Evans Mountain Thinning

Environmental Assessment and Finding of No Significant Impact

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United States Department of the Interior
Bureau of Land Management, Oregon State Office
Salem District, Cascades Resource Area
Marion County, Oregon

T. 8 S., R. 3 E. section 24, and 25;
T. 8 S., R. 4 E. sections 29, and 30; W.M.

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BLM
Salem District

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BLM/OR/WA/AE-13/043+1792

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1.0 Purpose and Need for Action

1.1 The Proposed Action

The Cascades Resource Area, Salem District, Bureau of Land Management (BLM), proposes to thin approximately 252 acres of 48-92 year old forest stands. Connected actions include restoration activities such as fuels management; maintenance or replacement of several culverts; mulching, seeding, and fertilizing for roadway stability; and removing and improving roads (EA Sections 2.2.3).

1.1.1 Project Area Location and Vicinity

The proposed project area is within the Little North Santiam 5th field watershed, near the City of Gates in Marion County, Oregon. The BLM-administered land is intermixed with privately owned land (agricultural, industrial timber and residential). The project is located within Township 8 South, Range 3 East, sections 24 and 25; Township 8 South, Range 4 East, sections 29, and 30 Willamette Meridian. See EA Sections 7.0 – Project Maps, Glossary and Acronyms.

1.1.2 Need for the Action

The BLM's staff has analyzed forest inventory data and conducted field examinations to identify specific forest stands in the project area vicinity that need forest management actions to continue meeting land use objectives defined in the *Salem District Record of Decision and Resource Management Plan*, May 1995 (RMP). The identified stands are overstocked, or will soon grow into an overstocked condition. Overstocked stands have more trees than the sites have water, nutrients and growing space to sustain. If these overstocked stands are not managed growth rates decline, the health and vigor of the trees and other vegetation decline, and the stands begin to "self-thin" as the smaller trees die. This typically results in slower tree growth, lower site productivity and delays development of complex stand structure for habitat.

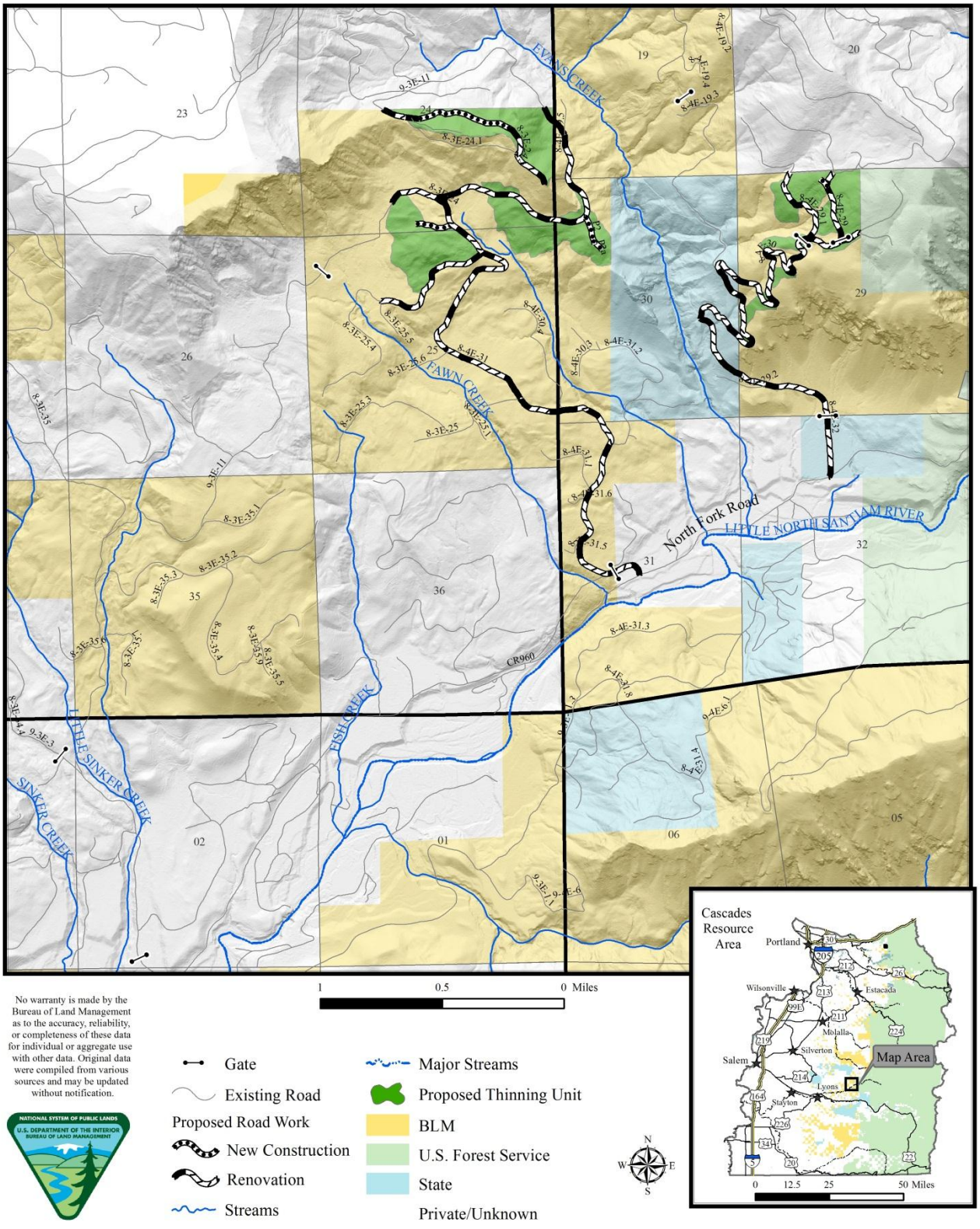
There is also a need to provide a sustainable supply of timber to contribute to local and state economies. In recent years state and county revenues dropped and timber related jobs decreased. Further, the Secure Rural Schools Act county payments, supporting numerous facilities and services are uncertain. The proposed forest management activities are needed in these stands to improve growth rates and forest diversity so the stands contribute to current and future forest production (RMP pp. 46-48).

Lands within the Riparian Reserve LUA are designated for restoring and maintaining the ecological health of watersheds and aquatic ecosystems (RMP p. 5), and for providing habitat for terrestrial species (RMP p. 9). The conifer stands identified for treatment exhibit simple stand structure and low species diversity. The stands also have declining growth rates that result in delayed development of large diameter snags and other habitat characteristics associated with late-successional forests.

Evan's Mtn. Proposed Projects Location

6/28/2013

Map 1 – Vicinity Map



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NATIONAL SYSTEM OF PUBLIC LANDS
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- Gate
- Existing Road

Proposed Road Work

- New Construction
- Renovation
- Streams
- Major Streams
- Proposed Thinning Unit
- BLM
- U.S. Forest Service
- State
- Private/Unknown

1.1.3 Purpose (Objectives) of the Project

This project has been designed under the RMP and related documents which direct and provide the legal framework for management of the BLM lands within the Salem District. The area proposed for treatment falls within the Matrix and Riparian Reserve Land Use Allocations (LUA) as defined in the RMP (p. 8) and Northwest Forest Plan (NWFP) (pp. A-4, A-5). The Evans Mountain Thinning project incorporates the following RMP objectives and directions:

Project Objectives within the Matrix LUA

1. Manage developing stands on available lands to promote tree survival and growth to:
   - achieve a balance between wood volume production, quality of wood, and timber value at harvest (RMP p. 46);
2. Supply a sustainable source of forest commodities from the Matrix LUA to provide jobs and contribute to community stability (RMP pp. 1, 46-48) by developing timber sales that can be successfully offered to the market place.
3. Develop and maintain a safe, efficient transportation system that serves the needs of users in an environmentally sound manner (RMP p. 62).
4. Provide habitat for a variety of organisms associated with younger forests; and provide early successional habitat (RMP p. 20) by creating low-density thinning patches.
5. Provide for important ecological function such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees to provide habitat for a variety of organisms associated with both late-successional and younger forest (RMP p. 20).

Project Objectives within the Riparian Reserve LUA

1. Maintain water quality standards (RMP p.2) and improve stream conditions by:
   - Maintaining effective shade for streams, pursuant to the BLM's TMDL agreement with the State of Oregon;
   - Designing temporary roads and using existing roads to avoid increasing the quantity of water and sediment transported to streams.
2. Maintain, develop, and accelerate development of large conifers with deep crowns and large limbs; future source material (large green trees) for coarse woody debris (CWD); future source material (large green trees) for large (larger than 15 inches diameter and 15 feet tall) snag habitat; long-term structural, spatial and tree species diversity; multi-layered stands; and other elements of late-successional forest habitat(RMP p. 11).
3. Provide habitat for Special Status, SEIS special attention and other terrestrial species (RMP p. 9) by applying commercial thinning treatments within the Riparian Reserve LUA (RMP p. 11, D-6;).
3. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species (RMP p. 6) associated with openings or young forests by creating low density thinning patches.

Project Objectives within Both Matrix and Riparian Reserve LUA

1. Reducing natural and activity fuel hazards on the BLM-administered lands in Rural Interface Areas.
2. Limiting potential human sources of wildfire ignition by controlling access and reducing fuel hazards on the BLM-administered lands.

1.1.4 Decision to be Made

The following decisions will be made through this analysis:

- To determine if a Finding Of No Significant Effect (FONSI) or an Environmental Impact Statement (EIS) should be prepared based on the anticipated impacts to the human environment.
- To determine at what level, where, and how to harvest trees on the BLM-administered lands.
- To determine a level of transportation system and fuels related actions necessary for an economically viable timber sale and protection of resources.

In making the decision, the Cascades Resource Area Field Manager will consider the anticipated environmental effects disclosed in this EA and the project record as well as to the extent to which the proposed actions meet the identified objectives for each Land Use Allocation.

1.2 Conformance with Land Use Plan, Statutes, Regulations, and other Plans

The BLM has designed this project to comply with the Salem District Record of Decision and Resource Management Plan, May 1995 (RMP) and related documents, which direct and provide the legal framework for management of the BLM lands within the Salem District. In summary, the Evans Mountain thinning project conforms to the:

1. *Salem District Record of Decision and Resource Management Plan*, May 1995 (RMP): The RMP has been reviewed and it has been determined that the proposed thinning activities conform to the land use plans and objectives.
2. *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl*, April 1994 (the Northwest Forest Plan, or NWFP).
3. *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, January 2001 (2001 ROD), as modified by the 2011 Survey and Manage Settlement Agreement (July 2011).

The analysis in the Evans Mountain Thinning EA is site-specific, supplements and tiers to analyses found in the *Salem District Proposed Resource Management Plan/Final Environmental Impact Statement*, September 1994 (RMP/FEIS). The RMP/FEIS includes the analysis from the *Final*

Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl, February 1993 (NWFP/FSEIS). The *Final Supplemental Environmental Impact Statement for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, November 2000 amends the RMP/FEIS.

The IDT incorporated information from the Little North Santiam Watershed Analysis, 1997 (LNSWA) into the development of the proposed thinning activities, and into the description of the affected environment and environmental effects (*EA section 3.0*) and is here by incorporated by reference.

1.2.1 Relevant Statutes/Authorities

This section is a summary of the relevant statutes/authorities that apply to this project.

- Archaeological Resources Protection Act (ARPA) 1979 – Protects archeological resources and sites on federally administered lands.
- Clean Air Act (CAA) 1990 – Provides the principal framework for national, state, and local efforts to protect air quality.
- Clean Water Act (CWA) 1987 – Establishes objectives to restore and maintain the chemical, physical, and biological integrity of the nation's water.
- Endangered Species Act (ESA) 1973 – Directs Federal agencies to ensure their actions do not jeopardize threatened and endangered species.
- Federal Land Policy and Management Act (FLPMA) 1976 – Defines BLM's organization and provides the basic policy guidance for the BLM's management of public lands.
- Healthy Forests Initiative (HFI) 2002 - Focuses on reducing the risk of catastrophic fire by thinning dense undergrowth and brush in priority locations that are identified on a collaborative basis with selected Federal, state, tribal, and local officials and communities.
- Migratory Bird Treaty Act of 1918 - Protects migratory birds (16 U.S.C. 703).
- National Environmental Policy Act (NEPA) 1969 – Requires the preparation of EAs or EISs on federal actions. These documents describe the environmental effects of these actions and determine whether the actions have a significant effect on the human environment.
- Oregon and California Act (O&C) 1937 – Requires the BLM to manage O&C lands for permanent forest production in accordance with sustained-yield principles. Management of O&C lands must also protect watersheds, regulate stream flow, provide for recreational facilities, and contribute to the economic stability of local communities and industries.

