction in carbon response are probably fairly accurate, however, and these results may be instructive for comparing the effects of the alternatives on local (watershed-scale) carbon stores.

The Olalla-Camas project would harvest approximately 870 acres of conifer dominated forest stands. Modeling indicates the stands currently contain approximately 119,549 tonnes of sequestered carbon, approximately 0.03 percent of the estimated 417 million tonnes of carbon stored overall on BLM-administered lands in western Oregon.

Common to Both Alternatives

Site specific data from stand exams was entered into the ORGANON Growth Model (Hann 2009). The outputs from the model were then used to calculate amounts of carbon that would be released or sequestered, and the resulting net carbon balance that would result under the alternatives. The modeled results are displayed in Table 3.18 Effects of the Alternatives on Carbon Release and Storage.

B. Alternative One (No Action) - Effects

There would be no direct release of carbon as fossil fuels would not be consumed in conjunction with road construction and renovation, timber harvest operations, or timber hauling. Direct release of carbon from the cutting of live trees would not occur. Absent the creation of any logging slash, no carbon would be released by the burning and/or decomposition of activity fuels. No wood products would be produced which would release carbon over time.

Forest stands in the project area would continue to grow and develop along a trajectory described in Timber Resources in Alternative One (Chapter One, pp. 25-26). Carbon would be released through the decay of snags, woody debris and dead vegetation, and through the process of respiration. At the same time, carbon would be sequestered as live, growing trees and other vegetation fix atmospheric carbon dioxide through the process of photosynthesis. As illustrated in Table 3.18, over the course of the next 50 years the total carbon stored on-site would increase to 253,333 tonnes, a 212 percent increase from current conditions. This would represent approximately 0.04 percent of the estimated 596 million tonnes of carbon stored on BLM-administered lands in western Oregon, at that time.

C. Alternative Two (Proposed Action) - Effects

The action alternative would impact approximately 870 acres of forest, volatilizing some carbon, moving a portion of the carbon from live tree pools to detritus and wood products pools while leaving some residual trees and growing replacement trees. Table 3.18 displays the current levels of carbon storage on-site, and the effects of the alternatives on these carbon pools in terms of direct (immediate) and indirect (long-term) releases of carbon.

Based on Smith et al., 2006, 13.5 percent of gross saw log carbon and 14.8 percent of gross pulpwood carbon (3,358 tonnes) would be immediately released into the atmosphere at time of harvest. Other direct carbon release would occur through the consumption of approximately 130,039 gallons of gasoline and diesel fuel (356 tonnes), and carbon released by prescribed burning (3,376 tonnes).

An estimated 7,090 tonnes of carbon would be directly released by the regeneration harvest, compared to an estimated annual carbon released in the United States of 1.6 billion tonnes (EPA, 2009; pgs. 2-3) and 6.8 billion tonnes globally (IPCC, 2007; p. 513). Carbon released by the proposed action would represent only 0.0004 percent of annual emissions in the United States, and 0.0001 percent of annual global emissions.

Approximately 21,403 tonnes of carbon would be stored in wood products, and another 15,490 tonnes in untreated logging slash. As illustrated by Table 3.18, both of these carbon pools would gradually release carbon over time through processes of decay, sublimation and disposal of wood products by burning. This release, modeled out 50 years, would average 252 tonnes annually.

While there would be a direct release of 7,090 tonnes of carbon, and an indirect release of 252 tonnes annually from wood products and unburned slash, growth of remaining trees from the green tree retention would sequester atmospheric carbon and store it on site in the form of additional standing volume. As illustrated in Table 3.18, re-sequestration of carbon directly released by implementation of the proposed action would occur in just under 22 years.

Modeling was conducted for intervals extending out 50 years. The net carbon balance for this project was analyzed by calculating: amount of carbon held in live trees and other forest components (snags, down wood, soil carbon, etc.), amount of carbon held in wood products and logging slash that would be gradually released over time, and carbon released by the burning of fossil fuels and slash. The methodology used is described in Appendix G-Carbon Storage/Release Analytical Methodology.

Fifty years, post-harvest, on-site carbon storage would increase approximately 60,194 tonnes, or an average of about 12,000 tonnes per decade, representing a 28 percent increase over the current condition, and a 400 percent increase over post-harvest conditions. The total carbon balance 50 years following harvest would be 160,397 tonnes, an amount approximately 92,935 tonnes less than the No Action alternative after 50 years. Differences in carbon storage between the alternatives would continue to decrease through time because the rate of carbon storage under No Action would decelerate after stands reach the age of culmination of mean annual increment.

The total 50-year carbon flux of the Proposed Action compared to the No Action would not produce measurable change in global climates considering current detection and modeling technologies. To place this carbon flux in context, the total 50 year carbon flux associated with the action alternative would represent less than 0.01 percent of all carbon stored on BLM-managed lands in western Oregon (USDI/BLM 2008a), while BLM-managed lands in western Oregon represent roughly one percent of all carbon stored in the western U.S., and 0.02% of global carbon stores in vegetation, soil, and detritus (USDI/BLM 2008a).

Table 3.18 Effects of the Alternatives on Carbon Release and Storage (expressed in tonnes)

Timestep	Standing, Live Carbon	Wood Products	Logging Slash*	Other Than Live Trees*	Fossil Fuels	Slash Burning	Carbon Balance	Net Change (+/-)
Alternative One – No Action								
Current Condition	58,599	0	0	60,950	0	0	119,549	
At Harvest	58,599	0	0	60,950	0	0	119,549	0
10 years	82,053	0	0	60,950	0	0	143,003	23,455
20 years	106,314	0	0	60,950	0	0	167,264	24,261
50 years	176,863	0	0	76,469	0	0	253,333	86,068
Alternative Two – Proposed Action – Regeneration Harvest								
Current Condition	58,599	0	0	60,950	0	0	119,549	
At Harvest	14,972	21,403	18,865	58,783	(356)	(3,376)	110,291	(9,257)
10 years	21,079	19,632	13,197	58,783	0	0	112,691	2,400
20 years	26,490	18,760	11,246	58,783	0	0	115,729	3,037
50 years	75,166	17,327	6,955	60,950	0	0	160,397	44,669
						Carbon Neutral Time ~ 22 years		

V. Monitoring

Monitoring would be conducted in accordance with provisions contained in the ROD/RMP, Appendix I (pp. 84-86, 190-191, 193-199, and 201-202). Monitoring efforts would focus on consideration of the following resources: Riparian Reserves, Matrix, Air Quality, Water and Soils, Wildlife Habitat, Fish Habitat, Special Status Species Habitat, Cultural Resources, and Visual Resources.

Chapter Four

Agencies and Individuals Contacted, Preparers, and Literature Cited

I. List of Agencies and Person Contacted

Adjacent landowners and downstream water users
Cow Creek Band of Umpqua Tribe of Indians
Coquille Indian Tribe
Confederated Tribe of Coos, Lower Umpqua, and Siletz
NOAA Fisheries
U.S. Fish and Wildlife Service

II. Agencies, organizations, and individuals to be notified of the completion of the EA

American Forest Resources Council
Cascadia Wildlands
Douglas Timber Operators
Klamath Siskiyou Wildlands Center
National Marine Fisheries Service
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Wild
Pacific Northwest 4-Wheel Drive Association
Umpqua Valley Audubon Society
Umpqua Watersheds, Inc.
U.S. Fish and Wildlife Service

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Appendix A – Vicinity Maps and Maps of the Proposed Harvest Units

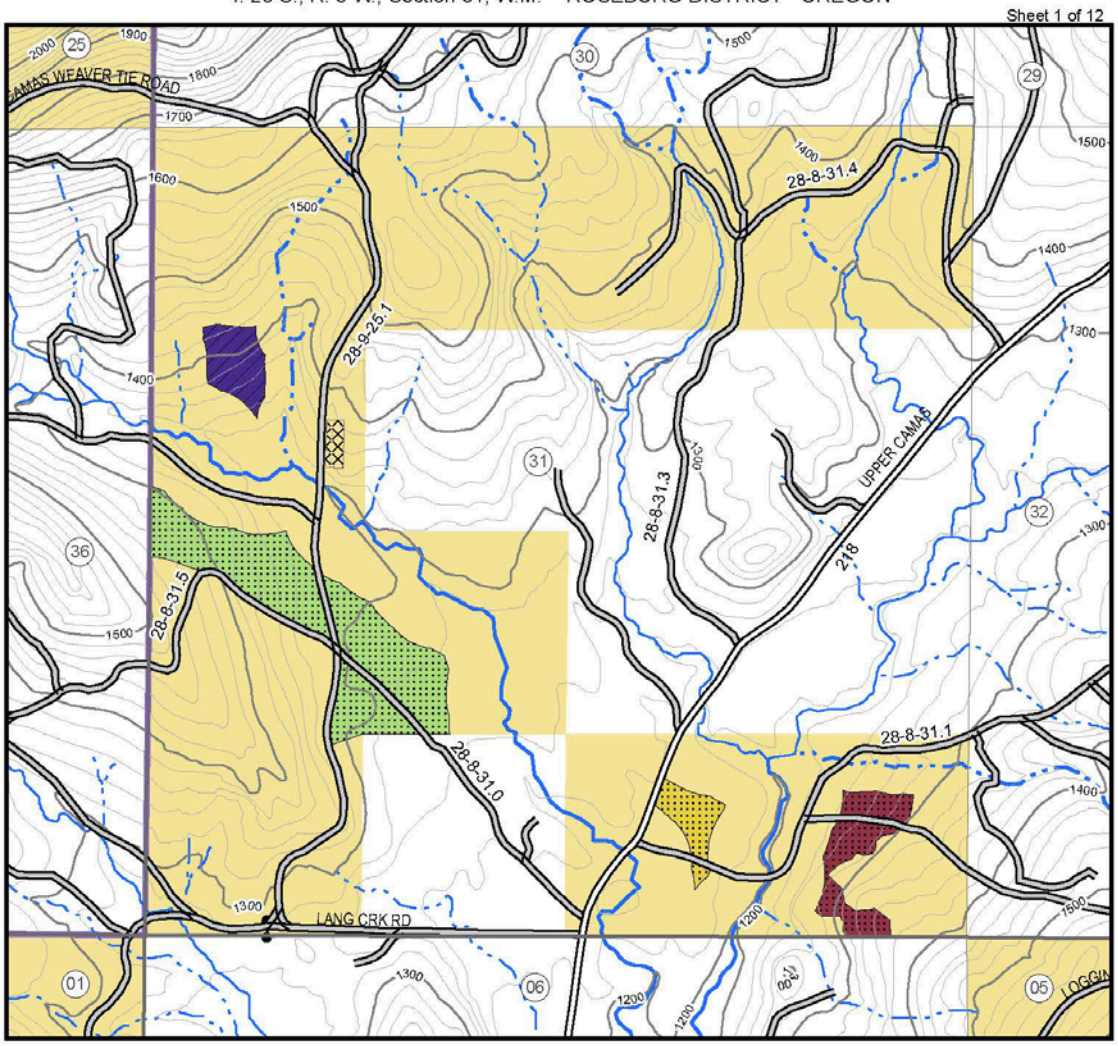
United States Department of the Interior - BUREAU OF LAND MANAGEMENT

11/24/2014

Olalla-Camas Regeneration Harvest Project Map

T. 28 S., R. 8 W., Section 31, W.M. - ROSEBURG DISTRICT - OREGON

Sheet 1 of 12



28-8-31A 4 acres

28-8-31B 23 acres

28-8-31D 3 acres

28-8-31E 6 acres

Ground-Based Yarding

Skyline Yarding

Gate

County Road

Other Road

Streams

Fish Presence verified

Fish Presence not verified

Fish Absence verified

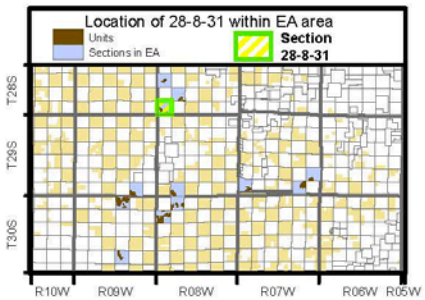
Fish Absence not verified

Landing (1 acre)

Acres exclude a 40' buffer of existing GTRN roads (except closed or decommssioned) and roads to be renovated

Contour interval: 20 ft.