EA section 3.1.8, Table 19 describes additional authorities and management direction.

1.3 Scoping and Identification of Relevant Issues

1.3.1 Scoping

The Interdisciplinary Team (IDT) of BLM resource specialists conducted internal scoping through the project planning process, which includes record searches, on-site field examinations of the project area, professional observation and judgment, literature review and IDT discussion. In the project planning process, the IDT considered elements of the environment that are particular to this project as well as elements of the environment that are common to all similar timber management projects.

The BLM conducted external scoping for this project by means of a scoping letter sent out to approximately 59 federal, state and municipal government agencies, nearby landowners, tribal authorities, and interested parties on the Cascades Resource Area mailing list on July 22, 2010. The BLM received approximately seven comment letters/emails during the scoping period. The scoping and EA comment letters/emails/postcards are available for review at the Salem District's BLM Office.

1.3.2 Relevant Issues

The IDT identified relevant issues based on applicable law, management direction contained in the RMP, and information gathered during the scoping and project planning process. Issues are considered to be relevant if they determine the appropriate range of alternatives to analyze, determine whether the proposed action should be modified, and to determine the significance of the project's effects on elements of the environment. Analysis of these issues provides a basis for comparing the environmental effects of action alternative(s) and the no action alternative and aids in the decision-making process.

The IDT considered the following issues as it developed and refined the project alternatives, identified project design features (PDF), and analyzed the environmental effects. EA section 8.0 contains the response to the scoping comments received, including these issues.

1. **Issue 1:** The Effects of Management Actions on Water Quality, including municipal drinking water supplies, sediment from landslides, sediment from roads and thinning

2. **Issue 2:** The Effects of Management Actions on Wilderness and Wilderness Characteristics

3. **Issue 3:** The Effects of Management Actions on Vegetation and Forest Stand Characteristics, including older stands, Units 29B and 29F, variable density thinning, and riparian thinning

4. **Issue 4:** The Effects of Management Actions on Wildlife Habitat, including early successional and late successional habitat, snags and coarse woody material (CWD), stream buffers, riparian habitats including fisheries, adjacent mature and old-growth habitat

1.3.3 Issues Considered, Not Analyzed in Detail

1. **Economic Viability of Management Actions:** The BLM did not analyze the economic viability of the sale because the project was designed to be economically viable in order to

meet the purpose and need of the project, specifically EA project objectives 1-3, (EA section 1.1.3). Specific concerns about harvest operations are addressed in EA section 8.0 (Response to Scoping comments).

2. **Carbon Storage / Emissions:** The BLM did not analyze carbon storage or emissions specifically for this sale because the BLM has sufficient information from analysis of four previous commercial thinning projects[1] in the Cascades Resource Area for the Decision Maker to make an informed decision between alternatives. Therefore, analyzing quantitative carbon storage and emissions for this project would not provide any additional information needed for a reasoned choice among alternatives for this project.

The following is a summary of information from those four analyses[2]:

- Range analyzed for treated acres in the projects: 290 to 1,724 acres.
- Range analyzed for carbon in harvested wood: 7,000 to 107,000 tonnes.
- Range analyzed for total carbon emissions in the 30 year period following harvest: 1,850 - 17,080 tonnes.
- Range of carbon storage in untreated project area at 30 years: 45,420 – 450,270 tonnes.
- Range of carbon storage in treated project area plus carbon in landfills and wood products at 30 years: 42,150 – 342,200 tonnes.

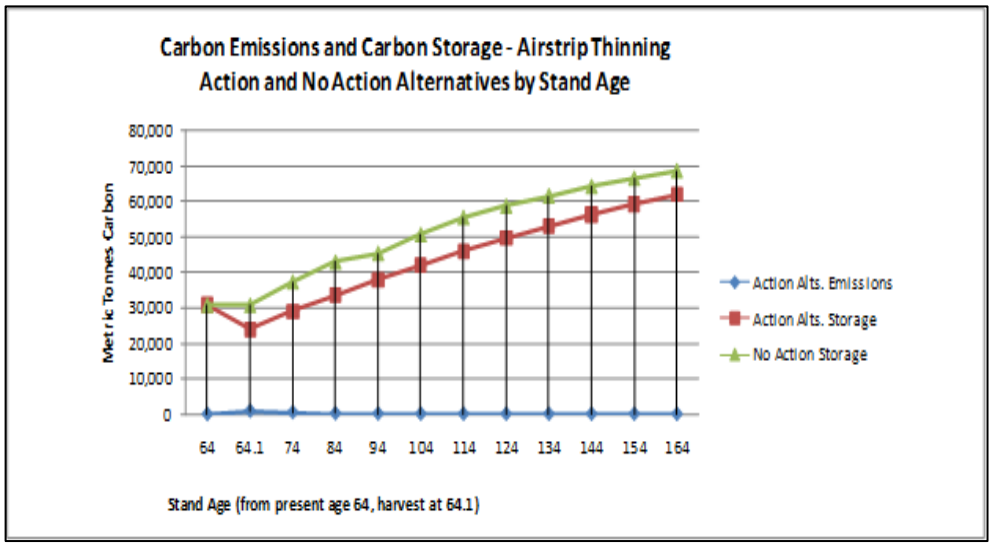
The analysis of each of these projects shows that:

- The carbon emissions attributable to the projects, both individually and cumulatively, are of such small magnitude that it is unlikely to be detectable at any scale (global, continental or regional) and thus would not affect the results of any models now being used to predict climate change.
- Total carbon storage for the no action alternative of each project is higher than the total carbon storage for all action alternatives throughout the 30-year analysis period. Figure 12 of the Airstrip EA and figure 6 of the Power Mill EA are incorporated here by reference. They show the relationship between carbon storage in the proposed action and no action alternative as well as carbon emissions during the analysis period. The other sales analyzed (Gordon Creek and Highland Fling Thinning) show a similar pattern.

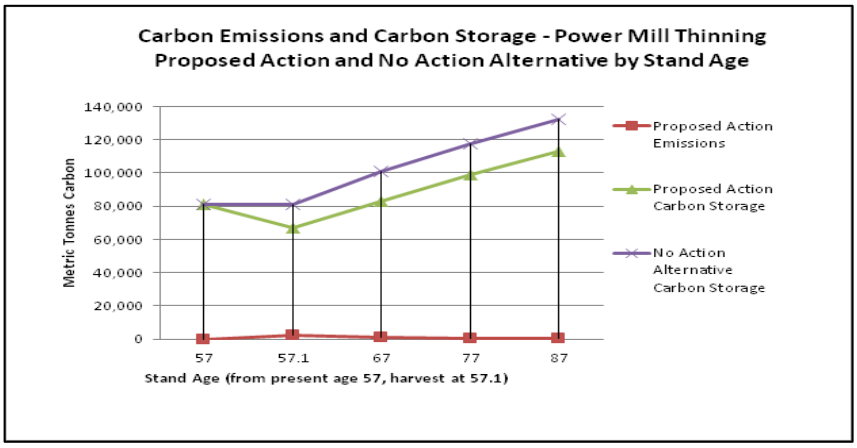
[1] Airstrip, Gordon Creek, Highland Fling, and Power Mill Thinning projects

[2] For each project, carbon analysis was based on more area than was actually treated and more wood volume than was actually harvested. Harvested wood volume is reported here as tonnes (or gigatonnes, equal to one billion tonnes) of carbon. Carbon emitted is the sum of carbon in harvested wood that would be released in the 30 year analysis period, plus the carbon in diesel fuel used for harvest operations and carbon released by burning piles of logging slash and debris.

Airstrip Thinning, EA Figure 12, p. 86



Power Mill Thinning EA, Figure 6, p. 95



The Evans Mountain Thinning project falls within the range covered by the projects analyzed and is expected to have similar results.

3. **Cultural Resources:** Cultural Resource inventories were conducted (Greatorex, Fred., 2012) for the Evans Mountain Thinning. No cultural resources were discovered during these inventories; therefore, there are no effects to be analyzed.

2.0 ALTERNATIVES

2.1 Alternative Development

Pursuant to Section 102 (2) (E) of the National Environmental Policy Act (NEPA) of 1969, as amended, Federal agencies shall:

"…study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources."

There were no unresolved conflicts concerning alternative uses of available resources, therefore, this EA will analyze the effects of the current proposed action and No Action alternative (which provides the baseline to evaluate effects).

2.1.1 Planning and Implementation Process

The IDT also developed a set of project design features (PDF) that would guide implementation of the project. The actions described in EA Section 2.2 and analyzed in EA Section 3.0, and the PDF described in EA Section 2.2.3, taken together, form the best management practices (BMP) for the Evans Mountain Thinning project. These actions are based on the site-specific application of the principles outlined in chapter 2 of this document, and the Salem RMP including Appendices C, D, G, and K.

The BLM would implement the selected actions and PDFs analyzed in this EA in project layout (physical delineation of treatment boundaries and road locations) and timber sale contract provisions. The timber sale contract would be written and administered by the BLM and requires the timber sale operator to accomplish the requirements of the contract in a manner that is consistent with the actions and PDF analyzed in this EA.

2.2 Proposed Action

2.2.1 Proposed Treatments

The BLM proposes to thin 252 acres of overstocked 48-92 year old forest stands, using ground-based yarding on approximately 156 acres and skyline yarding on approximately 96 acres (Table 1).

In addition, in Unit 24B, to increase habitat diversity, the BLM proposes to create up to three (3) low density thinning patches, each up to one acre in size. These patches would be thinned to 10-12 trees per acre (TPA) with average tree spacing of 60 to 65 feet (LNSWA Chapter 7, pp. 5-6). These patches would not encroach into the Stream Protection Zones.

To encourage establishment and growth of grasses, forbs, and understory vegetation within these low density patches and provide access for big game animals, logging slash would be removed and scattered, or piled and burned.

Evans Mountain Thinning Proposed Action

Table 1: Harvest Unit and Logging System Acres

Stand Age (Years)	Unit Number	Total	Matrix LUA*		Riparian Reserve (RR) LUA		Low Density Thinning Patches Logging System	
			Ground	Skyline	Ground	Skyline	Matrix LUA	RR LUA
48	24A	53	28	25	0	0	0	0
56	24B	50	49	0	1	0	**3**	0
52	29A	74	26	26	5	17	0	0
92	29C	14	0	11	0	3	0	0
56	30A	61	42	12	5	2	0	0
Total Acres		**252**	145	74	11	22	**3**	0

*- Land Use Allocation

Table 2: Logging System Summary

Logging System	Total Acres	All	
		Ground	Skyline
Thinning*	249	153	96
LDT**	3	3	0
Totals	**252**	156	96

* Thinning would retain 53-90 trees per acre;
** Low Density Thin (LDT) patches would retain 10 - 12 trees per acre

Matrix LUA

The BLM proposes to thin approximately 219 acres of overstocked 48-92 year old forest stands within the Connectivity/Diversity Blocks (CONN) portion of the Matrix Land Use Allocation (LUA). Of this, ground-based yarding would take place on approximately 66 percent (145 acres) and skyline yarding on the remaining 3 percent (74 acres). The following the silvicultural prescription guidelines include:

- Retain and protect all remnant old-growth trees including retaining trees that are 36 inches in diameter and larger for the stand, emphasizing the retention of the largest, healthiest and best formed dominant and co-dominant trees;
- Thin from below: Cut and remove suppressed and intermediate trees, and co-dominant trees;
- Maintain and provide adequate growing space for the retained trees based on target stocking (number of trees per acre to be retained in each stand);
- Retain a mix of the species that are currently present in the stand, including hardwood trees;
- The proposal targets relative basal area densities within thinned stands of 30-50% (Curtis Relative Density (RD));

- Retain and protect, at a minimum, 90 percent of existing large (larger than 15 inches diameter and 15 feet tall) snags from damage during timber harvest activities;
- Reserve trees larger than 20 inches diameter that must be felled would be left on site as CWD unless the CWD standard for the applicable LUA is fully met in the area (see PDF 40);
- Retain and protect 90 percent of existing CWD (down logs larger than or equal to 20 inches diameter and 20 feet long) from damage during timber harvest activities;
- Maintain spotted owl dispersal habitat (minimum 40 percent canopy cover) and suitable habitat (60 percent canopy cover) after thinning.

Riparian Reserve LUA

The BLM proposes to thin 33 acres within the 735 acres of Riparian Reserve LUA within the project area. Of this, ground-based yarding would take place on approximately 33 percent (11 acres) and skyline yarding on the remaining 67 percent (22 acres). To achieve the riparian objectives, the proposed prescription would:

- Maintain an average of at least 50 percent canopy cover of retained dominant and co-dominant trees (typically ranging from 55-70 percent) following thinning;
- Maintain stream protection zones (SPZ) on all perennial and intermittent streams to retain primary shade and protect stream water temperatures. SPZ would have a minimum width of 85 feet on each side of perennial streams, and 50 feet on each side of intermittent streams. These SPZ would increase to 200 feet on the perennial stream in section 29 and remain 50 feet on intermittent streams within one mile upstream of ESA listed fish habitat. The BLM has designed these SPZ to prevent sediment generated by logging operations from reaching the streams and prevent loss of shading on those streams to avoid increasing water temperature. No new or temporary roads would be created within the SPZ.
- Exclude treatment in areas that have:
  - Areas with steep, unstable slopes;
  - Conditions where conifers, hardwood trees and brush species already provide desired levels of structural complexity; and
  - Areas where logging is not feasible in conjunction with operations in the adjacent Matrix thinning;

2.2.2 Connected Actions

Road Work: Proposed roadwork is shown in Table 3 and displayed in EA section 7.0 – Project Maps.

Table 3: Proposed Road Work

Township Range Section Unit	Temp. Road Construction Miles			Decommission Constructed Road	Road Renovation Miles		
	BLM	Private	Total		BLM	Private	Total
24A	0.5	0	0.5	0.5	0.4	1.1	1.5
24B	0.2	0	0.2	0.2	0	0	0
29A	0.1	0	0.1	0.1	0.5	0	0.5
29C	0	0	0	0	0	0	0
30A	0.2	0	0.2	0.2	0	0	0
Total	1.0	0	1.0	1.0	0.9	1.1	2.0

Temporary Road Construction: One mile of temporary roads would be constructed to facilitate thinning and fuel reduction actions and, subsequently, would be decommissioned following project implementation. Construction involves clearing vegetation within the road Right-of-Way (ROW) using ground based logging equipment. Clearing would average 30 feet wide and would avoid special wildlife habitats, unstable ground, wet areas, and old growth trees and snags when feasible.

Following project completion, the BLM would decommission all newly constructed roads detailed above (1.0 miles). Road decommissioning seeks to improve/restore hydrologic function and consists of the following actions:

- Ripping then seeding with native plant species and mulching with logging slash or approved sterile mulch to establish effective ground cover prior to the wet season;
- Reestablishing natural drainage patterns by removing all culverts, using water bars or other drainage features to prevent water erosion of exposed soil;
- Blocking vehicle access, typically with earth/debris barricades.

To improve hydrologic function in the Little North Fork Santiam Tier 1 key watershed the BLM proposes to decommission 0.5 miles of Rd 8-3E-24.1(A)(Map T08S-R03E 24, Section 7.0) as defined above. This route has a slide area that the road is making worse. Repairing Road 8-3E-24.1 would not be cost effective or environmentally preferable as the road would still be susceptible to future fill and cut slope slumping. The BLM proposes to rehabilitate the current road and use an alternate route that would utilize portions of an existing skid trail, reducing the amount of new soil compaction and establishing the road in a stable location.

The BLM complies with the "no net increase in road mileage" in this watershed because in addition to not increasing permanent road miles associated with the Evans Mountain Thinning project the BLM decommissioned 1.19 miles of existing permanent BLM roads in the Little North Santiam River Tier 1 Watershed in 1999 (table 3). The BLM reduced the net decrease in road mileage by applying a 0.5 mile of this decommissioning to the Power Mill and Power House Timber sales resulting in a 0.7-mile net decrease in road mileage in the Little North Santiam Watershed.

Table 4: Roads Decommissioned under Contract 53-04R4-8-2660J in the Little North Santiam Watershed

Status	Road Number	Miles	
Total Decommissioned Miles under contract 53-04R4-8-2660J			**1.19**
Mileage applied to Power Mill Project	9-2E-13.3	0.20	
	9-2E-13.4	0.11	
	9-3E-19	0.20	
	subtotal	**0.51**	
Road miles to be retained in Power Mill and Power House Timber Sales			**0.5**
Net decrease in road mileage			**0.69**

Road Renovation: The BLM would renovate approximately 0.9 mile of existing road on BLM managed land and approximately 1.1 miles of existing road on private land. Renovation would bring existing roads up to safe timber haul standards by adding rock, blading and shaping the road, cleaning ditches and culverts, and cutting roadside brush. Road renovation would take place on Roads 9-3E-11, 8-3E-24.2, 8-3E-24.1(B) in section 24, and 8-4E-29.1, 8-4E-30 in section 29 (Maps, EA section 7.0). These roads have a visible road prism for most of their length, and have only low growing vegetation such as ferns, Oregon grape, and salal growing in the road prism.

Road renovation activities include removing brush and branches where it is encroaching into the road prism. Road renovation would also include replacing three stream crossings where log fills or under-sized culverts that are failing or are in danger of failing in section 29.

All proposed culvert work would take place during the dry season (Oregon Dept. Fish and Wildlife in-stream work period in the project area is June 1 – Oct 15) when most of these streams have very low or no flow. After the completion of project operations, the BLM would stabilize disturbed sites with seed and mulch.

Road Maintenance: The BLM and private landowners would perform routine maintenance on existing roads along the timber haul route, including replacement of failing or undersized culverts.

Fuels Treatments (Table 5) Post-treatment fuels hazard surveys would be conducted and site-specific fuels treatments would be recommended. Fuel treatment strategies would be implemented 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 (after fuels reduction has occurred). Fuel treatments in the low density thinning areas would be implemented to facilitate for grass and forb establishment, and to remove barriers to big game use.

Table 5: Fuels Treatment Methods

Township - Range	Section	Proposed Treatments
8S - 3E 8S - 4E	24 29 & 30	Construct, cover, and burn landing piles (approximately 60 landings)
8S - 3E 8S - 4E	24 29 & 30	Construct, cover, and burn machine piles along property lines and in low density harvest areas (approximately 25 acres)
8S - 3E 8S - 4E	24 29 & 30	Construct, cover, and burn hand piles along property lines and in low density harvest areas (approximately 5 acres).

Fuels treatments may include:

Fuels treatments may include:

- Landing pile construction, covering, and burning: (Construct medium to large piles at landings of small to medium size fuels <6 inches diameter by machine and cover with .004 mil. black plastic).
- Machine pile construction, covering, and burning: (Construct medium to large piles along roads, property lines and in low density harvest areas, of small to medium size fuels <6 inches in diameter by machine and cover with .004 mil. black plastic).
- Hand pile construction, covering, and burning: (Construct small piles along roads, property lines and in low density harvest areas of small to medium size fuels <6 inches diameter by hand and cover with .004 mil. black plastic).

The BLM and operator may implement other fuels treatments following post-harvest fuels hazard surveys in addition to those listed above including slash pullback, slashing, lopping and scattering, and firewood cutting in areas needing such work.

- Slash pullback: (Pull slash <6 inches in diameter back 25 to 100 feet from roadsides and property lines, or other high hazard fire risk areas).
- Slashing: (Cut all brush and residual whips greater than 1 inch in height within the selected area.
- Lopping and scattering: (Cut and lop slash <6 inches in diameter into 6 inch or shorter lengths. Slash shall be scattered so that the depth does not exceed 1 foot measured from the ground).
- Firewood cutting: (Allow unmerchantable wood along the road or in piles to be cut for firewood).

In lieu of burning, the BLM and operator may remove slash at landing areas for mulch to cover roadbeds during stabilization (see EA section 2.2.3).

The total amount of debris expected to be machine-piled along roads and property lines or within harvest areas and low density thinning areas is estimated to be between 1000 and 1500 tons.

The total amount of debris expected to be hand piled along roads and property lines or within harvest areas and low density thinning areas is estimated to be between 10 and 30 tons, and the total amount of debris expected to be piled at landings is estimated to be between 1500 and 2000 tons.

Landings: The BLM would require the timber sale operator to construct landings according to the approved logging plan, and would require the operator to place landings outside the Stream Protection Zones.

Preventing Unauthorized Off-Highway Motor Vehicle (OHV) Use (RMP p. 41)

During operations, the timber sale purchaser would prevent unauthorized access, including OHV, during operations as part of their normal security measures. The BLM requires that the operator place physical barriers to block OHV access on roads and skid trails at the end of operations (*EA section 2.2.3).*

Special Forest Products (SFP) (RMP p. 49)

The BLM would make permits available to the public for collecting Special Forest Products such as firewood, mushrooms, ferns, etc. where collection does not interfere with the proposed project operations or have effects beyond those analyzed in this EA.

2.2.3 Project Design Features (PDF)

This section summarizes the PDFs that would keep the project's effects on the affected resources described in EA section 3 within the effects analyzed in the RMP/FEIS. The proposed action would implement PDFs described in this section unless otherwise specified. Many PDFs contribute to achieving multiple objectives. Table 5 shows the PDFs for the proposed action and the benefitting resource. These design features are based on the management guidance, design features and best management practices (BMP) described in the RMP/FEIS (chapter 2; Appendices G, K and S); and RMP (pp. 20-50; Appendices C and D).

Based on its combined experience, professional judgment, familiarity with published research, and field analysis of this project area, the BLM Interdisciplinary Team of Resource Specialists (IDT) then refined them into the proposed actions and PDFs described in this EA.

The BLM would incorporate the selected action and design features into the project layout, contract requirements, and contract administration to ensure that project implementation is consistent with this EA.

The Contracting Officer would enforce compliance with the contract, and would suspend operations if the operator fails to perform the required preventive and restorative practices analyzed in this EA and stipulated in the timber sale contract. The BLM timber sale contract holds the purchaser and operator financially liable and requires bonding in an amount sufficient for the BLM to complete restoration work if the purchaser fails to perform the preventive and restorative requirements of the contract.

The following project design features would:

- Protect special status species (Vegetation); soil productivity (Soil); water quality and quantity (Water); fisheries, listed fish and aquatic habitat (Fish); stand structure, habitat and species (Wildlife); air quality (Fire/Air); public safety, rural interface and recreation (Public); and cultural resources (Cultural).
- Prevent or reduce spread of invasive/non-native plant species populations (Invasives), fire hazards and risks (Fire/ Air).
- Achieve desired forest stand composition (Vegetation); Economic Efficiency (Economic), fuel reduction (Fire/Air).

Table 6: Project Design Features and Benefitting Resources

Applicable Resources / Objectives Project Design Features (RMP/FEIS references for key points)	Vegetation	Soil	Water	Fisheries	Wildlife	Invasive	Fire / Air	Public	Cultural	Economic
In All Logging Operations: RMP/FEIS (pp. 2-34 through 2-37; 4-11 through 4-13; G-1,2)										
1. Limit the area compacted by logging operations (skidding, yarding and landings) to less than 10 percent of the harvest area in each unit, outside of road rights-of-way.	♦	♦	♦	♦	♦	♦		♦		♦
2. Locate skid trails and skyline corridors to avoid concentrating runoff water flows that could cause rill or gully erosion with potential to displace soil.	♦	♦	♦	♦						
3. Lift the leading end of all logs off of the ground during yarding (one-end suspension) to prevent the blunt ends of logs from displacing soil.	♦	♦	♦	♦						
4. Limit the size and number of landings to the minimum needed for safe and efficient operations. Size and number of landings vary with terrain, equipment, log size, and road access. Locate landings 220 feet away from stream channels in Section 29.	♦	♦	♦		♦	♦	♦			♦
5. Retain duff, litter and logging slash on the forest floor as much as possible.	♦	♦	♦	♦	♦	♦				
6. Implement erosion control measures such as seeding with native species to prevent rill or gully erosion that would displace soil more than several feet.	♦	♦	♦	♦	♦	♦				
7. Prevent unauthorized off-highway motor vehicle (OHV) use by blocking access with debris, gates, or berms. Roads would be able to be re-opened for use by fire-fighting equipment.	♦	♦	♦	♦	♦	♦	♦	♦		
8. Directionally fall trees in the harvest units so that they would not enter the designated Stream Protection Zone (SPZ). If any trees or snags in the SPZ must be felled for safe logging operations, the BLM would require the operator to leave them on site in order to create CWD habitat.	♦			♦	♦					
In Ground-based Logging Operations: RMP/FEIS (pp. 2-34 through 2-37; 4-11 through 4-13; G-2)										
9. Allow ground based logging operations only when the site-specific combination of soil conditions, rainfall and operating methods would not result in soil compaction, displacement and erosion impacts exceeding those analyzed in the RMP/FEIS.	♦	♦	♦	♦		♦				♦
10. Re-use existing skid trails whenever possible for logging operations according to the approved logging plan.	♦	♦	♦	♦	♦	♦				♦
11. Generally locate new skid trails on slopes no greater than 35 percent.	♦	♦	♦	♦		♦				♦
12. Generally limit uphill skidding to slopes where skidders would not break traction to avoid soil displacement.		♦	♦							