1,000 500 0 1,000 Feet



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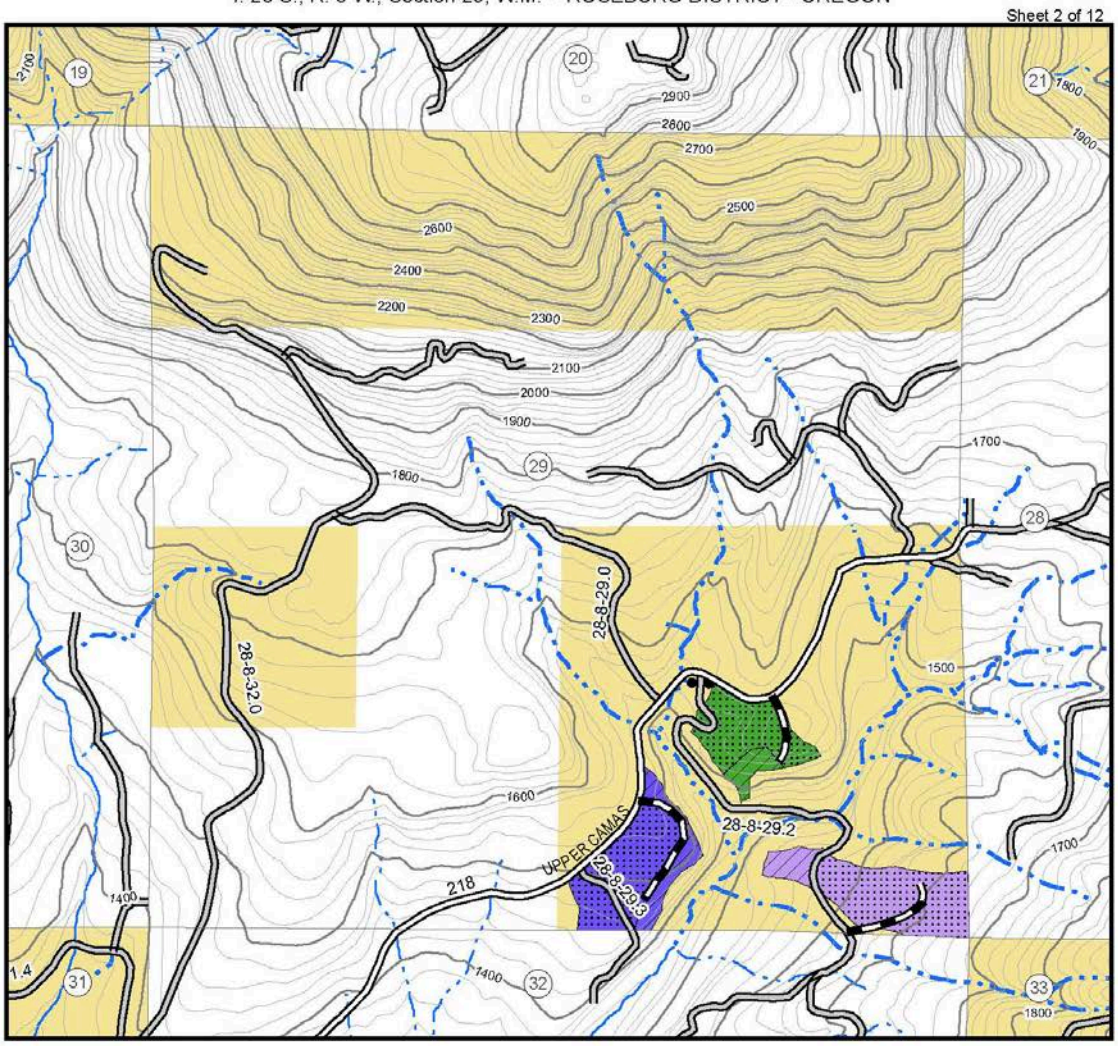
United States Department of the Interior - BUREAU OF LAND MANAGEMENT

11/24/2014

Olalla-Camas Regeneration Harvest Project Map

T. 28 S., R. 8 W., Section 29, W.M. - ROSEBURG DISTRICT - OREGON

Sheet 2 of 12



28-8-29B 6 acres

28-8-29C 9 acres

28-8-29D 10 acres

Ground-Based Yarding

Skyline Yarding

Gate

County Road

Other Road

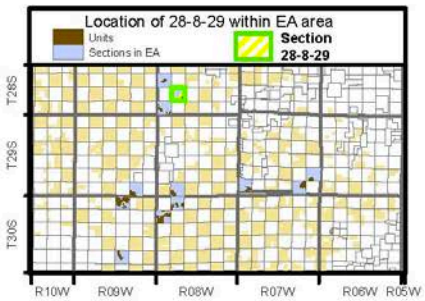
Road to Renovate

Streams

Fish Presence not verified

Fish Absence verified

Fish Absence not verified



Acres exclude a 40' buffer of existing GTRN roads (except closed or decommssioned) and roads to be renovated

Contour interval: 20 ft.

1,000 500 0 1,000 Feet

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.

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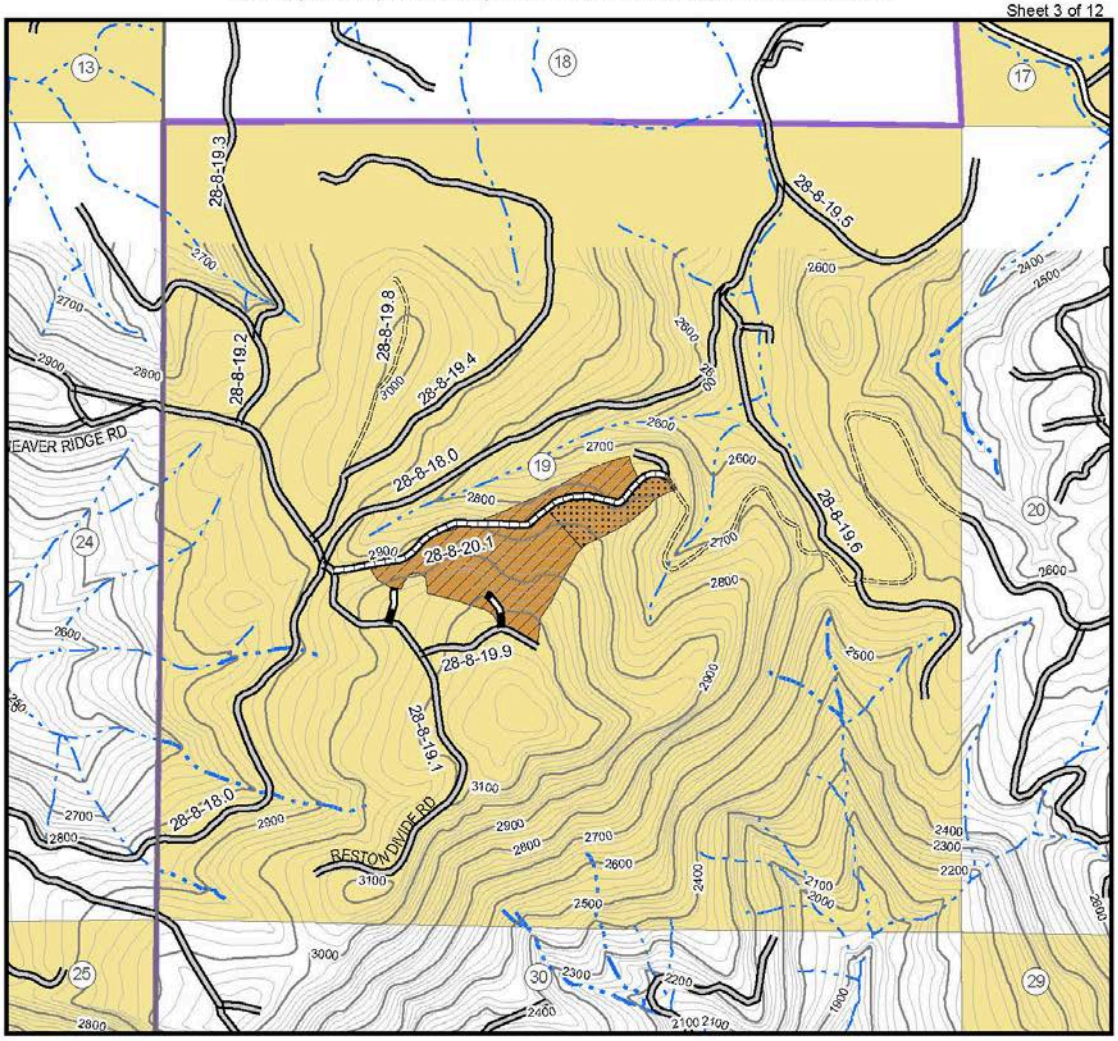
11/24/2014

United States Department of the Interior - BUREAU OF LAND MANAGEMENT

Olalla-Camas Regeneration Harvest Project Map

T. 28 S., R. 8 W., Section 19, W.M. - ROSEBURG DISTRICT - OREGON

Sheet 3 of 12



28-8-19A 21 acres

Ground-Based Yarding
Skyline Yarding
County Road
Other Road
Road closed or decommissioned
Road to Renovate
Renovate and decommission
Streams
Fish Presence not verified
Fish Absence verified
Fish Absence not verified

Location of 28-8-19 within EA area
Units
Sections in EA
Section 28-8-19
T26S
T29S
T30S
R10W R09W R08W R07W R06W R05W

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.

Acres exclude a 40' buffer of existing GTRN roads (except closed or decommssioned) and roads to be renovated

Contour interval: 20 ft.

Feet
1,000 500 0 1,000

N
11/24/2014

United States Department of the Interior - BUREAU OF LAND MANAGEMENT

Olalla-Camas Regeneration Harvest Project Map

T. 29 S., R. 7 W., Section 35, W.M. - ROSEBURG DISTRICT - OREGON

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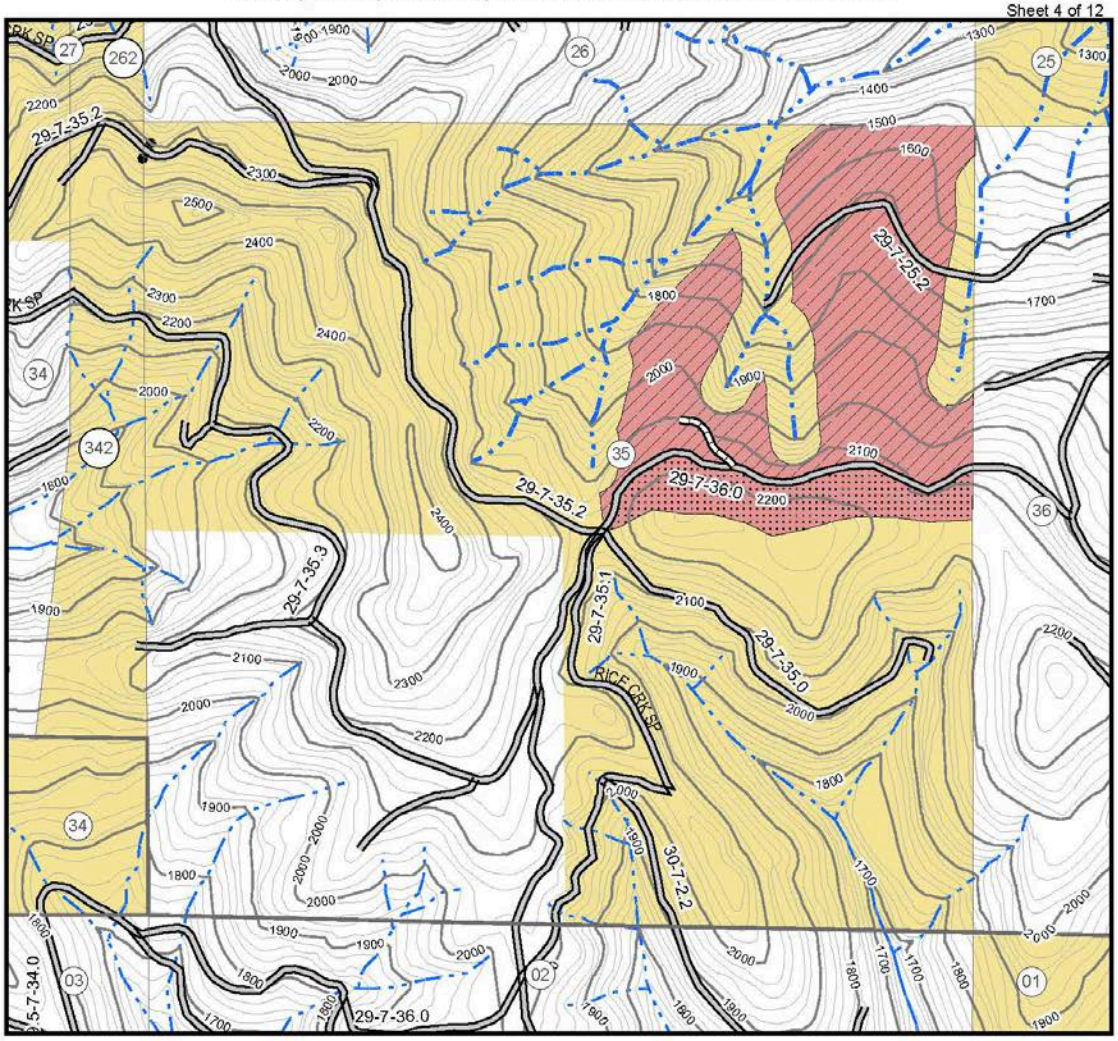

29-7-35A 81 acres

Ground-Based Yarding
Skyline Yarding
Gate
Other Road
Renovate and decommission
Streams
Fish Presence not verified
Fish Absence verified
Fish Absence not verified

Location of 29-7-35 within EA area
Units
Sections in EA
Section 29-7-35
T28S
T29S
T30S
R10W R09W R08W R07W R06W R05W

Acres exclude a 40' buffer of existing GTRN roads (except closed or decommssioned) and roads to be renovated

Contour interval: 20 ft.