Applicable Resources / Objectives Project Design Features (RMP/FEIS references for key points)	Vegetation	Soil	Water	Fisheries	Wildlife	Invasive	Fire / Air	Public	Cultural	Economic
13. Allow use of mechanized falling/processing and log handling machinery on slopes up to 45 percent where the machinery design and operating techniques (i.e. slash mat) would prevent gouging, soil compaction and displacement, and erosion with effects exceeding those analyzed in the RMP/FEIS (pp. 4-11 through 4-13).	♦	♦	♦	♦						♦
In Skyline Yarding Operations:[3] RMP/FEIS (pp. 2-34 through 2-37; 4-11 through 4-13; G-1,2)										
14. Design the skyline yarding layout so that corridors average 150 feet apart on at least one end of the corridors and to laterally yard logs to the skyline to limit the ground area impacted. For lateral yarding operations where it is not feasible to achieve one-end suspension (cable angles may not create enough lift to achieve one-end suspension until logs get close to the skyline), fall trees to orient logs so that they cause the least soil disturbance and damage to retained trees during lateral yarding.	♦	♦	♦	♦	♦					♦
In Other Operations: RMP/FEIS (pp. 2-34 through 2-37; 4-8 through 4-13; G-1,2)										
15. A Prescribed Fire Burn Plan would be initiated and signed by the Authorized Officer prior to any prescribed burning activity.	♦	♦	♦	♦	♦	♦	♦	♦		♦
16. Burning would be conducted in accordance with the Salem District RMP, Oregon State Implementation Plan and Oregon Smoke Management Plan as administered by the Oregon Department of Forestry and would comply with the provisions of the Clean Air Act.	♦	♦	♦	♦	♦	♦	♦	♦		♦
17. Prescribed burning may include swamper burning, or hand, machine, and landing pile construction and burning and may be used individually or in combination in areas where fuel loading is heavy or the fire risk is determined to be high.	♦	♦		♦	♦	♦	♦	♦		♦
18. Large woody debris greater than six (6) inches in diameter would not be piled.	♦	♦	♦		♦		♦	♦		♦
19. Hand, machine, and landing piles would be located as far as possible from green trees and reserved trees to minimize damage. In addition, piles will not be constructed on top of stumps or existing coarse woody debris (CWD)	♦				♦		♦			
20. Landing piles would only be constructed within twenty-five (25) feet of designated roads and landings. Equipment used in the construction of landings would remain on the roads or landings during the construction.	♦	♦			♦		♦			

[3] In skyline yarding operations, a cable is suspended above the ground which holds a carriage that uses another cable to pull logs laterally across the slope to the skyline. A yarder (machinery with a tower, cables and winches) located on the landing then pulls the carriage up the skyline and pulls (yards) logs up to the landing. The leading end of the log is suspended off the ground while being moved.

Applicable Resources / Objectives Project Design Features (RMP/FEIS references for key points)	Vegetation	Soil	Water	Fisheries	Wildlife	Invasive	Fire / Air	Public	Cultural	Economic
21. Machine piles would only be constructed within ground based harvest areas. These piles would be located along property lines, within low density thinning areas, and in other harvest areas where hazard fuel reduction is required.	♦	♦			♦		♦			♦
22. Lopping and scattering of fuels would be incorporated where fuel loading is relatively heavy but not heavy enough to warrant burning.	♦	♦			♦		♦			♦
23. Pullback of fuels would be incorporated where fuel loading is relatively light (especially along roads and property lines) and not heavy enough to warrant burning.	♦	♦			♦		♦			♦
24. Utilization of small diameter slash for firewood or energy production from biomass would be incorporated where appropriate. If biomass removal occurs in lieu of prescribed burning within commercial thinning ground based harvest areas; only logging debris accessible from existing roads and landings would be available for removal. If biomass removal occurs in lieu of prescribed burning in commercial thinning cable yarding areas, only logging debris less than 6 inches in diameter that has been pulled to landings would be available for removal.	♦	♦	♦	♦	♦	♦	♦			♦
24. The BLM expects the combination of wet soils that can resist heat and covered piles that are still dry enough to burn to occur in November in the Evans Mountain area.	♦	♦				♦	♦	♦		♦
25. Restrict or suspend ground-disturbing activities immediately if operators encounter prehistoric cultural resources during project implementation and develop appropriate management practices to protect the site/cultural values.									♦	
Road Construction, Reconstruction Renovation, Maintenance, Stabilization and Closure RMP/FEIS (pp. 2-22,68,69; 2-75,76; 4-11 -- 4-19; G-2 -- G-7)										
26. Locate, design and construct roads to drain surface water to adjacent slopes where it would infiltrate into the soil and groundwater; and to avoid collecting water (in ditches and on road surfaces) where it would be channeled directly to streams.		♦	♦	♦						
27. Locate, design and construct roads in upland areas on stable ground with side slopes generally less than 30 percent that do not require extensive cut-and-fill construction methods, in order to avoid increasing mass failure (landslide) potential and to avoid intercepting groundwater.		♦	♦	♦		♦				♦
28. When replacing culverts on streams that are flowing: to reduce potential increases in turbidity, capture flow and pipe/pump flow around the worksite. Dewater streams during culvert installation/removal operations in flowing streams by pumping or piping water around the construction site.		♦	♦	♦						
29. Prohibit timber transport on natural surface roads during high		♦	♦	♦						

Applicable Resources / Objectives Project Design Features (RMP/FEIS references for key points)	Vegetation	Soil	Water	Fisheries	Wildlife	Invasive	Fire / Air	Public	Cultural	Economic
moisture conditions that lead to road deterioration and sedimentation.										
30. During log hauling, BLM personnel would visually monitor at stream crossings on the haul route, comparing water above and below the crossing. If there is a visible (more than a 10 percent) increase in turbidity below the mixing zone (approximately 100 meters), suspend hauling and other operations immediately and implement measures to reduce fine sediment run-off into the stream.			♦	♦						♦
31. Use sediment control measures such as vegetation in the ditch, small settling basins, or wattles as sediment traps and/or filters in ditches that drain to stream crossings to prevent sediment transport that would cause a visible increase in turbidity in streams.			♦	♦		♦				♦
32. Use water bars or other surface shaping to drain runoff water to vegetated slopes; surface tilling; seeding with native species; sediment traps and/or other techniques to promote infiltration, to stabilize roads, to prevent erosion and sediment transport to streams that would cause a visible increase in turbidity, and to prevent increases in peak flows.	♦	♦	♦	♦	♦	♦	♦	♦		♦
33. Leave culverts and subgrades of closed and stabilized roads intact to accommodate renovating the road for future use or fire control use with minimal disturbance and expense.	♦					♦	♦	♦		♦
34. Restrict road construction, and stabilizing operations to times, weather conditions and soil conditions when no surface mud or sediment-laden runoff would be generated		♦	♦	♦		♦				♦
35. Winterize temporary roads after season's operations, using erosion control measures described in PDF #32.										
Stand Structure, Wildlife Habitat and other Vegetation: RMP/FEIS (pp. 2-17,22,26,32--3337--38,59--62;80--92; 4-11 through 4-13; G-1,2; K-1--3)										
36. Retain and protect old-growth trees by individually designating them as reserved, and protect them from logging damage that would potentially affect the health or function of the trees.	♦				♦					♦
37. Retain and protect (intact and standing) at least 90 percent of snags larger than 15 inches diameter and taller than 15 feet during logging activities. Comply with Oregon Occupational Safety and Health Division (OR-OSHA, Oregon Occupational Safety And Health Standards, OAR Chapter 437, Division 7, Forest Activities).					♦					♦
38. Retain and protect existing Coarse Woody Debris (CWD) meeting RMP standards of at least 20 inches diameter (large end) and 20 feet long wherever feasible (a minimum of 90 percent) and protect them from logging damage. Design skid trail location and		♦			♦					♦

Applicable Resources / Objectives Project Design Features (RMP/FEIS references for key points)	Vegetation	Soil	Water	Fisheries	Wildlife	Invasive	Fire / Air	Public	Cultural	Economic
operating techniques that require minimal movement of CWD to protect its physical integrity. (RMP p. 21).										
39. Retain (number varies according to local abundance) trees that have desirable characteristics for wildlife habitat (e.g.: multiple or broken tops, large limbs, dead areas being used by cavity excavators, deep crevices and cavities).	♦				♦					
40. Avoid damaging retained trees by using techniques such as: seasonal restrictions, directional falling to lead with skid trail or skyline corridor alignment; lateral yarding to skylines; using selected "cut" trees as rub trees in locations where logs "turn a corner" during logging. When a tree designated for retention must be felled, it should be left on the ground were felled unless all CWD standards for the applicable LUA are being met in the immediate area.	♦				♦					♦
41. Seed and mulch disturbed soil in roads and landings using certified weed free native plant species seed and sterile mulch, in order to stabilize the soil and prevent establishing invasive/non-native plant species on disturbed soil in the project area.	♦	♦	♦	♦	♦	♦				
42. Clean all ground-disturbing logging and road construction equipment of off-site soil, plant parts and seed prior to entering the project area to prevent introducing invasive and non-native plants into the project area.						♦				
43. Retain all hardwoods, allow them to be felled and left in place if needed to facilitate safe and efficient logging.	♦				♦					
44. Restrict or suspend operations, or modify project boundaries at any time if plant or animal populations that require protection are found during ongoing surveys or are found incidental to operations or other activity in the project area.	♦				♦					

Seasonal Restrictions and Operational Periods: The Seasonal Restrictions and Operating Periods are summarized in Table 6.

Table 7: Summary of Seasonal Restrictions and Operational Periods

Seasonal Restriction	Reason	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
All operations and hauling in unit 29C	Peregrine falcon												
All operation and hauling in Units 29A&C	Spotted Owl												
Falling and yarding	Bark slippage												
Hauling	Water quality and sedimentation, fish habitat												
Ground-based yarding	Soil damage/erosion control												
Skyline yarding	Soil damage/erosion control												
Road Construction / Decommissioning	Soil damage/erosion control												
In-water work: stream crossings/ culvert work	Protect fish and aquatic habitat												
Logging operations	Fire season, ODF industrial fire precaution levels, and regulated use												

Key	Operations generally allowed.	Operations restricted, modified or allowed depending on conditions.	Operations generally restricted

2.3 Scope of the Proposed Action

Table 8: Acres of BLM Land, Matrix, and Riparian Reserve

T.S. R.E. section	Total Acres by Section			Evans Mt. Proposed Action			No Thinning		
	BLM Land	Matrix LUA	Riparian LUA	Total Acres	Matrix Thinning	Riparian Thinning	BLM Land	Matrix LUA	Riparian LUA
8-3-24	334	261	73	92	90	2	242	171	71
8-3-25	644	270	374	52	48	4	592	222	370
8-4-29	478	253	225	88	62	26	390	191	199
8-4-30	143	80	63	26	24	2	117	56	61
Totals	**1599**	**864**	**735**	**258**	**224**	**34**	**1341**	**640**	**701**

The proposed action would thin:

- 252 acres out of a total of the 1599 acres (16 percent) of BLM land within the project area.
- 34 acres out of a total of the 735 acres (5 percent) of BLM land within the Riparian Reserve LUA within the project area.
- 0.3% of the LN Santiam watershed
- 2.4% of BLM ownership in the LN Santiam watershed

2.4 No Action Alternative

The "No Action alternative" means that no timber management actions, fuel reduction treatments, or connected actions would occur. If this alternative were to be selected, the following activities would not take place in the project area at this time: silviculture treatments; timber harvest; road construction, renovation, improvement or closure; stream crossing restoration projects such as culvert upgrades or replacement of failing culverts; and fuel reduction projects. Only normal administrative activities and other uses (e.g. road use, programmed road maintenance, harvest of special forest products on public land) would continue on BLM within the project area. On private lands adjacent to the project area, forest management and related activities would continue to occur on a rotational basis .

Selection of the No Action alternative would not constitute a decision to change the land use allocations of these lands. Selection of the No Action alternative would not set a precedent for consideration of future action proposals.

2.5 Alternatives Considered But Not Analyzed In Detail

Treatment of other forest stands within the Riparian Reserve LUA

The IDT evaluated all Riparian Reserve stands adjacent to proposed harvest units to determine whether treatment would contribute to attaining LUA and ACS objectives for habitat. The BLM used two general criteria in this screening process:

- If the stand has a simple structure that would benefit from thinning to accelerate development of elements of complex structure for habitat enhancement; and
- If the stand can be treated in conjunction with the adjacent Matrix unit using only existing roads and roads that would be constructed to manage Matrix land (no road construction for the sole purpose of treating Riparian Reserve stands).

Riparian Reserve stands that did not meet both of the above conditions were dropped from further consideration for treatment.

Reserve The Stands In The Project Area For Carbon Storage

The BLM did not analyze this alternative in detail for the following reasons. This Alternative:

- Does not respond to the purpose for the project (EA section 1.2);

- Is not in conformance with the RMP which sets the basic policy objectives for the management of the project area, in which Matrix lands are managed primarily for timber production, and Riparian Reserves are managed to help develop late successional habitat conditions in line with the Aquatic Conservation Strategy. The RMP does not include a Land Use Allocation that reserves lands or stands for carbon storage; and this alternative; and
- Is substantially similar in design to the "No Action alternative" which is analyzed in the EA.

2.6 Alternative Analyzed and Later Dropped

Table 9: Units or portions of Units Dropped from the Proposed Action

Unit from Scoping Letter Map	Reason the Units were dropped from the Proposed Action			Additional Comments
	Not Economically Feasible to Log	Presence of Red Tree Voles	Within the Bull of the Woods/Opal Creek Lands with Wilderness Characteristics	
19A	X			
19B	X			
29B		X	X	
29C (portion)			X	That portion of the unit outside those lands identified to contain wilderness characteristics (Wilderness addition) remains in the proposed action
29D (portion)		X		That portion of the unit outside the Red tree vole buffer has been added to unit 29A
29E	X			
29F	X		X	
30A (portion)	X			That portion of the unit that is that is feasible to log remains in the proposed action

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

This section of the EA describes the current condition and trend of the affected resources and the environmental effects of the alternatives on those resources. The interdisciplinary team of resource specialists (IDT) reviewed the elements of the human environment, required by law, regulation, Executive Order and policy as well as the issues raised in scoping (EA section 1.3). The purpose of this review is to determine if these resources would be affected by the proposed action.

Assumptions

- Timber management activities will occur on BLM-administered lands allocated to planned, sustainable harvest. The type, quantity, and impacts of allocating these lands for the type and quantity of these timber management activities were analyzed in the Salem RMP/FEIS for both the short-term (10 years) and long-term (decades). Under the RMP, this applies to Matrix/GFMA lands in the proposed project area.
- Future timber management activities on those BLM-administered lands will re-use the transportation system of skid trails, landings and truck roads proposed for this project.
- The Riparian Reserve LUA on BLM-administered lands will be managed for protection of watershed values in compliance with the ACS objectives and for special status, SEIS special status, and for terrestrial wildlife habitat on both a local and landscape level.
- If the proposed project is implemented, no further silvicultural treatments would be done for approximately the next 20 years in these stands, both Matrix/GFMA and Riparian Reserve.
- Most private industrial forest lands in these watersheds will be intensively managed with regeneration harvests scheduled on commercial economic rotations occurring at 50-60 year intervals (RMP/FEIS 1994, p. 4-3). BLM observations of recent trends in industrial forest management indicate that this interval may be reduced to 30-40 years for some landowners.

Methodology

The BLM compiled the forest condition information from a variety of resources:

- The RMP/FEIS provided general resource information for the Salem District planning area as of September 1994.
- Research publications provided further information specific to forest vegetation and the impacts of managing or not managing forest stands (Silvicultural Report, Wildlife Report).
- BLM resource specialists used Geographic Information System (GIS) data, aerial photographs and satellite imagery, the BLM's Forest Operations Inventory (FOI) records, resource specific field surveys (see the following EA sections for specific surveys conducted) and field reconnaissance to describe vegetation, habitat, and plant and animal species present on BLM lands.

3.1 Resource Specific Affected Environment and Environmental Effects

3.1.1 Vegetation and Forest Stand Characteristics

Sources Incorporated by Reference: *Evans Mountain Silvicultural Prescription-Commercial Thinning, Soo et. al 2012; Wildlife Report Evans Mountain Project, England 2012, Evans Mountain Botanical Report, Fennell 2010.*

Assumptions:

- As relative density[4] (RD) increases above 50 percent, competition for light, nutrients and water begins to reduce growth rates and increase stresses on individual trees and on the stand as a whole.
- Forest stands with above 65 percent RD have lower tree vigor, higher mortality of suppressed trees, and higher susceptibility to insects, disease, and more severe fire behavior than stands with lower densities (Perry 1994; Hann and Wang 1990; Curtis 1982). These conditions reduce stand resiliency and resistance to environmental stresses.
- Current forest stand conditions reflect the cumulative result of the past actions. Information on the current environmental condition is comprehensive and more accurate for establishing a baseline condition for a cumulative effects analysis than attempting to establish such a starting point by adding up the effects of individual past actions. Unlike current conditions, past actions and perceived effects can no longer be verified by direct examination.

  As the Council on Environmental Quality (CEQ), in guidance issued on June 24, 2005, points out 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 historical details of individual past actions." This is because a description of the current state of the environment inherently includes the effects of past actions.

Methodology:

- For stand age and structure information, Stand Exams were conducted in 2007. The BLM's Silviculturalist did field reconnaissance of all proposed thinning units.
- The Resource Area Silviculturalist analyzed plot data using the BLM's EcoSurvey Program and the ORGANON growth mode (Hann et al 2006). The BLM analyzed and incorporated the data (Table 10) into the description of existing vegetation, forest stand characteristics and for developing the prescriptions. A weighted average of sample tree ring counts (cores) determined the stand "birthdate" or age.
- Threatened/Endangered/Special Status/Special Attention Botanical Species: The BLM botanist for Cascades Resource Area conducted two types of surveys within the project area and vicinities; Known Site Surveys (Data Search) and Field Surveys (Botanical

[4] Relative density (RD) is a measure of crowding in a stand of trees, expressed as a percentage of density (based on the number and size of trees) relative to theoretical maximum density. Curtis Relative Density (RD) is calculated by dividing the basal area per acre by the square root of the quadratic mean diameter. Other common ways of communicating density in a forest stand include trees/acre, basal area/acre, average spacing and crown or canopy closure.

Inventory). The Botanist conducted comprehensive botanical inventories of the project area in June of 2010.

Affected Environment

Matrix LUA

The RD throughout the project area ranges from 62-84 and stocking typically ranges from 148-365 trees per acre (TPA) (Table 10). These densities and stocking levels are associated with overstocked stands where competition for site resources (water, nutrients and light) results in moderately to severely reduced growth rates and stand vigor with increased susceptibility to damage from insects, disease, fire and wind throw.

Stand Structure and Development

Unit 24A:

Stand History: Original logging occurred here in 1961. There is evidence of slash burning following the logging and the current stand is a result of natural seeding.
Stand Structure: This is a variable mixed 48 year old stand of dense western hemlock and Douglas-fir. There are some scattered red-alder, mainly along old road openings, or near the edge of the stand. With the exceptions of the edge effects from adjacent private clear cuts, this is a dense stand with little understory. Understory vegetation present includes salal, western swordfern, vine maple and oxalis.

Unit 24B:

Stand History: Original Logging occurred here in the early 1940's. There is evidence of slash burning following logging and the current stand is a result of natural seeding.
Stand Structure: This is a variable stand of 57 year old Douglas-fir and western hemlock, with several pockets of hardwoods scattered throughout the stand consisting predominately of big-leaf maple and red-alder. There are some large Douglas-fir (over 36 inches DBH) along the 9-3-11.0 road. Understory vegetation includes vine maple, western sword fern and oxalis.

Unit 30A:

Stand History: This unit encompasses 5 separate stands, with two distinct age classes. The western portion of unit 30A consists of an age range from 26 and 46 years of a similar timber type. The original logging occurred here in 1961, under the same contract as unit 24A. The unit was burned after harvest and the current stand is a result of natural seeding.

The eastern portion of unit 30A consists of an age range of approximately 37 to 76 years, some of which would have been logged under the same contract as 24A in 1961. However, there are no records of the original harvest in the older portions of the stands (60-76 year old timber), which according to current average stand ages, would have occurred in the late 1940's or early 1950's. There is some evidence that suggests the stand was burned after logging with the current stand a result of natural seeding. Some salvage logging occurred in this area in the 1970's.
Stand Structure: This unit consists of variable spaced Douglas-fir and western hemlock with some scattered red alder. There are some large snags (up to 45 inches DBH) in the eastern portion of the unit, with down logs throughout the area from the original logging. The understory vegetation consists of mostly salal, Oregon grape, vine maple, western sword fern and oxalis.

Unit 29A:
Stand History: The original logging occurred here in 1951. The stands age class is 53 years. Maps from the original contract indicate the area was burned after harvest. The current stand is a result of natural seeding. Unit 29A was pre-commercially thinned to 13 foot spacing in 1975.
Stand Structure: This is an even-aged and even-spaced Douglas-fir with western hemlock stand. Understory species present include vine maple, red huckleberry, rhododendron, salal, western sword fern, oxalis and Oregon grape.

Unit 29C:
Stand History: There are no records of any logging or salvage operations taking place in this stand. Due to the stands older age class (93 years), stand structure and proximity to an active spotted owl nesting site (see Evans Mountain Wildlife Report), a minimum of 60% canopy closure would be required after thinning treatment in unit 29C.
Stand Structure: This is a dense 93 year-old Douglas-fir and western hemlock stand with an understory of vine maple, rhododendron, red huckleberry, western sword fern and oxalis.

Riparian LUA
Stand Structure and Development
The Riparian Reserve LUA stand conditions and structure proposed for thinning are similar to and contiguous with the Matrix stands proposed for thinning. When BLM lands in the Evans Mountain Thinning project area were logged and reforested, there was no distinction made between forest stands in what is now classified as Riparian Reserve and those in Matrix LUAs.

Stands in the Riparian Reserve LUA that are naturally developing structural complexity were dropped from consideration for thinning. Units included in the proposed action are those stands lacking vertical canopy structure in terms of tree regeneration or tall shrubs. Within these stands, there are other areas where understory trees and/or shrubs are present, but their growth is hindered by the shade of the overstory canopy.

Table 10: Evans Mountain Thinning Stand Characteristics

T-R-Sec	Unit	Stand Acres	Stand Age*	Current Condition			Average Diameter, Year 20 No Thin	After Proposed Treatment			
				Trees per Acre	Quadratic Mean Diameter	Curtis RD		Trees per Acre	Average Diameter Year 1	Average Diameter Year 20	Curtis RD
8S-3E-24	24A	53	49	365	12	84	17	83	18	22	33
8S-3E-24	24B	50	57	193	15.0	62	18.3	90	16.8	21.3	34
8S-3E-25											
8S-4E-29	29A	74	53	188	16.9	72	21.1	61	21.9	27.7	34
8S-4E-29	29C	14	93	148	20.7	76	24.0	53	26.4	30.3	39
8S-3E-24	30A	61	26 - 76	220	14.4	65	17.5	73	18.1	22.8	31
8S-3E-25											
8S-4E-30											

*As of August, 2013

Threatened & Endangered/Special Status and Survey & Manage Species

BLM field surveyed and searched known databases for the presence of Special Status and Survey & Manage Species. No Sensitive or Survey & Manage Species were found during field surveys and there are no known sites within the proposed harvest area(s) as determined by a known site data search. Similarly, no T&E vascular plant or suitable habitat were found during field surveys and there are no known sites within the proposed harvest area(s) as determined by a known site data search.

Survey Results for Invasive / Non-native Plant Species

During field surveys the following BLM Manual 9015 Class C and/or Oregon Department of Agriculture (ODA) List B invasive non-native species were found to occur adjacent to the proposed harvest areas within road corridors and regen-harvest units: tansy ragwort (*Senecio jacobaea*), St. John's wort (*Hypericum perforatum*), herb Roberts (*Geranium robertianum*) and scotch broom (*Cytisus scoparius*).