1,000 500 0 1,000 Feet

N
11/24/2014

United States Department of the Interior - BUREAU OF LAND MANAGEMENT

Olalla-Camas Regeneration Harvest Project Map

T. 29 S., R. 7 W., Section 31, W.M. - ROSEBURG DISTRICT - OREGON

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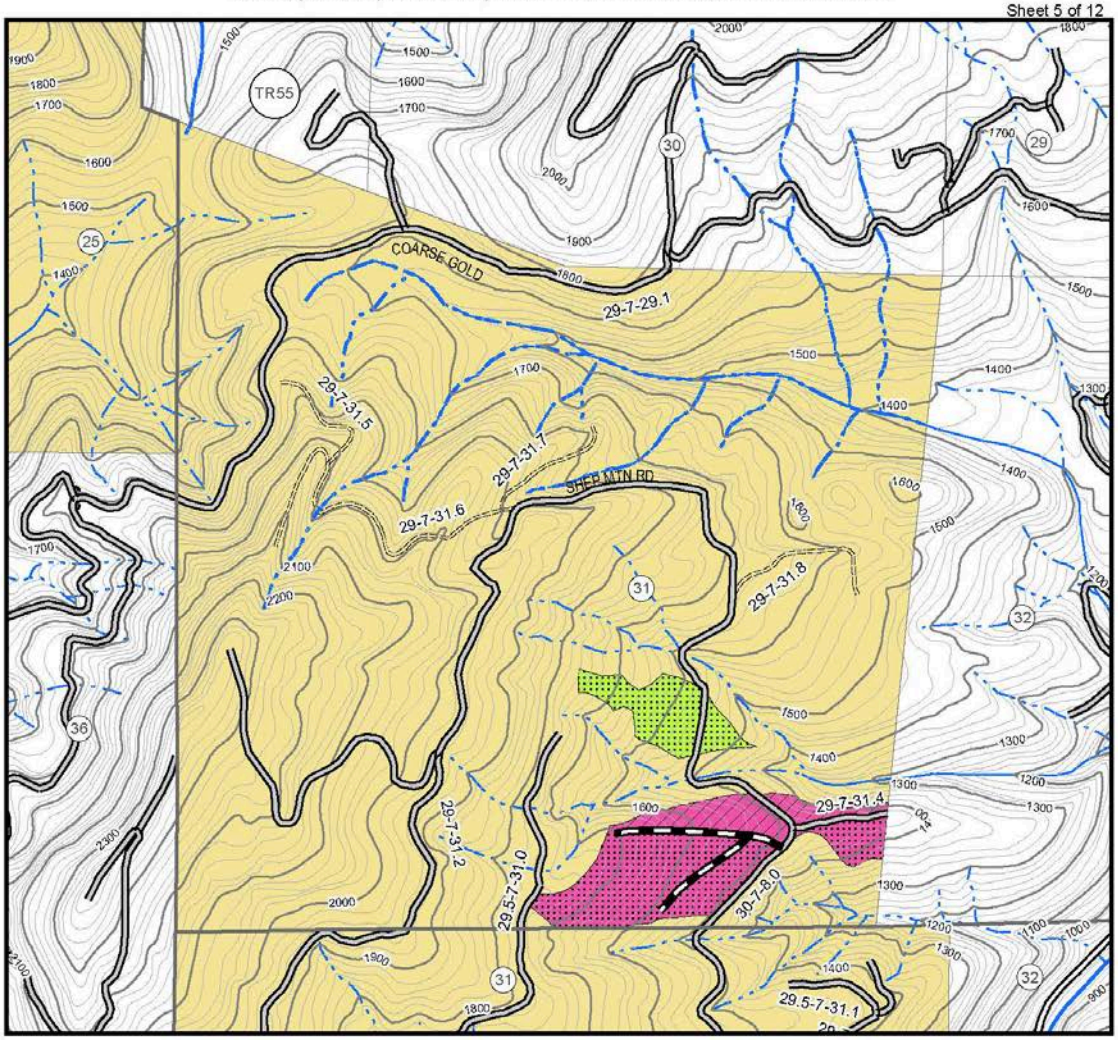

29-7-31A 8 acres

29-7-31B 25 acres

Ground-Based Yarding

Skyline Yarding

Gate

County Road

Other Road

Road closed or decommissioned

Road to Renovate

Streams

Fish Presence verified

Fish Presence not verified

Fish Absence verified

Fish Absence not verified

Location of 29-7-31 within EA area

Units

Sections in EA

Section 29-7-31

T28S

T29S

T30S

R10W R09W R08W R07W R06W R05W

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Acres exclude a 40' buffer of existing GTRN roads (except closed or decommssioned) and roads to be renovated

Contour interval: 20 ft.

Feet

1,000 500 0 1,000

N

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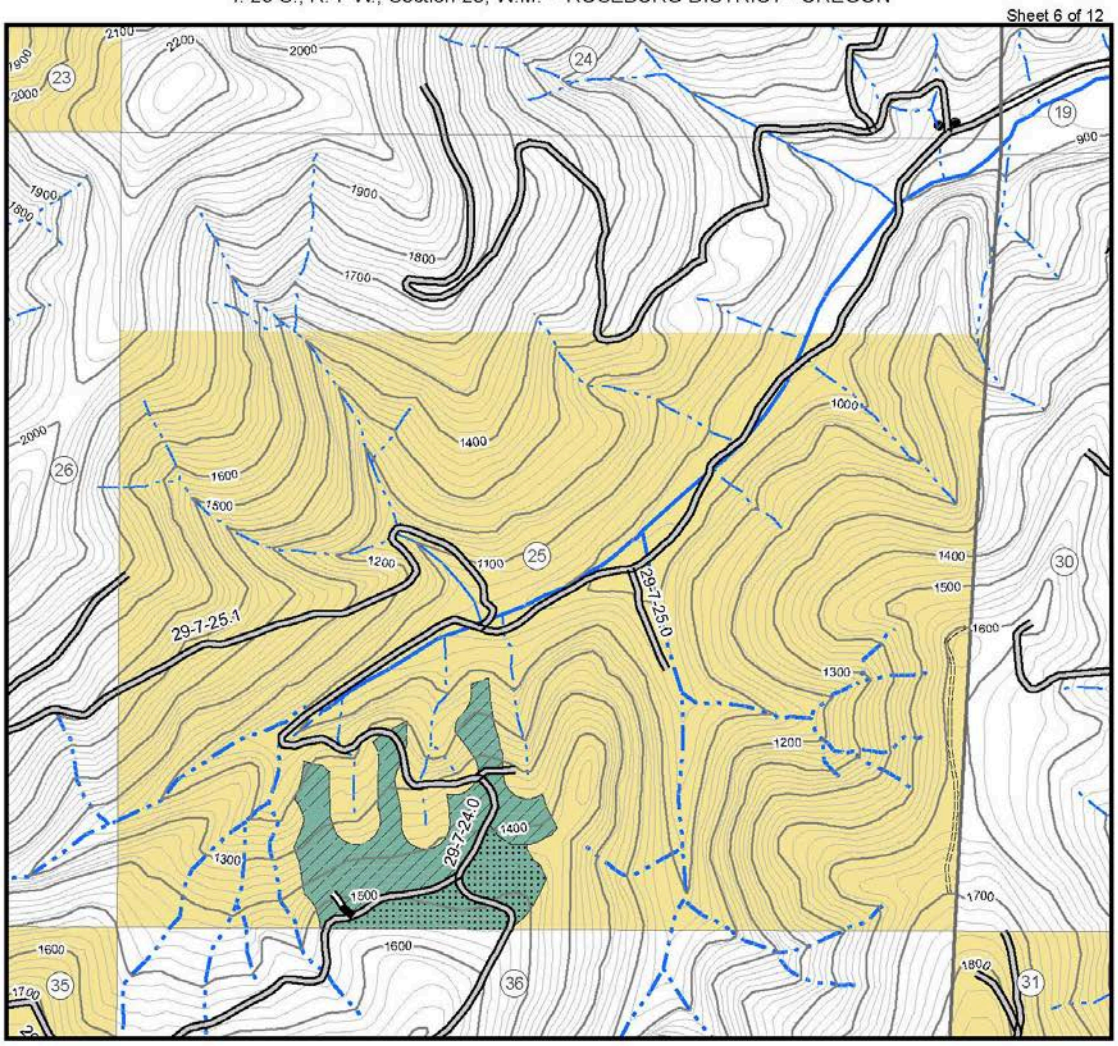
United States Department of the Interior - BUREAU OF LAND MANAGEMENT

Olalla-Camas Regeneration Harvest Project Map

T. 29 S., R. 7 W., Section 25, W.M. - ROSEBURG DISTRICT - OREGON

Sheet 6 of 12



29-7-25A 30 acres

Ground-Based Yarding

Skyline Yarding

Gate

County Road

Other Road

Road closed or decommissioned

Road to Renovate

Streams

Fish Presence verified

Fish Presence not verified

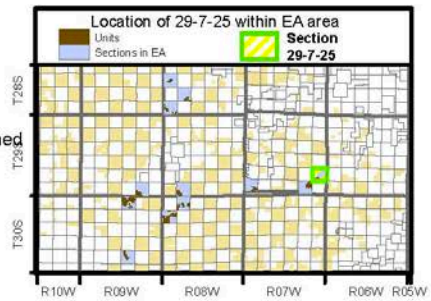
Fish Absence verified

Fish Absence not verified

Acres exclude a 40' buffer of existing GTRN roads (except closed or decommssioned) and roads to be renovated

Contour interval: 20 ft.

1,000 500 0 1,000 Feet



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United States Department of the Interior - BUREAU OF LAND MANAGEMENT

Olalla-Camas Regeneration Harvest Project Map

T. 29 S., R. 8 W., Section 32, W.M. - ROSEBURG DISTRICT - OREGON

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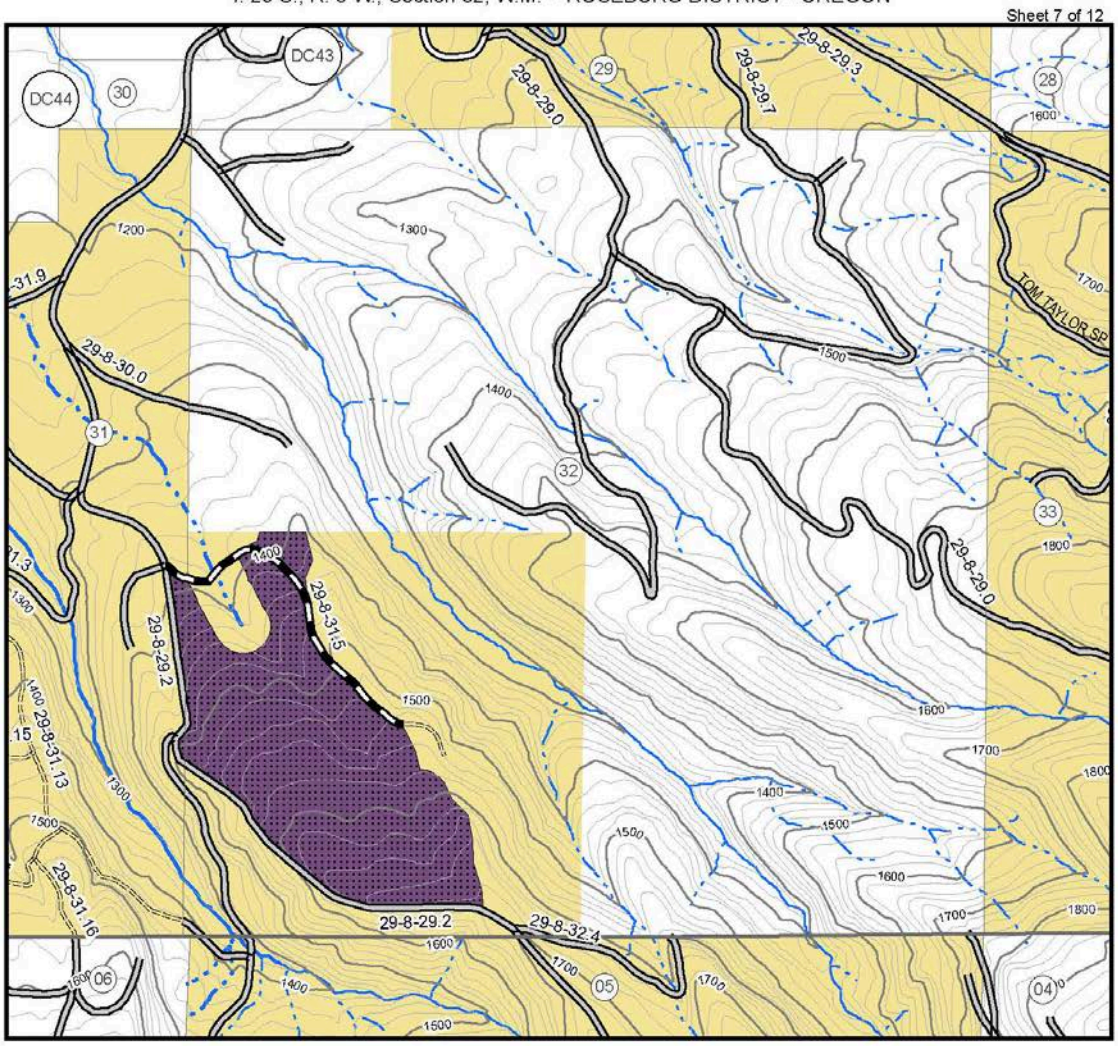
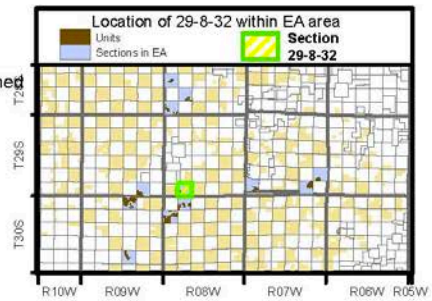


29-8-32A 57 acres

Ground-Based Yarding
County Road
Other Road
Road closed or decommissioned
Road to Renovate

Streams
Fish Presence verified
Fish Presence not verified
Fish Absence verified
Fish Absence not verified



Acres exclude a 40' buffer of existing GTRN roads (except closed or decommssioned) and roads to be renovated

Contour interval: 20 ft.

Feet
1,000 500 0 1,000

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Olalla-Camas Regeneration Harvest Project Map

T. 29 S., R. 9 W., Section 35, W.M. - ROSEBURG DISTRICT - OREGON

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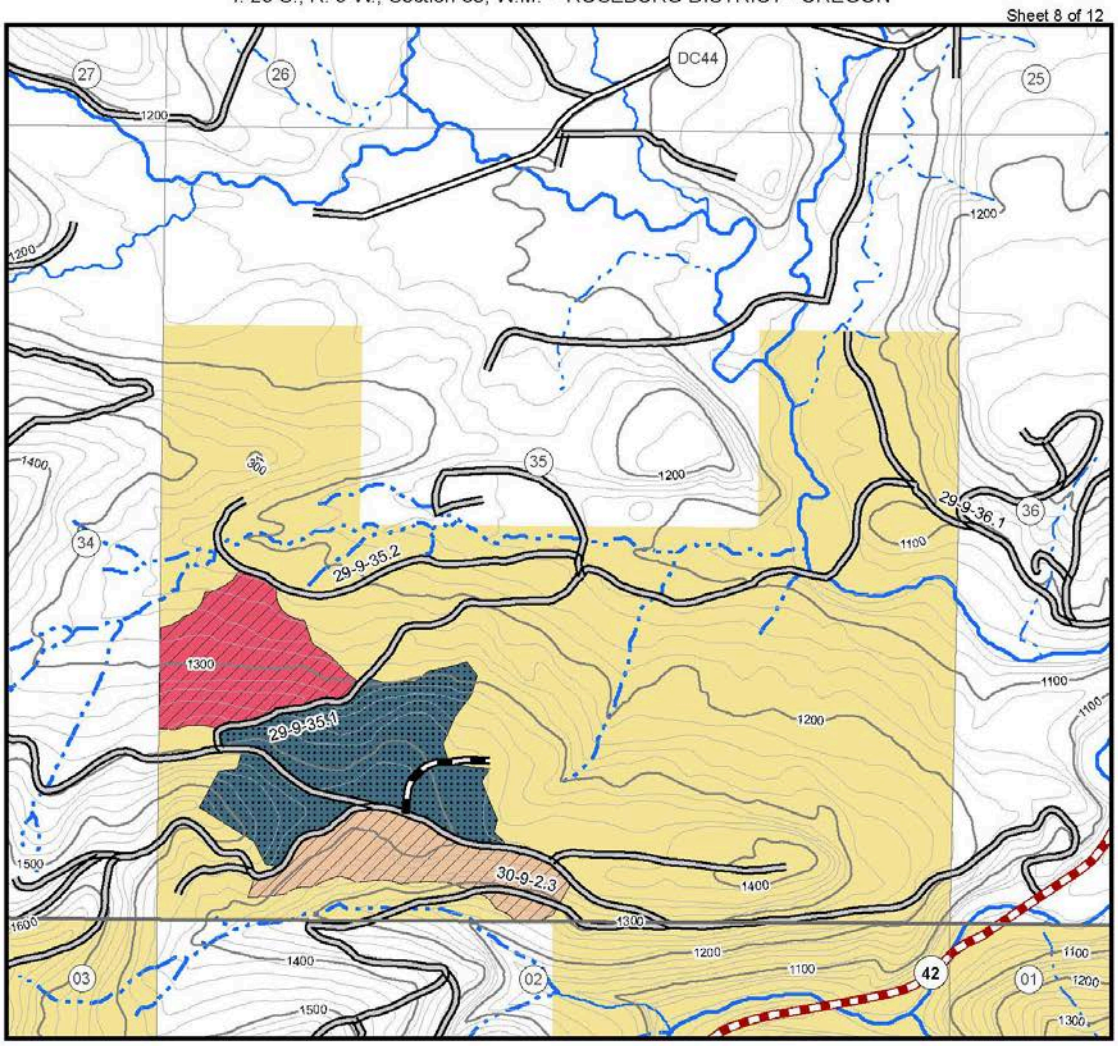


29-9-35A 20 acres

29-9-35B 33 acres

29-9-35C 16 acres

Ground-Based Yarding

Skyline Yarding

Gate

State Highway

County Road

Other Road

Road to Renovate

Streams

Fish Presence verified

Fish Presence not verified

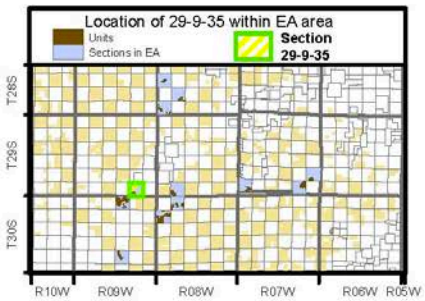
Fish Absence verified

Fish Absence not verified

Acres exclude a 40' buffer of existing GTRN roads (except closed or decommssioned) and roads to be renovated

Contour interval: 20 ft.

1,000 500 0 1,000 Feet



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11/24/2014

United States Department of the Interior - BUREAU OF LAND MANAGEMENT

Olalla-Camas Regeneration Harvest Project Map

T. 30 S., R. 8 W., Section 7, W.M. - ROSEBURG DISTRICT - OREGON

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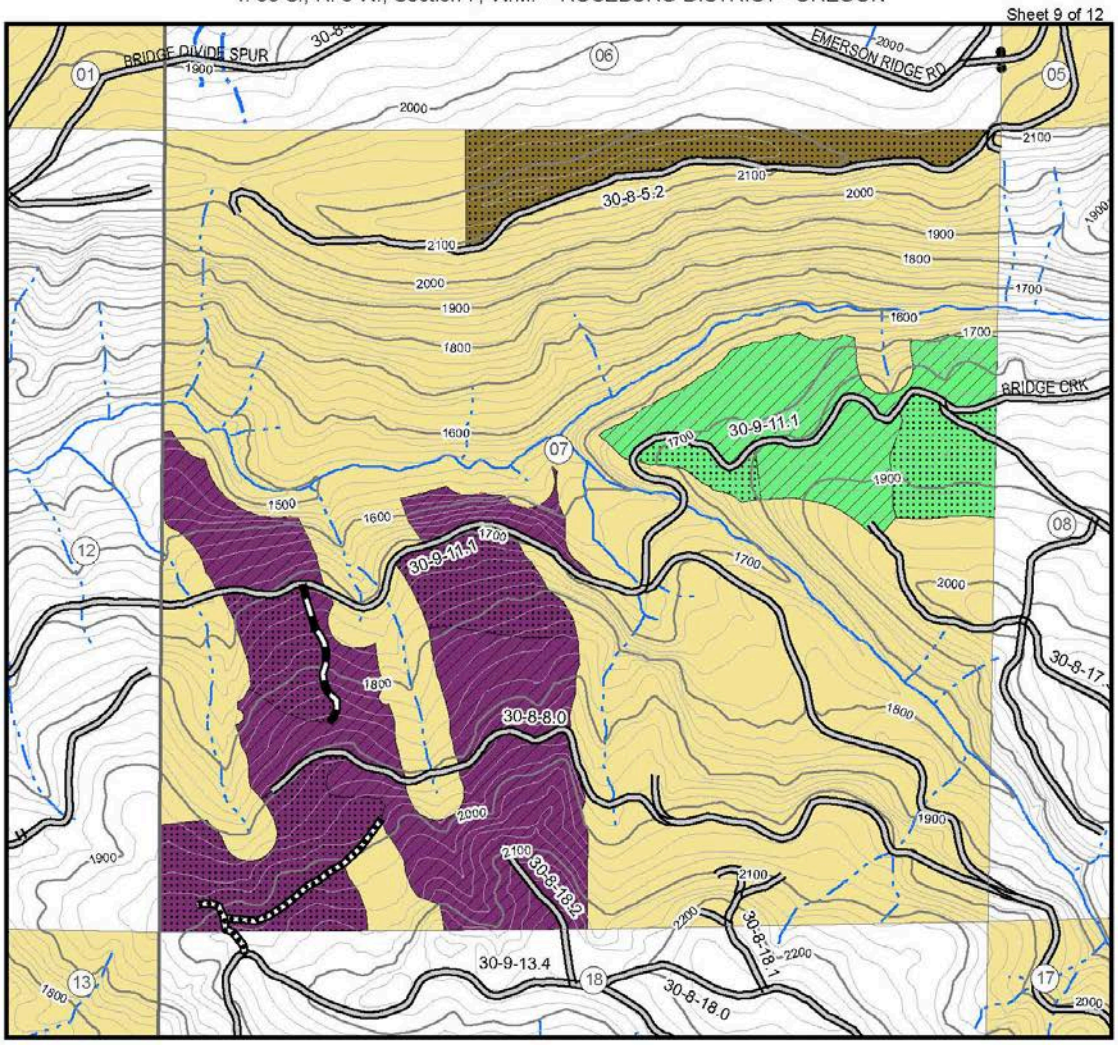


30-8-7B 120 acres

30-8-7D 49 acres

30-8-7A 25 acres

Ground-Based Yarding

Skyline Yarding

Gate

Other Road

Road to Renovate

New Construction

Streams

Fish Presence not verified

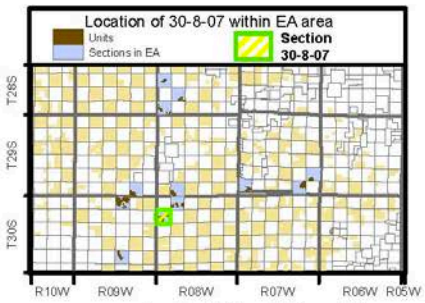
Fish Absence verified

Fish Absence not verified

Acres exclude a 40' buffer of existing GTRN roads (except closed or decommssioned) and roads to be renovated

Contour interval: 20 ft.

Feet
1,000 500 0 1,000



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United States Department of the Interior - BUREAU OF LAND MANAGEMENT

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Olalla-Camas Regeneration Harvest Project Map

T. 30 S., R. 8 W., Section 5, W.M. - ROSEBURG DISTRICT - OREGON

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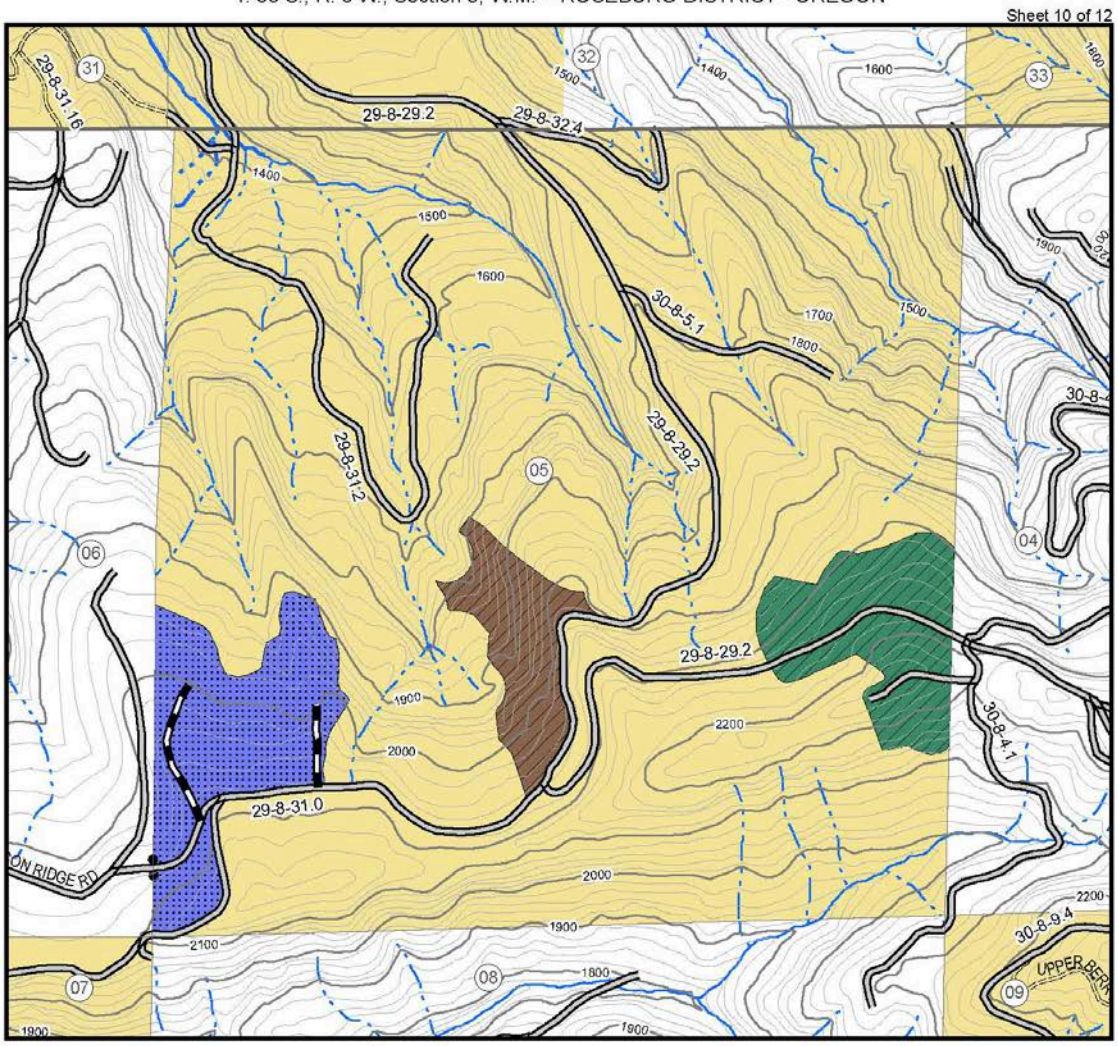

30-8-5A 34 acres

30-8-5B 17 acres

30-8-5C 26 acres

Ground-Based Yarding

Skyline Yarding

Gate

Other Road

Road closed or decommissioned

Road to Renovate

Streams

Fish Presence verified

Fish Presence not verified

Fish Absence verified

Fish Absence not verified

Acres exclude a 40' buffer of existing GTRN roads (except closed or decommssioned) and roads to be renovated

Contour interval: 20 ft.