BLM Manual 9015 Class C and ODA List B species identified during field surveys are species of economic importance due to their potential impacts to livestock, agriculture and reforestation, and ecological importance due to their potential impact on natural areas. All of the identified species are regionally abundant and well distributed throughout northwest Oregon. Eradication of these invasive/non-native species is not practical due to the widespread ubiquitous nature of their infestations. Class C species receive the lowest priority (BLM Manual 9015) and management direction and emphasis is to contain spread to current population size or decrease population to a manageable size.

All of the invasive/non-native species identified were found to inhabit areas of high light and soil disturbance (e.g. road corridors); none were found within the proposed harvest areas.

Environmental Effects

Proposed Action

Matrix (GFMA) LUA

Stand Structure and Development

Observed Characteristics and Direct Effects Immediately after Thinning to 10 Years

The stands should appear healthy with uniform spacing and tree size. Following harvest tree crowns would be more widely spaced than prior to treatment, allowing more light to reach the forest floor. The average diameter of the forest stand would be larger than prior to thinning because "thinning from below" primarily removes the smaller and less vigorous trees from the stand.

There would be some visible damage to some retained trees, but contract requirements and administration would prevent more than two trees per acre being damaged for more than half the circumference as defined in the project design features. Some felled trees larger than 20 inches diameter would remain on site as CWD.

Skyline thinning corridors would create linear gaps in the canopy. Soil in road rights-of-ways, at landings and in skid trails and yarding corridors would be disturbed, and some of that soil (less than 10 percent of the area) would be compacted by logging operations. Logging slash and debris, consisting primarily of limbs and broken boles generally less than six inches diameter would cover much of the ground surface.

The width (12 feet) of skid trails and skyline corridors is less than the average spacing of retained trees (21-25 feet). Therefore, they would have little to no effect on stocking densities.

Observed Characteristics and Trends in the Long Term (10-30 Years)

After thinning, tree crowns, understory brush, grass and forbs would continue to grow as limbs grow longer and lower limbs continue to grow instead of dying and self-pruning. As crown closure increases (limbs grow and fill in the open space in the tree canopy) the amount of light reaching the forest floor would slowly diminish. Understory vegetation and lower tree limbs then begin to decline in vigor in the second decade as crown closure increases.

Most areas of damaged bark and cambium on retained trees would heal while some of the trees with more than 50 percent of the circumference damaged would be expected to develop decay pockets or die and become snags. Some individual tree and small group wind throw would be expected, based on BLM experience with similar projects.

Disturbed soil would become fully revegetated with herbaceous species (especially the native species used for seeding) within two years and woody species would be expected to become established on some of the disturbed soils over a five-year period. Logging slash would lose its needles within one year and decay over a three to seven year period to blend into a mat of duff and litter.

Figure 1

Typical dense stand before treatment.	**Typical stand a few years after thinning.**
	
Additional Comments: Typical dense stand with complete canopy closure, similar to those proposed for treatment. Note the lack of ground cover vegetation and understory. Sec. 25, T10S, R1E. T. Fennell 2008	Additional Comments: Typical stand resulting after treatment, approximately five years after thinning. Note the typical understory development and snag. Sec. 12, T1S, R5E. File photo by K. Walton 2006

Indirect Effects

Diameter growth rates on retained trees would increase because of decreased competition for site resources (light, water, nutrients), resulting in larger trees available for future harvest or other management objectives. Crown ratios would increase because lower limbs would not self-prune for a decade or more, resulting in healthier trees with larger crowns and larger limbs compared to trees in an overstocked stand. Stand structure would become more complex as understory and ground cover develops, compared to an overstocked stand with limited light reaching the forest floor. Tree mortality, wind throw and decay that began because of injury to some trees would add snags, CWD and "cull tree" elements of structural complexity to the stands. Growth models predict that Culmination of Mean Annual Increment (CMAI) would occur within 25-30 years after thinning and the need for additional treatment would be evaluated at that time.

Within the Riparian Reserve LUA

Stand Structure and Development

Observed Characteristics and Direct Effects Immediately after Thinning:

The thinning prescription and logging methods are essentially the same in the Riparian Reserves as they are in the adjacent Matrix portions of the treatment area. Therefore, the environmental effects would be the same as thinning in the Matrix.

Thinning to the same average relative density in the Riparian Reserves as Matrix and retaining the largest trees and less common species regardless of spacing would aid in developing older and more diverse stand characteristics. The small clumps and gaps created by spacing variation would also introduce density variability, as well as improving the distribution and species mix of ground cover plants, brush and conifer understory. Less common tree species would be expected to have higher survival and growth rates than would be expected if the stands were not thinned.

Skyline corridors would create linear openings in the canopy perpendicular to slopes. These openings would not change the stand stocking because the width of the corridor (12 feet) is less than the average leave tree spacing (average 21-25 feet, ± 25 percent). Skid trails would be visible on the ground and take one to two decades longer to grow ground cover and understory than the adjacent area that is not compacted by skid trails.

Observed Characteristics and Trends in the Long Term

In the next 20 years, growth on the retained trees should continue at a steady rate, which would be greater than the growth rate if the area remained unthinned. The crowns would expand and fill the spaces created by the thinning and the site should be fully occupied so that the growth rate begins to slow by the end of the second decade after thinning.

The understory vegetation in the thinned area should be well established and vigorous by five years after harvest, but start to become less vigorous after about 15 years as the conifer crowns expand resulting in less light reaching the forest floor.

Indirect Effects

When an overstocked forest stand is thinned and fewer trees compete for site resources (light, nutrients and water), the retained trees respond in predictable ways:

- Within one to two years diameter growth rate increases noticeably, as can be seen in the width of annual rings. This faster growth rate is maintained for several years (5-20 or more years depending on how widely spaced the trees) until the crowns close again and start shading out the lower limbs in a process called "self-pruning". Even when growth slows, growth is usually still faster than it would have been without thinning because the crowns are wider and deeper (more needles for photosynthesis) than in an overstocked stand. This develops larger diameter trees faster than they would develop in an overstocked stand.
- Branches grow larger and longer as they grow into open space instead of competing directly for space with branches from neighboring trees. Since these branches still have enough light to continue growth, they do not die and "self-prune". Larger diameter branches are one of the characteristics associated with late-successional Douglas-fir forests.
- When branches live longer before self-pruning, the crowns are "deeper" they comprise a larger percentage of the total height of the tree. This also contributes to increased photosynthetic surface area. Deeper crowns are another characteristic of late-successional Douglas-fir forests.

Thinning the Douglas-fir component, while retaining and releasing locally underrepresented conifer species and hardwoods, would move the composition of these managed Douglas-fir stands toward a more natural species mix. Thinning opens the canopy so more light reaches the interior of the forest stand and stimulates growth in the understories to contribute toward meeting the management objective for multi-layered stands.

Riparian Reserve stands tend to be located on stream canyon bottoms rather than on exposed upland ridges so they tend to be more sheltered from high winds than Matrix stands on exposed ridges, in general. The BLM expects, based on experience with similar projects, even less windthrow in Riparian Reserves than in Matrix stands.

Trees damaged from breakage during felling, log movement, and logging equipment would add to habitat for cavity excavating/nesting wildlife species through the natural decay process, and eventually become snags or woody debris.

Long Term Management Objectives

Riparian objectives include recruiting large snags and coarse woody debris. The trees retained when thinning would continue to grow and develop large diameters over time, allowing for the recruitment of these characteristics in the future as needed.

Large diameter dead wood is considered more valuable than smaller diameter dead wood because it lasts longer, does not change moisture content as quickly or as drastically as smaller dead wood, and is used by more species than smaller diameter dead wood; large live trees are necessary to be source material for large dead wood. Disease, lightning and windthrow will create some snags and CWD over time.

Leave trees would generally be healthy for the next several decades, with some natural mortality and windthrow. If there is not enough natural mortality and windthrow to meet snag and CWD objectives, it may be necessary to create more snags from larger healthy trees or fall some of them to create CWD. If management intervention is needed to create snags, large green trees would be available as source material sooner in a thinned stand than in an overstocked stand.

Spatial and Horizontal Complexity

Immediately after thinning, the Evans Mountain Thinning project area would have a higher degree of complexity on a landscape level. Spacing variability within thinned stands and between thinned and unthinned stands would create structural diversity. The untreated areas include stands of almost pure hardwoods and brush, mixed conifers and hardwoods, and high-density conifer stands. As each of these stands continue to mature and be influenced by natural forces over the next 20 years and beyond, the different niche habitats provided by each stand type should continue to develop increasing complexity and diversity.

Both Land Use Allocations

Threatened, Endangered, Special Status and Survey and Manage Plant Species

Since no T&E, SSS or S&M species were found within proposed project area boundaries, no direct or indirect impacts would be expected. Suitable habitat would remain in both the thinned area and reserves. Therefore, the project would neither adversely impact suitable habitat nor any undiscovered SSS or S&M species, nor contribute to the need to list any species as T&E.

Invasive/Non-native Plant Species

A slight increase in the number of individual invasive/non-native plants is likely to occur where they are currently present in and near the project area because of project activities. Consistent with the RMP EIS (p. 4-25) the use of equipment and road access would create opportunities for the spread of noxious weeds. However, considering the widespread and ubiquitous nature of the invasive species identified in the proposed project area, any increase that might occur would be difficult to quantify, but would not contribute immediately or cumulatively to the impact these species have in western Oregon or in the Evans Mountain Thinning project area for the following reasons:

Based on observations of the location and abundance of invasive species made during field surveys, invasive species are not strong competitors with native species. In the professional opinion of the BLM botanist, these invasive species will continue to be present along roads, but they are not expected to become strong competitors with native species. Project design features including washing of earth moving and logging equipment before entering BLM land, visual inspection of that equipment by BLM personnel, and monitoring invasive species after logging, have been proven over the last decade to reduce the risk of spreading invasive species to a very low level.

Seeding native species on exposed soil associated with roads has been demonstrated on BLM land for more than a decade to consistently abate the establishment of invasive/non-native species. Similarly, native species have historically established themselves on disturbed soil in the forest interior, abating establishment of invasive/non-native species in these locations.

Cumulative Effects

No adverse cumulative effects are expected with regard to stand structure and development because the proposed thinning would maintain a forested setting in the same age class as before thinning. Positive cumulative effects at a landscape level include increased habitat diversity as treated stands develop differently from untreated stands and from recent plantations on private land.

No adverse cumulative effects to Threatened, Endangered (T/E) and Special Status Species (SSS) are expected because no suitable habitat to support T/E species was identified within the proposed project boundaries and no SSS were found.

Suitable habitat for SSS will remain in the proposed thinning area because thinning would not remove such habitat, and suitable habitat for SSS will remain undisturbed adjacent to the proposed thinning areas.

The proposed project will not contribute to the need to list any SSS as Threatened or Endangered. Positive cumulative effects for these species would be expected as a wider variety of habitat types develop as described above.

In addition, no cumulative effects are expected with regard to invasive/non-native plants because the project would not contribute to the spread of invasive species populations or to the introduction of new species. When similar projects have been implemented on BLM lands in the vicinity, there has been little or no difference in the composition or numbers of invasive/non-native species populations.

Timber harvest activities have occurred and will continue to occur within the watershed and the project area itself over time. Private lands are harvested in compliance with rules and procedures administered by the Oregon Department of Forestry. The status of the overall watershed is detailed and assessed in the Little North Fork Santiam watershed analysis (BLM) including harvesting timber and other land management activities for the area.

No Action Alternative

Stand Structure and Development (all land use allocations)

The forest stands would continue to grow, but at a reduced rate compared to the proposed action. In the Matrix/GFMA LUA, at rotation age there would be smaller diameter trees to harvest and total net yield could be reduced below the potential for the site.

Especially important to the Riparian Reserves, crowns would continue to close together resulting in more suppression mortality (smaller trees would be shaded and die). Because the smaller trees in the stands are generally the ones that die from suppression mortality, the snags and down wood created would generally be smaller than average stand diameter and would generally not meet desired criteria for large snags (>15 inches diameter and >15 feet tall) or RMP standards for CWD (>20 inches diameter and >20 feet long).

Within the Riparian Reserve LUA especially, there would be slower development of the 15+ inch DBH trees desirable for future snags and 20+ inch diameter trees desirable for future coarse woody debris recruitment. Fewer of them would reach these sizes within the next 20 years. Crown closure would further reduce the amount of light reaching the forest floor so understory vegetation would be reduced in quantity, size and diversity compared to current levels. Shading and self-pruning of the

lower limbs would result in more clean bole (no live limbs), reduced crown ratios (height of the live crown relative to total tree height) and less potential for large diameter limbs to develop.