1,000 500 0 1,000 Feet

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United States Department of the Interior - BUREAU OF LAND MANAGEMENT

Olalla-Camas Regeneration Harvest Project Map

T. 30 S., R. 9 W., Section 27, W.M. - ROSEBURG DISTRICT - OREGON

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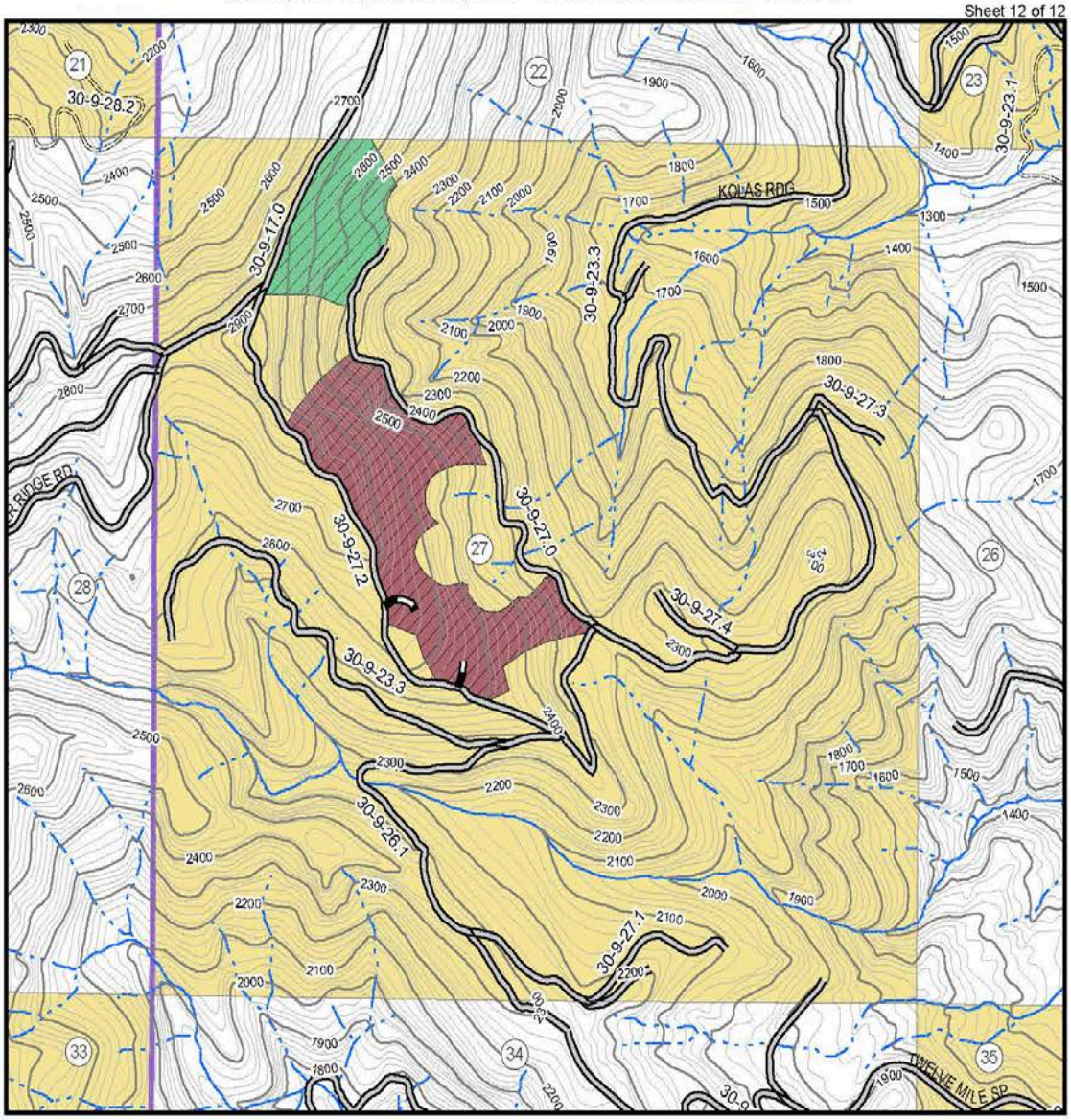

30-9-27A 13 acres

30-9-27B 33 acres

Skyline Yarding

Other Road

Road closed or decommissioned

Road to Renovate

Streams

Fish Presence not verified

Fish Absence not verified

Location of 30-9-27 within EA area

Units

Sections in EA

Section 30-9-27

T28S

T29S

T30S

R10W R09W R08W R07W R06W R05W

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.

Acres exclude a 40' buffer of existing GTRN roads (except closed or decommssioned) and roads to be renovated

Contour interval: 20 ft.

Feet

1,000 500 0 1,000

Appendix B – Proposed Road Renovations

Olalla Creek Watershed	**Road 30-7-8.0**
Sec. 31, T. 29 S., R. 7 W.	Install cross-drains 150 feet and 250 feet north of stream crossing between Units 29-7-31A/B to disconnect road drainage from stream
	Replace culvert west of junction with Road No. 29-7-31.0 with culvert sized for 100-year flood event for the drainage area.
	Road 30-7-5.0
Sec. 31, T. 29 S., R. 7 W.	Road use limited to dry season, typically mid-May through mid-October.
Rice Creek – South Umpqua River Watershed	**Road 29-7-25.2**
Sec. 35, T. 29 S, R. 7 W.	At east section line, lift road grade and install culvert to pass an intermittent stream. Add drive-thru dip approximately 80 feet west of the crossing.
	Road 29-7-24.0
Sec. 25, T. 29 S, R. 7 W.	Approximately 500 feet east of road switchback in the SW¼SW¼ of the section, pull ditches with a grader, compact road surface with vibratory roller after ditch pulling. Reshape road surface. Install cross drain approximately 60 feet east of the stream crossing.
Twelve Mile Creek	**Road 30-9-23.3**
NE¼NE¼, Sec. 27, T. 30 S., R. 9 W.	Bench down 6 feet± to rebuild road failure, replace culvert, and install large riprap to buttress slope below.
NW¼NE¼, Sec. 27, T. 30 S., R. 9 W.	Replace both pipes with pipe arch sized 3'-6"x 2'-5"for 100-year flood event. Dam ditchline below pipe entrance.
SW¼NE¼, Sec. 27, T. 30 S., R. 9 W.	Remove root wad from culvert inlet and clean out sediment deposits in the culvert basin and road ditch.
NW¼SE¼, Sec. 27, T. 30 S., R. 9 W.	Install cross drain 50 feet southeast of stream crossing.
Road 30-9-11.1	**East of Junction with Road No. 30-9-11.0**
MP 1.55	Install cross drain 50 feet east of stream crossing.
Slater Creek	**Road (30-9-17.0)**
MP 0.070	Clean bridge deck and regrade road crown at bridge approaches. Install bark bags on bridge scuppers during wet season haul
MP 0.160	Clean culvert inlet
MP 0.36	Trench berm north of road to improve drainage and avoid road fill erosion.
MP 0.44	Install cross-drain at the grade break about 60 feet up the hill and east of the steam crossing.
MP 0.72	Install two cross drains 50 and 300 feet southwest of this site.
MP 0.90	Install bark bags above stream crossing in road ditch during haul.
MP 0.92	Install riprap splash pad at the culvert outlet.
MP 0.97	Install cross drain 150 feet up from the stream crossing and place bark bags or gravel in the eroded area.
MP 1.07	Install bark bags in ditch above stream crossing during wet season haul.
MP 1.31	Riprap splash pad at culvert outlet, and riprap cut slope along ditchline for 50 linear feet. Also repair the culvert inlet and install bark bags in the road ditch above stream crossing during wet season haul
MP 3.88	Line inside of road corner west of stream with straw bales and install cross drain 50 feet east from site. Armor ditchline in the vicinity of the seep.
MP 4.04	Line the inside of corner with straw bales for wet season haul.
MP 4.20	Install a cross drain culvert above next curve, approximately 50 feet downhill from a slide in the cut slope.
MP 4.26	Install cross drain 100 feet to the west of stream crossing.
MP 4.64	Install cross drain culvert just beyond curve, uphill from stream crossing; replace deteriorated stream crossing culvert and size for 100-year event. Extend outlet end and widen road along inside of curve to next junction.
MP 4.95	Repair/replace damaged cross drain.

Upper Camas and Weaver Road	**Road 28-8-20.1**
Sec. 19, T. 28 S, R. 8 W.	Road use limited to dry season. Waterbar, remove failed culvert, and close to traffic afterwards.
	Road 28-8-31.1
Sec. 31, T. 28 S., R. 8 W.	Install cross drain at junction of temporary spur in Unit 28-8-31E with Road 28-8-31.1

Appendix C – Coarse Woody Debris and Snag Volume

Unit ID	Total Down wood volume (cu ft/ac)	Snag Volume (cu ft/ac)	Total Volume (cu ft/ac) DWM & Snags	Total Snags per acre	Average Snag Height (ft)	Snag QMD (inches)
28-8-19A	2337.2	79	2416.2	9.5	33	12.4
28-8-29B	1217.4	0	1217.4	0	NA	NA
28-8-29C	1217.4	0	1217.4	0	NA	NA
28-8-29D	1217.4	0	1217.4	0	NA	NA
28-8-31A	1558.0	125	1683.0	0.2	150	59.9
28-8-31B	1558.0	125	1683.0	0.2	150	59.9
28-8-31D	1511.9	95	1606.9	5.3	70	11.8
28-8-31E	1511.9	95	1606.9	5.3	70	11.8
29-7-25A	2466.0	0	2466.0	0	NA	NA
29-7-31A	439.5	0	439.5	0	NA	NA
29-7-31B	439.5	0	439.5	0	NA	NA
29-7-35A	1415.6	0	1415.6	0	NA	NA
29-8-32A	1311.8	0	1311.8	0	NA	NA
29-9-35A	1170.1	0	1170.1	0	NA	NA
29-9-35B	966.7	0	966.7	0	NA	NA
29-9-35C	1742.2	0	1742.2	0	NA	NA
30-8-5A	2478.2	0	2478.2	0	NA	NA
30-8-5B	548.8	0	548.8	0	NA	NA
30-8-5C	3113.2	0	3113.2	0	NA	NA
30-8-7A	2055.9	0	2055.9	0	NA	NA
30-8-7B	7805.3	324	8129.3	4.1	53	26.8
30-8-7D	7805.3	324	8129.3	4.1	53	26.8
30-9-3A	1462.5	53	1515.5	1.3	69	17.9
30-9-3B	2895.2	0	2895.2	0	NA	NA
30-9-3C	2135.5	293	2428.5	0.8	142	37.5
30-9-3D	No data	No data	NA	NA	NA	NA
30-9-27A	1684.0	78	1691.3	7.3	55	10.0
30-9-27B	1134.3	173	1135.3	1.0	128	27.0

Appendix D – Port-Orford-cedar Risk Key

The *Record of Decision and Resource Management Plan Amendment for Management of Port-Orford-cedar in Southwest Oregon, Coos Bay, Medford, and Roseburg Districts* (USDI/BLM 2004) provides direction for assessing risk and controlling spread of *Phytopthora lateralis*, a root disease, in order to maintain Port-Orford-cedar as an integral component of the vegetative communities of which is a part. The risk key is used for site-specific analysis to access the need for application of additional management practices. An assessment of the project area indicates no special mitigation is required, because:

- There are no uninfected Port-Orford-cedar within, near or downstream of any of the proposed treatment units or anticipated haul routes whose ecological, Tribal, or product use or function measurably contributes to meeting resource management objectives;

- There are no uninfected Port-Orford-cedar within, near or downstream of any of the proposed treatment units or anticipated haul routes that, were they to become infected, would likely spread infections to trees whose ecological, Tribal, or project use or function measurably contribute to meeting land and resource management plan objectives; and

- None of the proposed treatment areas are located within uninfected 7th-field watersheds (drainages).