Threatened/Endangered/Special Status/Special Attention/ Survey & Manage Plant Species

With no human caused changes and excluding natural disturbances to the habitat that currently exists at the proposed project sites, no impact to any known or undiscovered Threatened, Endangered, Special Status, or Survey and Manage botanical species would be expected to occur.

However, as the habitat in the proposed project area naturally changes over time, species composition for the different botanical groups would constantly change (some species would increase and others decrease) during different stages of succession as suitable environmental conditions and substrates become available.

Invasive / Non-native Plant Species (including Noxious Weeds)

Without new disturbance, existing populations of invasive/non-native plants would likely decline due to competition with native species. Invasive/non-native species would likely maintain a small population along roads and in natural openings. Population size may increase in areas where natural disturbances occur. Management activities on land not managed by the BLM and public access into the area may result in introducing additional species, or increasing populations of species that are currently in the area. Natural events that disturb soil may result in new or expanded populations of weeds that would then decline because of competition with native species.

3.1.2 Hydrology

Sources Incorporated by Reference: *Hydrology/Channels/Water Quality: Specialist Report for the Proposed Evans Mountain Thinning Project, (Hawe, 2011) (Hydro Report), WEPP (Water Erosion Prediction Project) Report for Evans Mountain Thinning (Hawe, 2010).*

Methodology: The Water Erosion Prediction Project (WEPP) soil erosion model was used to predict potential changes in erosion and sediment yield from actions proposed in this EA. Documentation of the WEPP model is available at the following web site: http://fsweb.moscow.rmrs.fs.fed.us/fswepp (Hydrology Report pp. 25-27). The BLM Hydrologist used criteria provided in the BLM publication *Riparian Area Management. A User Guide to Assessing Proper Functional Condition and the Supporting Science for Lotic Areas* (USDI., 1998); and compared current conditions to similar channels in the Western Cascades to assess project area channel conditions.

Affected Environment

Project Area Precipitation and Basin Hydrology

The project area is located in the Oregon Western Cascades range at elevations between 2,200-3,300 feet, an elevation zone subject to rain-on-snow events (ROS) that have the potential to increase peak flows during winter or spring storms. The ROS zone varies with temperature during winter storms but is assumed to lie between 1,500 - 3,000 feet in elevation. The project area receives approximately 83-94 inches of rain annually and has a mean 2-year precipitation event of 4.0 inches in a 24-hour period.

The project lies in three separate 7th field sub-watersheds with approximately 4,927 acres (7.7 miles^2) in combined drainage area. All are tributary to the Little North Fork Santiam River fifth field and the fourth field North Fork Santiam River #17090005. The Little North Fork Santiam is utilized as a drinking water source for several municipalities (see "Municipal Water Providers and Water Source Assessments" p. 35). The Little North Fork Santiam is a Tier 1 key watershed Detailed discussion of compliance with the Aquatic Conservation Strategy can be found in Section 3.1.9.

Channel and Wetland Morphology (ACS Objective 3)

Project area stream channels

The project area is situated in the Western Cascades physical province and streams reflect the geologic origin of the area. Most of the terrain around the treatment units is composed of undifferentiated tuffaceous sedimentary rocks; tuffs; and basalt (Walker, 1991). Stream channels immediately adjacent to, or in some cases, within the proposed treatment units are first order headwater channels with intermittent flow that converge in 2nd to 3rd order perennial channels that flow to the Evans Creek main channel.

Stream channels in the project area were field reviewed by the area hydrologist in 2010 - 2011. The small headwater tributary channels formed in the deep soils of the benches and ridges in the project area; surface flow is intermittent, alternating between surface and subsurface. It's likely that ground water and intricate patterns of subsurface flow, as opposed to surface run-off, is the primary system of water delivery to these channels. Most are moderate gradient (4-10%) with small substrates reflecting the adjacent soils.

Utilizing the Montgomery-Buffington typology (Montgomery & Buffington, 1997), these channels classify as colluvial: "small, headwater streams at the tips of a channel network that flow over a colluvial valley fill and exhibit weak or ephemeral fluvial transport." Most have too low of a gradient to be subject to debris torrents or land sliding.

Some of the small tributaries in the project area are much steeper and potentially unstable due to channel incision into the resistant volcanic rocks. These channels are often steep A3/4a+ channel types (Rosgen classification): steep channels incised into resistant bedrock and subject to debris flows. They have steep side slopes that are prone to landsliding and, because it is difficult for conifer in these locations to establish, they tend to be dominated by deciduous species such as red alder and salmon berry. Due to the relatively frequent disturbance regime in these channels, the surrounding stands are often open (i.e., not fully stocked) and "brushy" with large quantities of downed wood.

The small headwater tributaries adjacent to the proposed treatment units eventually reach larger perennial channels that flow to the main Evans Creek channel. These larger 3rd order streams have entrenched into the relatively resistant bedrock forming constrained valleys with moderately steep adjacent slopes (average 50-60%). There is a low to moderate supply of gravel and cobble sized material actively transported in these Rosgen "B3" channels (Rosgen, 1996). Utilizing the Montgomery-Buffington typology (*Montgomery & Buffington, 1997*), these perennial streams would be classified as step-pool channels: "Step-pool morphology generally is associated with steep gradients, small width to depth ratios, and pronounced confinement by valley walls."

The BLM Hydrologist used criteria provided in the BLM publication Riparian Area Management. A User Guide to Assessing Proper Functional Condition and the Supporting Science for Lotic Areas (U.S.D.I., 1998) and compared current conditions to similar channels in the Western Cascades to assess project area channel conditions. Project area channel reaches observed on BLM are currently in proper functioning condition (PFC) due to adequate vegetation, landform, or large woody debris present to: dissipate stream energy, filter sediment, aid ground-water recharge, aid floodplain development, stabilize streambanks and maintain channel characteristics. A determination of "proper functioning condition" means that the channel elements and physical processes are in working order relative to an area's capability and potential. It does not mean that the channel is functioning at full biological potential or that nothing could be improved by human intervention (i.e., placing additional wood structure, repairing infrastructure, thinning adjacent forest, etc.).

Some of these channels are shaded by dense stands of second growth conifer, often dominated by hemlock. Wood and shade are in abundant supply, banks are stable and channel morphology is controlled by bedrock features with a cobble-boulder bed. These channel types are highly resilient and unlikely to be altered much by disturbance. Utilizing the same PFC criteria described and comparing conditions here to similar channels in the Western Cascades, all of the perennial channels on BLM viewed in the field by the area hydrologist are currently in "proper functioning condition." Nevertheless, these channel reaches could benefit from release of conifer to increase the recruitment of large wood debris.

Existing roads and Stream Channels

Where roads cross streams, channel morphology (the shape, size and slope of a channel) is generally altered in a predictable manner. Within the area occupied by the road prism (this volume varies with the length, width and depth of the road prism), vegetation and organic materials are removed, the channel surface, banks and bed are compacted (bulk density, or the weight by volume, of the soil is increased by as much as 30% relative to undisturbed soil), the original channel is buried by road fill, and the channel cross section is reduced to the dimensions of the culvert.

In most locations culvert dimensions (shape, area and slope) are adequate to allow for the transport of most or all of the water, sediment and organic materials from upstream; hence, the stream is said to be "at grade" and channel morphology upstream of the road fill is not affected. However, in other cases, the reduced area imposed by culverts and/or collapsed road beds have restricted the passage of water, sediment and organic materials from upstream resulting in the deposition of sediment above the crossing. The length of aggraded channel upstream of culverts varies with channel slope and the supply of material and water, but (based on professional judgment and observation) is generally restricted to less than 100 feet on the small streams in the project area.

Project area wetlands

There is one wetland in section 25 identified on National Wetlands Inventory maps. The BLM GIS Water Bodies theme (for smaller wetlands, ponds and lakes), and the BLM GIS Timber Production Capability Classification (TPCC) provides more detailed mapping of wet areas within the project area. These inventories are based primarily on review of aerial photographs with some field verification and thus small (<1 acre) areas with high water tables, ponds and/or wetlands may not have been identified, particularly when situated under forest canopy. During field review of the project area locations with high water tables, ponds and/or wetlands were identified and, where appropriate, either the TPCC,

hydrology, or lakes GIS themes were updated to reflect these features. All wetlands are excluded from treatment.

Project Area Hydrology (ACS Objective 6)

There is a U.S.G.S. gaging stations several miles downstream of the project area on the Little North Fork Santiam near Mehama just upstream of the confluence with the North Fork Santiam main channel. The North Fork Santiam is regulated at the Detroit reservoir while the Little North Fork Santiam is free-flowing. The streams directly draining the project area have not been gauged but stream-flow is assumed to be typical of smaller Western Cascades streams.

Base Flow

Base-flow or low-flow occurs during late summer and early fall when mean stream discharge drops below 20% of the mean winter flow. Many small headwater channels (referred to as "intermittent" in this analysis) dry up completely during this period.

Peak Flow

Peak flows occur following a rapid and substantial depletion of the snow-pack during prolonged rain-on-snow periods (ROS) in the transient snow zone (TSZ). The two largest peak flow events in recent history took place in December of 1964 and in February of 1996. Both events are estimated to be at or above a 100-year flood return interval and both were in response to substantial snow pack melt-off.

Potential for peak flow augmentation due to forest harvest: Current Condition

A preliminary analysis for the risk of increases in peak flow as a result of forest harvest was conducted using the Oregon Watershed Assessment Manual watershed analysis methods for forest hydrology (OWEB, 1997).

Table 11 displays statistics for the Elkhorn sixth field watershed used to determine the current risk of peak flow augmentation in the project area watersheds. The proportion of the Elkhorn sixth field watershed in the ROS zone is 10%. The risk of peak flow enhancement varies with the proportion of this area that has been recently harvested. The proportion of ROS area with current crown closure <35% is 10% indicating that there is currently a *low risk for peak-flow enhancement (OWEB 1997).*

Table 11. Risk of Peak Flow Enhancement by Sixth Field Watershed in Evans Mountain Thinning.

6th Field Sub-watershed Name	*Watershed Area (acres)*	*Percent of Watershed in ROS Areas*	*Percent of ROS area with <35% Current Crown Closure*	*Peak-Flow Enhancement Risk*
Little North Fork Santiam – Elkhorn Creek 6th	17,965	10% (1813 acres)	10% (194/1813 acres)	Low

Roads and Peak Flow/Water Quality

Road surfaces have also been identified as contributors to increased peak flows in the Western Cascades. Under the worst-case scenario, more than 50% of cut banks near stream channels may intercept groundwater and rout it through road ditches (Toman, 2004). In addition, when road ditches drain intercepted water directly to streams, they act as an "extension" of the stream network and can have a measurable effect on stream flow that may include an augmentation of peak flows on a watershed scale (Wemple et al, 2003).

The closer road surfaces are to streams, the greater the risk of altering stream flow, channel geometry and/or water quality. This relationship has not been quantified but is presumed to be highly variable across the landscape both in space and time. As a surrogate for risk, the increase in drainage density due to road/stream intersections was calculated for the three seventh field watersheds in the project area.

Drainage density increases in the project watersheds range from a low of 10% in Lower Evans East to 17% in Lower Evans West. The Wemple study implies that drainage density increases due to road stream intersections of approximately 20% or greater have the capacity to alter both the timing and quantity of peak flows. Based on this, the three watersheds in the project area are currently at low risk for augmentation of peak flows.

Roads in the project area were inspected by BLM engineers and hydrologist. Most road surfaces are well maintained and in good condition with little potential to contribute fine sediment to area streams. However, one exception was noted. The surface of road 8-4E-30 in Section 29 is in poor condition due to high gradient, interception of ground water in the road cut, and lack of maintenance. Currently the road drainage is directed to stable slopes by several well-spaced water bars. However, once this road has been graded to provide truck access, water bars would be removed and the ditch relief culverts would drain most surface flow, along with any sediment in transport, directly to the adjacent tributary which the road crosses at five locations. The potential for this road to be a source of fine sediment and turbidity during winter storms is high. However, PDFs restrict the use of the road to dry season use, preventing hauling generated sediment from entering creeks. Additional road stability actions are detailed in the EA Connected Action section (p. 45) for road 8-3E-24.

Project area ground water

The Oregon Water Resources Department (OWRD), together with the Oregon Department of Environmental Quality (DEQ), is responsible for the regulation and protection of ground water quality and quantity. The DEQ has not identified any groundwater pollution problems in Evans Creek.