Although no additional mitigation is indicated, measures to reduce the risk of further spread of Port-Orford-cedar root disease would be implemented. These would include: equipment washing as previously described with respect to noxious weed control, restricting road construction, improvements, renovation, maintenance and decommissioning to the dry season, typically May 15th to October 15th, subject to weather conditions as described in Chapter Two; restricting hauling on unsurfaced roads to the dry season; scheduling operations in uninfested areas prior to work in infested areas; decommissioning and blocking unsurfaced roads upon completion of harvesting operations; spacing Port-Orford-cedar trees selected for retention within units a minimum of 50 feet from other Port-Orford-cedar trees to eliminate the possibility of the disease being spread through root grafting.

Appendix E – Wildlife

Table E.1 NEPA Impacts Assessment for Special Status Wildlife Species.

Wildlife Species	Policy Status [1]	Analysis Needed [2]	Habitat Notes and Impact Analysis Rationale.
INVERTEBRATES			
Crater Lake Tightcoil Snail *Pristiloma arcticum crateris*	BSS SM-A	No	Associated with perennially wet habitats in mature conifer forests of Western Oregon Cascades (USDA/FS and USDI/BLM 2010a). Project area is outside of known range.
Chace Sideband Snail *Monadenia Chaceana*	BSS SM-B	Yes	Primary habitat association is rocky outcrops, talus, loose rock, and soil fissures in dry conifer and mixed conifer/hardwood forest communities. May occur in adjacent forest stands that provide accumulations of down wood (Duncan 2005). Survey and Manage Category B requires equivalent effort surveys in older forest patches. Rocky habitat types adjacent to a few proposed units.
Green Sideband Snail *Monadenia fidelis beryllica*	BSS	No	Rare endemic snail restricted to the west slope of the Oregon Coast Range from the Pistol River to the Winchuck River (USDA/FS and USDI/BLM 2010b). Project area is outside of known range.
Oregon Shoulderband Snail *Helminthoglypta hertleini*	BSS	Yes	Species found on rock-on-rock habitat, talus, soil fissures, the interior of large woody debris, herbaceous vegetation, or deciduous hardwood leaf litter as refugia from desiccation during dry periods (Duncan 2004). Previously Survey and Manage Category C was removed from list in 2003. Rocky habitat types adjacent to a few proposed units.
Rotund Lanx Snail *Lanx subrotunda*	BSS	No	Umpqua River and major tributaries (USDA/FS and USDI/BLM 2010c). Proposed action would not modify habitat.
Western Ridged Mussel *Gonidea angulate*	BSS	No	Larger streams and rivers a low to mid-elevations with cobble, gravel, or mud substrates (USDA/FS and USDI/BLM 2011b). Project would not modify habitat.
Shield-backed Bug *Vanduzeeina borealis californica*	BSS	No	Associated with tall grass prairies and grassy bald habitat at higher elevations (Applegarth 1995). No known sites in project vicinity and no habitat in the project units.
Franklin's Bumble Bee *Bombus franklini*	BSS	No	Requires habitat with a sufficient supply of floral resources to provide continuous blooming throughout the colony season (USDA/FS and USDI/BLM 2009). No habitat in project units; no known sites in project vicinity.
Western Bumble Bee *Bombus occidentalis*	BSS	No	Forage on flowering shrubs and forbs usually in open habitat that include lupines and California poppy (USDA/FS and USDI/BLM 2014). No habitat in project units; no known sites in project vicinity.

Wildlife Species	Policy Status [1]	Analysis Needed [2]	Habitat Notes and Impact Analysis Rationale.
REPTILES AND AMPHIBIANS			
Foothill Yellow-Legged Frog *Rana Boylii*	BSS	No	Found in low-gradient streams with bedrock or gravel substrate (Corkran and Thoms 1996). Project would not modify habitat.
Pacific Pond Turtle *Actinemys marmorata*	BSS	No	Primary habitat is marshes, ponds, lakes, streams, and rivers with emergent structure. (Csuti et al. 1997). May nest in upland areas within 0.6 miles of water. Nesting usually occurs in areas of sparse vegetation and good solar exposure. Unlikely to nest within any units, since adjacent aquatic habitats are very small, isolated, or beyond 0.6 miles. Project would not modify habitat.
BIRDS			
American Peregrine Falcon *Falco peregrinus anatum*	BSS BCC	Yes	Cliffs and rocky outcrops with shear vertical structure often near water (White et al. 2002). Known site beyond 1 mile of a unit, rocky cliffs near two other units.
Bald Eagle *Haliaeetus leucocephalus*	BSS BCC BGEPA	No	Large overstory trees near large bodies of water (Marshall et al. 2003). Not expected in project area, no suitable water bodies.
Golden Eagle *Aquila chrysaetos*	BGEPA	No	Associated with open grassland, pasture, and shrub land conditions. In southwestern Oregon, nests on rocky cliffs or in large overstory trees (Marshall et al. 2003). Known site beyond 1.0 mile; no evidence of foraging in or adjacent to proposed units.
Great Gray Owl *Strix nebulosa*	SM-C	No	Nests in late-seral and old-growth forests and forages in adjacent open meadow habitats. Most sites are in the Western Cascades Province at higher elevation. Rarely found in the Oregon Coast Range. Closest site is 11 miles south of proposed units. Low potential for unknown sites in project area.
Harlequin Duck *Histrionicus histrionicus*	BSS GBBDC	No	Larger fast-flowing streams and riparian areas (Marshall et al. 2003). Not documented in project area; project would not modify potential nesting habitat.
Lewis's Woodpecker *Melanerpes lewis*	BSS BCC	No	Open woodland with ground cover and snags, often near water (Marshall et al. 2003). Project area outside of breeding and wintering range and associated habitats.
Oregon Vesper Sparrow *Pooecetes gramineus affinis*	BSS BCC	No	Dry, open grassy habitat with moderate herb and shrub cover (Marshall et al. 2003). Habitat not present in project area.
Purple Martin *Progne subis*	BSS	Yes	Nests in snags, and woodpecker cavities; typically found in open areas near water (Marshall et al. 2003). Proposed units will create patches of open habitat with snags.

Wildlife Species	Policy Status [1]	Analysis Needed [2]	Habitat Notes and Impact Analysis Rationale.
Marbled Murrelet *Brachyramphus marmoratus*	ESA-T	Yes	Nests in late seral and old-growth forests, rarely found in mid seral forests if trees with suitable nesting structure are present. Noise disturbance within 0.25 mile of occupied habitat may affect breeding birds. Surveys recommended for some units.
Northern Spotted Owl *Strix occidentalis caurina*	ESA-T	Yes	Utilizes late-seral and old-growth forests for nesting, roosting, and foraging, and will use mid-seral forests for dispersal. Proposed harvest units may affect known sites.
White-tailed kite *Elanus leucurus*	BSS	No	Low-elevation grassland, farmland, or savannah and nearby riparian areas (Dunk 1995). Habitat not present in project area.
MAMMALS			
Columbian White-tailed deer *Odocoileus virginianus leucurus*	BSS	No	Oak woodland habitats near and north of Roseburg. (USDI/FWS 1983). Project area outside range of the species.
Fisher *Pekani pennanti*	ESA-P	No	Associated with large contiguous blocks of late-seral and old-growth forests in Western Cascades Province and Rogue River Basin (Verts and Carraway 1998). No LSOG forests affected by this action and no known sites in project area.
Fringed Myotis *Myotis thysanodes*	BSS	Yes	Hibernacula and roost sites include caves, mines, buildings and large snags. A few units have large snags, all units considered foraging habitat.
Pallid Bat *Anthrozous pallidus pacificus*	BSS	Yes	Hibernacula and roost sites include caves, mines, rock crevices, bridges, hollow trees and snags (Lewis 1994). A few units have large snags; all units considered foraging habitat.
Red Tree Vole *Arborimus longicaudus*	SM-C	Yes	Most often found in late-seral and old-growth habitat and but sometimes found in younger conifer stands. Project area is outside of Distinct Population Segment in northern Oregon Coast Range. One unit would trigger protocol surveys; several units previously had vole presence.
Townsend's Big-Eared Bat *Corynorhinus townsendii*	BSS	Yes	Rare is western Oregon. Roost sites include buildings, caves, mines, bridges, hollow trees and snags (Verts and Carraway 1998). A few units have large snags; all units considered foraging habitat.

[1] Policy Status includes: Bureau Sensitive Species (BSS); Survey and Manage Program, Category A (SM-A), Category B (SM-B), and Category C (SM-C); Endangered Species Act, Listed as Threatened (ESA-T) and Proposed for Listing (ESA-P); Bald and Golden Eagle Protection Act (BGEPA); U.S. Fish and Wildlife Migratory Bird Program, Birds of Conservation Concern (BCC) and Game Birds Below Desired Condition (GBBDC).

[2] Analysis Needed: Yes = Action has potential for positive or negative effects to species and or habitat, such that further analysis in NEPA process is warranted; No= Action is not likely to have any appreciable positive or negative effects to species or its habitat.

Table E.2 Evaluation of Land Bird Species in Project Area.

Common Name	Federal Status[1]	PIF Status[2]	Nesting and Foraging Habitat	Presence in Area[3]
American Goldfinch		SDT	N&F-forest openings at lower elevations and valley margins; mid-late summer breeder	L
Bald Eagle	BCC BGEPA		N-large trees/snags for nest platforms close to large rivers, lakes/ reservoirs, and estuaries for foraging	L
Band-tailed Pigeon	GBBDC		N-closed-canopy forest; F-berries from shrubs and trees	H
Black Swift	BCC	FS PS	N- cliffs associated with waterfalls; F- aerial insectivore over forest mosaic habitats	X
Black-throated Gray Warbler	BCC	FS PS	N&F-deciduous canopy and sub-canopy trees, riparian habitats	L
Blue (Sooty) Grouse		FS PS	N&F-mesic sites with deciduous cover in open and closed forests	H
Brown Creeper		SDT	N-large snags/trees with loose bark for cavity/ crevice nesting; F-bark gleaner.	H
Bushtit		SDT	N&F-dense shrubs and small trees, prefers deciduous vegetation; lowest elevations/valley margin	L
Cassin's Vireo		PS	N-deciduous canopy/subcanopy trees and shrubs for nesting; lowest elevations/valley margins, warmer sites; F-conifer canopy	L
Cedar Waxwing		SIT	N-forest openings/edges; F-berries	M
Chestnut-backed Chickadee		PS	N-snags; F-dense conifer foliage	H
Chipping Sparrow		SDT	N&F-open woodlands with grassy patches	L
Common Raven		SIT	N-large conifer trees	H
Common Yellowthroat		SIT	N&F-wetlands with tall herbaceous layer and dense shrubs	L
Cooper's Hawk		PS	N-mature trees for nesting; F-open and closed forests	M
Dusky Flycatcher		PS	N&F-open canopy brushy habitat with small trees (clearcuts)	L
Golden-crowned Kinglet		PS SDT	N&F-dense conifer canopy	H
Golden eagle	BCC BGEPA		N- cliffs, rocky outcrops, large trees; F- open habitats, clearcuts, grasslands, agricultural fields.	L
Great Gray Owl	SM-C		N&F-mature forest stands adjacent to large natural meadows	L
Harlequin Duck	GBBDC		N&F- larger fast-flowing streams and riparian areas	X
Hammond's Flycatcher		SIT	N&F-open mid-story with dense conifer canopy cover	H
Hermit Thrush		SDT	N&F-conifer overstory with some shrubs and trees in understory	L
Hermit Warbler		FS PS SDT	N&F-dense conifer canopy	H

Common Name	Federal Status[1]	PIF Status[2]	Nesting and Foraging Habitat	Presence in Area[3]
Hutton's Vireo		PS	N&F-dense conifer canopy with deciduous subcanopy on drier sites	M
Lewis's Woodpecker	BSS		N&F-Snags in open habitats, usually oak woodlands with ponderosa pine, often in large valleys near water.	X
MacGillivray's Warbler		PS	N&F-openings with dense grass/forb/shrub vegetation on wettest sites	M
Marbled Murrelet	ESA-T		Addressed in Wildlife Report and Table A-1	L
Mountain Quail		PS	N&F-openings with herbaceous and dense shrub patches	M
Mourning Dove	GBBDC		N&F-forest openings and open forests, lowest elevations/valley margins; feeds on the ground	L
Nashville Warbler		SDT	N&F-dense shrubs in forest openings/edges on drier sites	L
Northern Goshawk	BCC	PS	N-Mature trees for nesting; F-forest mosaic with openings and edge habitat	L
Northern Pygmy-Owl		PS	N-snags; F-forest mosaic habitats; diurnal	H
Northern Saw-whet Owl		PS	N-snags; F-dense conifer canopy; nocturnal	L
Northern Spotted Owl	ESA-T		Addressed in Wildlife Report and Table A-1	L
Olive-sided Flycatcher	BCC	FS PS SDT	N&F-remnant large trees/snags in forest openings/edges and open forests	H
Orange-crowned Warbler		FS PS SDT	N&F-dense shrub habitat in forest openings	M
Vesper Sparrow	BCC BSS		N&F- open habitat and forest openings with grass/forb cover and scattered shrubs	X
Pacific-slope Flycatcher		FS PS SDT	N&F-deciduous canopy and subcanopy trees, especially alder	H
Peregrine Falcon	BCC BSS		N- Cliffs and rocky outcrops with shear vertical structure often near water; F- aerial predator mostly over open habitats	L
Pileated Woodpecker		FS PS	N-large snags in forest interior; F-primarily on snags	H
Pine Siskin		SDT	N&F-semi-open to closed conifer forest	M
Purple Finch		FS PS SDT	N&F-mixed conifer/deciduous forest edges and openings	H
Purple Martin	BSS	PS	N-large snag/snags (single pair and colonial nester) in large forest openings with low vegetative structure; F-over large forest openings, in adjacent valleys, or over large bodies of water	L
Red-breasted Nuthatch		SIT	N-snags; F-high volume of conifer foliage	H
Red-breasted Sapsucker		PS	N-snags; F-mostly on soft snags in the riparian zone	M
Red Crossbill		PS	N&F-mature, dense conifer canopy with a high volume of cones	H

Common Name	Federal Status[1]	PIF Status[2]	Nesting and Foraging Habitat	Presence in Area[3]
Ruffed Grouse		PS	N&F-deciduous shrubs/trees, esp. alder, in forest edges and openings	M
Rufous Hummingbird	BCC	FS PS SDT	N&F-dense shrub layer with nectar producers	H
Song Sparrow		SDT	N&F-dense grass/forb/shrub openings, prefers the wettest areas	L
Spotted Towhee		PS	N&F-dense shrub habitat in forest openings/edges	H
Steller's Jay		PS SIT	N&F-multi-layered conifer canopies with high volume of conifer foliage	H
Swainson's Thrush		SDT	N&F-dense shrub layer, prefers wettest sites	H
Townsend's Warbler		PS	N&F-dense conifer canopy higher elevations western cascades	X
Turkey Vulture		SIT	N-large structures for nesting platforms; F-over open country	L
Varied Thrush		FS PS SDT	N&F-structural complexity with mid-story and deciduous trees	H
Vaux's Swift		FS PS	N-large diameter, hollow live/dead trees for nesting and roosting	L
Western Bluebird		PS	N-snags; F-openings with sparse vegetation	M
White-tailed Kite	BSS		Low-elevation grassland, farmland or savannah and nearby riparian areas	X
Willow Flycatcher	BCC	PS SDT	N&F-dense shrub habitat, prefers the wettest sites	L
Wilson's Warbler		SDT	N&F-dense shrub habitat, prefers the wettest sites	H
Winter Wren (Pacific Wren)		FS PS	N&F-complex understory structure; will nest in cavities/crevices	H
Wrentit		PS SDT	N&F-dense shrub layer	M

[1] Federal Status includes Birds of Conservation Concern (BCC), Game Birds Below Desired Condition (GBBDC); Bald and Golden Eagle Protection Act (BGEPA); Endangered Species Act - Threatened (ESA-T); and BLM Bureau Sensitive Species (BSS).
[2] Partners in Flight Status includes: Focal Species (FS) and Priority Species (PS) with population trends noted as significant downward trend (SDT) in population within sub-region, or significant increasing trend (SIT) in sub-region, as per Table 4 in Altman and Alexander (2012).
[3] The likelihood of presence within the project area: H= high, M= moderate, L= low, X= not present or non-habitat.

Appendix F – Consistency with the Aquatic Conservation Strategy

The Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands. The ACS must strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats. This approach seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds (Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl, page B-9).

ACS Components

1. Riparian Reserves (ACS Component #1)

Table F.1 Site-Potential tree Heights for Project Subwatersheds

Subwatershed	Site Potential Tree Height (feet)
Olalla Creek	160
Rice Creek – South Umpqua River	160
Twelve Mile Creek	180
Headwaters Middle Fork Coquille River	180
Lost Creek – East Fork Coquille River	220

Riparian Reserves were established, two site potential tree heights in width, slope distance, on each side of fish-bearing streams, lakes and natural ponds, and one site-potential tree height in width, slope distance, on each side of perennial or intermittent non-fish bearing streams, wetlands greater than an acre, and constructed ponds and reservoirs.

2. Key Watersheds (ACS Component #2)

Key Watersheds were established "as refugia...for maintaining and recovering habitat for at- risk stocks of anadromous salmonids and resident fish species (ROD/RMP, p. 20)." There are no Tier 1 Key Watersheds in the analysis area.

3. Watershed Analysis (ACS Component #3)

In development of the proposed project, watershed analyses for each of the affected 6th field Hydrologic Units (HU) or subwatersheds were used to evaluate existing conditions, establish desired future conditions, and assist in the formulation of appropriate alternatives. Existing watershed conditions along with short and long term effects of the alternatives on aquatic resources are described in the Olalla – Camas Regeneration Plan EA and in the pertinent watershed analyses.

4. Watershed Restoration (ACS Component #4)

During the last 10 years, the BLM has implemented stream enhancement projects in the project watersheds for the purpose of enhancing spawning and rearing habitat and improving migratory access for Oregon Coast coho salmon, Oregon Coast steelhead trout and Coastal cutthroat trout.

Examples of such work include, but are not limited to: two stream crossing replacements on Holmes Creek and one on a tributary to Twelvemile Creek, and removal of a stream crossing on Loveseat Creek in the Upper Middle Fork Coquille; stream crossing replacements on Little Muley Creek, Muns Creek and Suicide Creek, in-stream wood placement on Muns Creek and Thompson Creek, and in-stream structure placement in Olalla Creek planned for the summer of 2016 in the Olalla Creek –Lookingglass Creek watershed; and replacement of stream crossings on Rice Creek in the Clarks Branch-South Umpqua watershed.

Proposed road renovation and improvements, and implementation of Best Management Practices, would improve habitat conditions for native fish species and assist in restoring and improving ecological health of watersheds and aquatic systems by replacing failing culverts and reducing road related impacts such as fish passage, sediment and wood routing and stream stabilization for the long-term restoration of the aquatic system (pp. 13-15, 59, 61-64 and Appendix B).

Future opportunities for restoration are discussed in the Olalla–Lookingglass Watershed Analysis (Ch. 6), the Upper Middle Fork Coquille Watershed Analysis (Ch. 6), and the East Fork Coquille Watershed Analysis (Ch. 8).

Range of Natural Variability

Natural disturbances to aquatic systems in the Pacific Northwest include wildfires, floods, landslides, and wind storms. These can be localized, or widespread and very damaging. The timing can vary from multiple occurrences in a given year to intervals of a century or longer.

Wildfire return intervals west of the Coast Range are generally greater than several decades, while east of the Coast Range return intervals are generally shorter as a result of reduced precipitation. Fires can remove riparian vegetation, allowing stream temperatures and peak flows to increase. Subsequent erosion can mobilize high volumes of sediment. At the same time, stream systems may experience nutrient enhancement which can lead to increases in macro-invertebrate populations which can be beneficial to fish populations.

Flood magnitude and frequency is unpredictable and highly variable, but floods usually occur in the winter months in association with storm events. Floods can be more prevalent in stream networks with reduced vegetation (canopy cover), and in watersheds largely located in the rain- on-snow zone where transient snow accumulations can rapidly melt under certain meteorological conditions. Floods can alter stream systems by removing or altering stream substrates, and affect salmonid eggs deposited in stream beds that winter. Floods can also benefit stream morphology by returning nutrients to the floodplain and providing off-channel rearing habitat for fish.

Wind storms may be extremely isolated resulting in the toppling of individual trees but can also be catastrophic in nature resulting in widespread loss of trees across multiple watersheds. Loss of trees can lead to increased exposure of streams to solar radiation which can lead to increases in stream temperatures. The addition of large woody debris to stream systems greatly enhances stream complexity, however, and under the right conditions this woody debris can be transported downstream.

Landslides and debris flows are typically shallow soil features that occur on unstable, steep, and/or highly saturated soils, that are often the result of one of the previously mentioned disturbances, but can also be attributed to poor land management (historical and modern). If landslides enter a stream, the system may be overwhelmed by high turbidity or even blocked to fish passage. The contribution of woody debris, boulders, and gravels can enhance fish habitat, however, leading to long-term stream complexity.

Based on the dynamic nature of aquatic systems in the Pacific Northwest, the range of natural variability at the site scale would range from 0-100 percent of potential for any given aquatic habitat parameter over time. Any of the aforementioned disturbances can have detrimental effects, but also be beneficial. It is important to consider that all streams in the Pacific Northwest evolved with these major disturbances, and that over time the condition of aquatic systems have cyclically moved between "stable" and "devastated."

Table F.2 Project area watershed descriptions

East Fork Coquille River watershed	Scale Description: This project is located in the 6th field subwatershed of the East Fork Coquille River 5th field HU. The BLM manages approximately 45,527 acres (53 percent) in the 85,975 acre watershed.	Scale Description: The Lost Creek – East Fork Coquille 6th field subwatershed is approximately 12,950 acres in size and the BLM proposes 21 acres of regeneration harvest (0.2 percent).
Middle Fork Coquille watershed	Scale Description: The project is located in two 6th field subwatershed of the Middle Fork Coquille River 5th field HU. The BLM manages approximately 59,243 acres (30 percent) in the 197,318 acre watershed.	Scale Description: The Headwaters Middle Fork Coquille 6th field subwatershed is approximately 8,807 acres and the Twelve Mile Creek 6th field subwatershed is approximately 3,924 acres. The BLM proposes 463, 65, and 237 acres of regeneration harvest respectively in each watershed which represents 5.2 and 6.0 percent of each subwatershed respectively.
Clark Branch-South Umpqua River	Scale Description: This project is located in one 6th field subwatershed of the Clarks Branch- South Umpqua River 5th field HU. The BLM manages approximately 7,477 acres (12.5 percent) in the 59,587 acre watershed.	Scale Description: The Rice Creek – South Umpqua River 6th field subwatershed is approximately 16, 979 acres. The BLM proposes 118 acres of regeneration harvest (0.7 percent).
Olalla Creek – Lookingglass Creek watershed	Scale Description: This project is located in one 6th field subwatershed of the Olalla Creek-Lookingglass Creek 5th field HU. The BLM manages approximately 27,354 acres (26.5 percent) in the 103,231 acre watershed.	Scale Description: The Olalla Creek-Lookingglass Creek subwatershed is approximately 17,115 acres and the BLM proposes 33 acres of regeneration harvest (0.2 percent).

Aquatic Conservation Strategy Objectives

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

No timber harvest would occur within Riparian Reserves, allowing forest stands astride the streams within them to continue to mature and develop structural characteristics of late-successional and old-growth forest. Deciduous trees and other unique riparian features protected within the Riparian Reserves would produce a more diverse and complex stand structure over time.

This distribution of Riparian Reserves across all the project watersheds would support attainment of this objective at the site and watershed scale.

2. Maintain and restore spatial and temporal connectivity within and between watersheds.

Over time, Riparian Reserves would restore forest conditions to a more natural state. The untreated areas within the Riparian reserves would maintain contiguous corridors along stream channels on BLM lands, providing habitat for riparian-dependent species, while previously thinned areas within the Riparian Reserves would create diverse habitat throughout the watersheds.

No new roads would be constructed within Riparian Reserves, and current road densities would remain unchanged within them. Absent the construction of any additional permanent stream crossings, there would be no influence on spatial and temporal connectivity at the site scale.

Spatial and temporal connectivity would be maintained at the site-scale and therefore at the watershed scale.

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

Harvest would not increase Equivalent Clearcut Area (ECA) to an extent that would influence peak flows. Road density would not exceed threshold levels that pose a risk for peak flow enhancement. Absent any peak flow enhancement, stream channel and bank stability would be unchanged (p. 66, Table 3.15).

The physical integrity of aquatic systems would be maintained for the same reasons at the site and watershed scale.

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

Riparian Reserves along streams would protect stream banks from disturbance and erosion that could contribute sediment to streams, and would serve to capture any sediment laden overland flow from harvested upland stands.

With the establishment of Riparian Reserves, there would be no expected change in the shade or canopy cover of the project area streams. No increases in stream temperatures are expected.

Implementation of additional Project Design Features and Best Management Practices would ensure water quality would not be degraded. Road and ditch renovation, installation of additional road drainage structures, seasonal restrictions on haul over unsurfaced roads, and sediment traps in ditches close to live streams would remove the mechanism for sediment transport to streams (pp. 13-15, 59, 61-64, and Appendix B).

Water quality would be maintained and in some cases restored through road renovation at the site-scale and hence the watershed scale.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved.

As previously discussed, Riparian Reserves established on streams adjacent to proposed units and Best Management Practices for road work would prevent direct disturbance to stream channels and stream banks, and intercept surface run-off allowing sediment transported by overland flow to settle out before reaching active waterways.

Maintenance of the existing road network which would include resurfacing and installing cross drain relief would more rapidly remove water from the road surface to the forest floor and minimize the amount of sediment from roads that is delivered directly to streams.

Based on the information discussed at the site scale, this project would aid in restoring the historic sediment regime at the watershed scale.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing.

The proposed regeneration harvest would not increase ECA to an extent that could potentially influence peak flows. The project would not increase roaded area to an extent where peak flows could potentially be enhanced (p. 66, Table 3.15).

This project would maintain stream flows within the range of natural variability at the site-scale and hence at the watershed scale.

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

As discussed in Objective 6, this project would maintain stream flows within the range of natural variability at the site scale. Absent any change in ECA or roaded area and there would be no detectable increase in peak flows or modification in the timing, variability and duration of flows at the site scale.

At the watershed scale, this project would also maintain stream interactions with the floodplain and respective water tables within the range of natural variability.

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

Riparian Reserves are intended to restore structural and species diversity capable of providing for the historic functions of an intact riparian ecosystem, including shade and temperature regulation, bank stability, forage for insect species and nutrient inputs to the stream environment.

The proposed project is designed to allow the riparian stands at the site-scale to move towards a more natural density and growth trajectory which would aid in restoring plant species composition and structural diversity at the watershed scale as well.

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

This project would allow the vegetative and structural development of riparian stands to trend toward historical conditions such that populations of riparian-dependent species including plants, invertebrates, and vertebrates would respond positively at the site-scale.

Improving riparian stand conditions and maintaining the integrity of the Riparian Reserves, allowing for growth and development across the multiple watersheds, would help restore adequate habitat to support r

Aquatic Conservation Strategy Summary

Based upon the information listed above, the proposed action would meet Aquatic Conservation Strategy objectives at the site and watershed scales. In addition, based upon the restorative nature of many actions taken by the BLM independently or in cooperation with other entities in the Middle Fork Coquille River, East Fork Coquille, Olalla Creek–Lookingglass Creek watershed, and the Clark Branch- South Fork Umpqua River watersheds, this project would not retard or prevent attainment of ACS objectives but would actually support attainment of these objectives. Therefore, this action is consistent with the Aquatic Conservation Strategy, and its objectives at the site and watershed scales.

Appendix G – Carbon Storage/Release Analytical Methodology

This appendix describes the analytical methodology used to calculate carbon storage and release associated with timber management, provides the analytical assumptions used, and describes how calculations were made.

Analysis of Carbon Storage

A variety of scientific literature is available describing quantitative measures (e.g. decay rates of slash, fire consumption of slash, fuel use and efficiency, haul distances, etc.) and other factors that may be used in calculating carbon storage with the potential to influence the outcome of an analysis. The methodology described here provides a consistent means for comparison of the relative effects of alternatives considered. It is not intended to express the absolute amount of carbon that would be stored or released.

The analysis of carbon storage modeled the amount of carbon stored in the forest and harvested wood products, and the amount of carbon released into the atmosphere to harvest those wood products. The analysis divides carbon storage/release into six pools:

- Standing, Live Trees
- Other Than Live Trees
- Wood Products
- Slash Burning
- Logging Slash
- Fossil Fuels

The estimated carbon in these six pools was summed at each time step to calculate the Net Carbon Balance by alternative.

Carbon Storage in Standing, Live Trees

The carbon pool of "Standing, Live Trees" represents the live trees that are developing currently and would develop in the future within the proposed representative units.

1. Standing, live tree carbon was derived using the outputs from the ORGANON model (Hann *et al.*, 2005) for standing tree volume in the proposed units over time for each alternative.

2. Standing tree volumes measured in board feet per acre were converted to cubic feet using a conversion factor of 6.00 board feet/cubic foot (2008 FEIS Appendices-28).

3. Cubic foot tree volumes per acre were converted to pounds of biomass, assumed to be Douglas-fir in this analysis, using a factor of 35 pounds of biomass/cubic foot (2008 FEIS Appendices-28, Table C-1).

4. Pounds of biomass per acre derived from tree volumes were expanded to a total biomass for entire trees (including branches, bark, and roots) per acre by multiplying by an expansion factor of 1.85 (2008 FEIS Appendices-28).

5. The expanded biomass value was converted to pounds of carbon per acre by multiplying by 0.50 (USDI/BLM 2008A, Appendices-28).

6. Pounds of carbon per acre in whole trees were converted to tonnes of carbon by dividing by 2,200 (2008 FEIS Appendices-28).

7. Total carbon within individual units was determined by multiplying tonnes of carbon per acre in whole trees by unit acres.

8. Tonnes of carbon in whole trees for the entire project were derived by summing the tonnes of carbon in whole trees for each unit, and represented in Table 3.18 as "Standing, Live Trees".

Carbon Storage in Forests Other than Live Trees

"Other than Live Trees" is the portion of the carbon pool representing shrubs, brush, snags, woody debris, and organic carbon in the soil within the proposed representative units.

1. Carbon in "other than live trees" was derived by multiplying unit acreage by tonnes of carbon per acre by structural stage, as expressed in Table G.1 (adapted from Table C-2, 2008 FEIS Appendices-29). Stands were aged based on time intervals used in the analysis (i.e. 10, 20, and 50 years after the current condition) and the corresponding tonnes of carbon per acre used to calculate "other than live tree carbon." A weighted average age was used to determine the average age of the representative stands in the project area.

2. The total tonnes of carbon, represented in Table 3.18 as "Other Than Live Trees", were derived by summing the tonnes of carbon within each unit.

Table G.1 Forest Ecosystem Carbon (Excluding Live Trees) By Structural Stage*

Age of Stand(s)	Structural Stage	Tonnes of Carbon per Acre
5-34 years	Stand Establishment	67.8
35-94 years	Young	70.3
95-124 years	Mature	88.2
>=125 years	Developed Structurally Complex	94.8

*adapted from USDI/BLM 2008, Appendices-29

Carbon Storage in Wood Products

The carbon pool of "Wood Products" represents the amount of carbon that would be converted from standing, live trees into saw logs or pulpwood, collectively referred to as wood products under the proposed action. There would be no carbon pool of wood products under No Action since wood products would not be generated.

1. The tonnes of carbon in whole trees were derived in Steps 1-7 under "Standing, Live Trees" for each time interval expressed in this analysis. The difference between the tonnes of carbon in whole trees at "current condition" and "at harvest time" would be the tonnes of carbon in whole trees that would be harvested.

2. The tonnes of carbon in whole trees that would be harvested per unit were summed to provide the total for the project.

3. The tonnes of carbon in whole trees that would be harvested were converted to tonnes of carbon in sawlogs by dividing by 1.85 (2008 FEIS Appendices-28). *Note:* this reversed the calculation that expanded biomass of harvested logs into the biomass of whole trees performed previously (Step 4 of "Standing, Live Trees").

4. At time of harvest, 13.5 percent of sawlog carbon would immediately be released (Smith *et al.* 2006); but afterwards the carbon in sawlogs would be gradually released over time. The tonnes of carbon held in sawlogs were then decayed over time by multiplying the tonnes of carbon in sawlogs that would be harvested by the values in Table G.2 (adapted from the 2008 FEIS Appendices-30, and Smith *et al.* 2006).

5. Additional tonnes of carbon held in pulpwood (e.g. chips) were derived by multiplying the tonnes of carbon in sawlogs (derived in Step 3 above) by five percent (2008 FEIS Appendices-30). *Note*: Pulpwood tonnage is five percent *in addition to* the saw logs not five percent *of* the saw logs.

6. At time of harvest, 14.8 percent of pulpwood's carbon would immediately be released (Smith *et al.* 2006); but afterwards the carbon in pulpwood would be gradually released over time. The tonnes of carbon held in pulpwood were then decayed over time by multiplying the tonnes of carbon in pulpwood by the values shown in Table G-2 which were adapted from the 2008 FEIS, Appendices-30, and Smith et al. (2006).

7. The sum total of the tonnes of carbon immediately released from saw logs (derived in Step 4 above) and from pulpwood (derived from Step 6 above) represent the total amount of carbon released by "Wood Products" at harvest time. The sum total of the tonnes of carbon held in sawlogs (derived in Step 4 above) and pulpwood (derived in Step 6 above) at each time step represent the amount of carbon stored in "Wood Products" as illustrated in Table 3.18.

Table G.2 Fraction of Carbon Remaining or Captured as an Alternative Energy Source*

Time Interval	Saw Logs	Pulpwood
Harvest Time (0 years)	0.865	0.852
+10 years	0.796	0.730
+20 years	0.761	0.691
+50 years	0.702	0.655

***These fractions include; wood products in use, wood products in the landfill, and wood products emitted as energy in lieu of fossil fuels (adapted from USDI/BLM 2008A, Appendices-30 and Smith et al. 2006)

Carbon Release in Slash Burning

The carbon pool of "Slash Burning" represents the amount of slash generated by the proposed timber harvest that is consumed through prescribed burning. There would be no carbon pool of slash burning under the No Action alternative since logging slash would not be generated and therefore not burned.

1. The amount of slash burned in landing piles for acres regeneration harvested was calculated by averaging slash burned in recently implemented sales under similar conditions and was found to be 2.0 tonnes of biomass per acre. Tonnes to be burned were calculated by multiplying two tonnes by total acres in the project area.

2. It was assumed that 90 percent of piled slash would be consumed (K.Kosel, pers. comm., 2009). Tonnes of slash consumed per acre were derived by multiplying total tonnes by 0.90.

3. The tonnes of slash biomass consumed per acre were converted to tonnes of carbon released per acre by using a conversion factor of 0.50 tonnes of biomass/tonne of carbon. It was calculated that an average of 0.9 tonnes of carbon would be released per acre of regeneration harvest unit scheduled for piling and burning using prescribed fire.

4. The release of carbon from pile burning in areas treated by regeneration harvest was calculated the same as areas treated by thinning except that 4.0 tonnes per acre was used as a constant. The total amount of carbon released per acre of regeneration treatment was 4.0 tonnes.

5. The amount of slash burned by broadcast burning was calculated by averaging the estimate amount slash loading and consumption by using the Photo Series Post-harvest (Maxwell and Ward 1976). An average of 15.2 tonnes of slash was used. These averages were multiplied by the treatment acres proposed for broadcast burning to calculate the total amount of carbon released from broadcast burning

6. The total amount of carbon released from prescribe burning was calculated by adding up the total amount of carbon released from pile burning in regeneration treatment areas, pile burning in treatment areas, and broadcast burning of regeneration treatment areas proposed for broadcast burning.

Carbon Storage in Logging Slash

The carbon pool of "Logging Slash" represents the limbs, fine branches, leaves/needles, stumps, and roots of harvested trees that are left on site in the proposed units after harvest operations that are not consumed during slash burning. There would be no carbon pool of logging slash under the No Action Alternative since logging slash would not be generated.

1. The tonnes of logging slash remaining on-site was calculated by subtracting the following three amounts of carbon from the total tonnes of carbon in whole trees that would be harvested from the project (derived in Step 2 under "Wood Products"):
    - The tonnes for carbon immediately released from wood products (derived in Step 7 of "Wood Products"),
    - The tonnes of carbon stored in wood products at harvest time (derived in Step 7 of "Wood Products"), and
    - The tonnes of carbon released from slash burning.

2. The tonnes of logging slash on-site were then multiplied by the fraction of Douglas-fir slash remaining at each time step as shown in Table G.3 (based on Janisch *et al.* 2005). This represents the amount of carbon stored in "Logging Slash" as it decayed and released carbon over time as shown in Table 3.18.

Table G.3. Decay Rates of Carbon from Douglas-fir Slash*

Time Interval	Fraction of Carbon Remaining in Douglas-fir Slash
Harvest Time (0 years)	1.000
+10 years	.852
+20 years	.726
+50 years	.449

*based on Janisch *et al*. 2005

Carbon Release in Fossil Fuels

The carbon pool of "Fossil Fuels" represents the amount of carbon that would be released through consumption of gasoline and diesel fuel by various harvest-related activities under the proposed action such as: timber falling, timber yarding, log hauling, and road construction and renovation. There would be no carbon pool of fossil fuels under the No Action Alternative since no harvest would occur.

1. Fuel consumption during harvest operations (i.e. timber felling and yarding) was estimated based on production rates and fuel efficiencies in Table G.4, and an 8.5 hour work day.

2. For log hauling, this analysis assumed an average load of 4,500 BF (based on experience of BLM Contract Administrators and Cruiser/Appraisers), fuel efficiency of 6.0 miles per gallon, and a 60-mile round trip.

2. For road construction it was assumed that 588 gallons of diesel would be consumed per mile of road constructed, and 73 gallons per mile of road renovated (Loeffler *et al.*, 2009)

4. For road rocking it was assumed that for every station (100 ft.) 57.5 yards of rock would be used (USDI/BLM 1970). It was also assumed that a truck would hold 10 yards and the average miles per load would be 60. The fuel mileage was assumed to be 6 miles per gallon.

5. The gallons of fuel that would be consumed by harvest operations (derived in Step 1), log hauling (derived in Step 2), road construction and renovation (derived in Step 3), and road rocking (derived in step 4) were summed to provide the total fuel consumption for the project.

6. The total gallons of fuel that would be consumed were converted to tonnes of carbon that would be released using the following conversion factors; 1 gallon of gasoline is equal to 19.4 pounds of CO_2, 1 gallon of diesel is equal to 22.2 pounds of CO_2, 1 pound of carbon is equivalent to 3.67 pounds of CO_2 (EPA, 2005). The total amount of carbon that would be released by fuel consumption is shown as "Fossil Fuels" in Table 3.18

Table G.4. Fossil Fuel Consumption during Harvest Operations

Equipment	**Production Rate**[a] (acres/day)	**Fuel Efficiency**[b] (gallons/hour)
Chainsaw (gasoline)	0.4	0.2
Motorized Carriage (gasoline)	1	0.4
Cable/Skyline Yarder (diesel)	1	6.1
Loader (diesel)	1	4.5
Rubber tire skidder (diesel)	2	4.8
Tracked tire skidder (diesel)	2	3.6
Harvester (diesel)	3	4.7
Forwarder (diesel)	3	4.3

[a]based on experience of BLM Contract Administrators and Cruiser/Appraisers
[b]based on World Forestry Institute (1997)