Water Quality and Beneficial Uses (ACS Objectives 4, 5)

Oregon Department of Environmental Quality (ODEQ)

The ODEQ, under the Clean Water Act, has been delegated authority to protect the quality of all waters in the State of Oregon. Established water quality standards "not to be exceeded" for all waters of the state are published in the Oregon Administrative Rules, Chapter 340, Division 41 (Willamette Basis standards begin with 442).

Designated Beneficial Uses

The State of Oregon (http://www.deq.state.or.us/wq/standards/uses.htm) designated the beneficial uses for all waters of the state. Water quality standards are ultimately meant to protect these uses. Both resident and anadromous fish are within a mile downstream from the proposed units. Additional beneficial uses include: Industrial Water Supply, Wildlife & Hunting, Fishing, Boating, Anadromous Fish Passage, Water Contact Recreation, and Aesthetic Quality.

Municipal Water Providers and Source Water Assessments

Several municipal water providers withdraw water from the Lower North Santiam River to treat and provide city residents with drinking water. The City of Salem Public Works (PWS# 4100731), Mill City Water Department (PWS #4100520), City of Gates (PWS# 4100317), the Lyons Mehama Water District (PWS #4100493) and Stayton Water Supply (PWS# 4100843) have withdrawals downstream of the project area. A *Source Water Assessment* for each provider is available on-line at: http://www.deq.state.or.us/wq/dwp/swrpts.asp. The source water assessment identifies potential sources of contamination within the watershed; forestry related activities (road building, clear-cut harvest, etc.) were listed as a potential source of concern. In addition to withdrawals for municipal water consumption, there are withdrawals downstream of the project area for domestic use, irrigation and livestock watering.

Water Quality Limited Streams

The ODEQ's 2006 303d List (http://www.deq.state.or.us/wq/WQLData) of Water Quality Limited Streams is a compilation of streams which do not meet the state's water quality standards. The North Santiam and LNFS were listed for exceeding summer stream temperature. In response, the ODEQ completed the Willamette Basin Total Maximum Daily Load assessment (DEQ 2005). Essentially, the TMDL requires the recovery or maintenance of full shade potential along perennial streams in the Willamette basin. As part of the TMDL, the BLM submitted the Salem and Eugene District Water Quality Restoration Plan (WQRP) for the Willamette Basin which details how the BLM will implement the TMDL on federal lands. The plan was approved by the DEQ on July 18, 2008

According to the TMDL, effective shade is a surrogate measure for the heat load a stream receives when exposed to direct sunlight and thus, maintaining or recovering site potential levels of effective shade should result in reductions in stream temperatures to levels that achieve state standards. In the project area, the site potential for effective stream shade is estimated by use of shade curves within the "near stream disturbance zone" up to 85 feet.

Percent shade along all tributary channels in the project area was determined to be 85-100% (i.e., full effective shade). Based on the shade results together with field verification surveys conducted in 2011, the area hydrologist concluded that effective shade is near to full potential along all of the perennial streams on public lands in the project area with effective shade averaging 95%. These data support the conclusion that the existing riparian vegetation is sufficient to maintain streams in the temperature range required by the ODEQ under the Clean Water Act.

Turbidity and Sediment

During the 1996 flood, high levels of persistent turbidity in the North Santiam became an issue for the City of Salem water supply (diverted from the North Santiam near Stayton, Or.). Investigations revealed that smectite clays associated with naturally occurring, deep seated rotation earth flows are the likely source for fine sediments which result in elevated turbidities on the North Santiam (Bragg 2007). According to the document, turbidity from the Little North Fork Santiam impacts the Salem water intake initially during high flows but is not persistent.

A follow-up study of turbidity is ongoing: The North Santiam River Basin Turbidity and Suspended-Sediment Study led by the U.S. Geologic Survey (USGS) in cooperation with the City of Salem and the U.S. Forest Service (Bragg 2007). As part of this study the USGS has installed continuous turbidity measuring equipment at several sites in the North Santiam including Evans Creek. Furthermore, follow-up field investigations have pointed to a landslide in the Evans Creek watershed, near the community of Elkhorn, as a major source of turbidity to the Little North Fork Santiam River. The landslide on Evans Creek covers more than 20 acres on the western slope of Evans Mountain (in Section 19, BLM ownership) and displays all the characteristics of a large, natural, complex landslide such as multiple scarps, debris flow channels, and transverse cracks. The failure of Evans Mountain Road at the top of the landslide occurred during the flood of 1996, with additional movement in 1997 and continuing currently. Because the landslide intersects the creek, material is constantly being eroded whenever higher flows occur. Turbidity values in the main Evans Creek channel downstream from the slide exceed several hundred NTUs during large storm events. In 2009 BLM initiated a landslide stabilization project (Evans Creek Landslide Stabilization Project) to promote stability and a reduction in turbidity. Effectiveness monitoring of the project is on-going.

Environmental Effects

Proposed Action

Channel and Wetland Morphology (ACS Objective 3)

Direct and Indirect Effects - Channel and Wetland Morphology

Temporary road construction would not cross stream channels or wetlands; therefore, there would be no direct alteration of the physical features of project area stream channels or wetlands. Further, riparian no entry buffers adjacent to stream banks, channel beds and wetlands would protect the streams from direct physical alteration or disturbance by harvesting equipment.

Temporary road construction would not cross stream channels or wetlands, however, work at three stream crossings is proposed. These stream crossings have failing fills with undersized culverts. Replacement of these culverts would provide improved stream flow and passage of sediment, organic materials and aquatic organisms and would eliminate the chronic erosion and turbidity at these sites. Some slight channel adjustment to grade or width may occur within the first year (varies with the timing and magnitude of storm events) following disturbance as the channel reaches equilibrium with flow and sediment transport. Based on previous experience with these type of channel crossings (i.e., judgment of the field hydrologist) long term effects to channel function or morphology from disturbance at these sites would be unlikely because the channels are resilient (i.e., they resist change) and would adjust to accommodate the disturbance without creating bed or bank instability. Channel

morphology adjustments would be unlikely to extend more than 100 feet upstream or downstream from the site of disturbance. In the long-term, these crossings would produce less sediment due to improved drainage and conveyance capacity.

With the exception of the normal cycle of road renovation and maintenance, disturbances are kept a minimum of 85 feet from perennial stream channels and 50 feet from intermittent channels. In addition, the proposal would not affect stream flow in a detectable manner (see the following discussion under watershed hydrology) and therefore any *indirect effects* to stream channels as a result of flow alteration or timing would not occur. As a result, the proposed action would not produce any detectable effects to channel morphology, such as increases in bank erosion, channel incision, loss of floodplain connectivity or alteration of local wetland hydrology that could result from augmented peak flows or altered watershed hydrology.

Project Area Hydrology (ACS Objective 6)

Direct and Indirect Effects – Watershed Hydrology

Water Yield, Base Flow, Fog-Drip, and Peak Flow

Implementation of the Proposed Action would likely result in some incremental increase in annual water yield correlated to the partial removal of the conifer over-story; however, "the increase in fall and winter discharge from forest activities is likely to have little biological or physical significance" (US EPA. 1991). The Proposed Action would not have a detectable effect on fog drip or a detectable effect on the base flow in project area streams because no studies have documented reductions in fog drip where less than 20 percent of the forest canopy is in an open condition, as in this case.

All of the proposed treatments lay in the zone generally subject to transient snow accumulations (TSZ) in the winter. It can be assumed that the reduction in stand density could result in some increase in snow accumulation on the ground in these areas because there would be less canopy interception and sublimation. However, this proposal would not increase openings (areas <35% canopy closure) within the TSZ in the Little North Fork Santiam–Elkhorn Creek 6th field watershed. The increase in snow accumulation and melt-off during ROS events would remain below a level likely to result in measureable increases in peak flows according to the State of Oregon risk assessment methodology.

Currently, the risk of hydrologic change resulting from the road system is low. This proposal would not increase permanent road mileage in the Little North Santiam watershed; the actions would maintain the current hydrology and stream flow. Additionally, existing roads were inventoried by area specialists and their recommendations for improvement and repair of road surfaces would be implemented under the Proposed Action. These road improvement actions would route intercepted rainfall to vegetated soil surfaces where it can re-infiltrate before reaching streams. The road actions would reduce both water and sediment routing, improving existing road conditions.

Proposed temporary road construction is located on slopes generally under 30 percent, and would not require extensive full bench or cut and fill construction. Roads constructed on these surfaces result in little or no sub-surface disturbance. Following construction and after project completion these roads would be decommissioned, restoring hydrologic patterns and processes. Similarly, these roads would

have no effect on sub-surface or groundwater flow and thus have no effect on the timing or volume of stream flow in the watershed (Wemple et al, 2003).

Since no additional permanent stream crossings are proposed, there would be no additional routes for water intercepted by road surfaces to reach streams. Intercepted rainfall on these roads would be drained to the adjacent undisturbed forest floor where, because of the high permeability of forest soils, it quickly infiltrates into the ground. Under these circumstances, road construction has a low risk of altering watershed hydrology or peak flows because intercepted flows would not be routed to stream channels.

Ground Water

The Proposed Action would not affect the flow, quantity or quality of watershed groundwater because the action is unlikely to alter in a measurable manner patterns of surface flow and runoff, so there is little capacity to affect groundwater patterns which are intimately linked to the surface. The proposed project would have no potential effect on ground water quality because no BLM action on this project would affect nitrate, pesticide, volatile organic compounds or bacteria levels analyzed by DEQ. The proposed project would not affect the infiltration capability of the project area.

Water Quality (ACS Objective 4)

Direct and Indirect Effects - Water Quality

Summer Stream Temperature Maximums in Perennial Streams

Summer temperature maximums in perennial streams adjacent to the proposed thinning areas would not increase because vegetation providing shade would not be cut or removed in the primary shade zone. The average canopy closure in the secondary shade zone that contributes to effective shade would be maintained above 50 percent which would not allow enough light to strike the water surface to increase the heat load. These measures are described in the Northwest Forest Plan Temperature TMDL Implementation Strategies (USFS and BLM, 2005). By implementing them, the proposal would maintain stream temperatures in their current range, and protect current beneficial uses.

Dissolved Oxygen, pH and Conductivity

The Proposed Action would have no measurable effect on dissolved oxygen (DO) levels in project area streams because the project would not measurably change the factors that contribute to reduced DO. The Proposed Action would not place large amounts of fine organic material in the stream, would not alter re-aeration, and would not result in any measurable increase in stream temperature or sedimentation. Available data indicates that most forest management activities have little effect on pH or conductivity (US EPA, 1991).

Turbidity

In most cases, management practices with the potential to accelerate erosion fall into three categories: road construction/maintenance and hauling, timber harvest or "yarding," and site preparation for reforestation (particularly prescribed burning).

All proposed treatment units are outside of any areas that are identified as unstable or prone to mass wasting in the TPCC and/or identified in the field. Areas with potential for slope instability mass wasting as identified and verified by BLM personnel during work for the project proposal. Tree removal is not proposed on steep, unstable slopes where the potential for mass wasting is high as defined by the TPCC. Continuous forest cover and its root structure would be maintained. Therefore, increases in sediment delivery to streams due to mass wasting induced by loss of root strength and increases in soil pore pressure would not occur.

Due to the high infiltration capacity of native soils, heavy vegetative growth, and the deep soil-duff layer the Proposed Action is unlikely to increase surface erosion. The Proposed Action would not lead to a measurable long-term alteration in sediment delivered to streams, stream turbidity, stream substrate composition, or sediment transport regime because BMPs and mitigation measures would eliminate and/or limit acceleration of sediment delivery to streams in the project area.

Based on research (Foltz and Yanosek, 2005) conducted at culvert replacement projects in forested watersheds, turbidity levels at the sites of disturbance would be unlikely to exceed the State of Oregon WQ standards (>10% increase relative to background levels) beyond the mixing zone downstream (about 100 meters) and would decrease as disturbed surfaces (and the channel bed) become "armored" (i.e., fines are removed). A turbidity plume downstream from the disturbance may be visible during the installation of culverts and would likely decrease by an order of magnitude within two hours after work ceases. Culvert replacements would probably be completed during one workday so any increase in turbidity would be unlikely to exceed eight hours.

To further reduce potential increases in turbidity, BLM staff would visually monitor turbidity as required by the State of Oregon during in-channel work at these sites. If Oregon State Standards were exceeded at anytime, BLM would stop all in-stream activities and require the contractor to take appropriate steps to reduce turbidity to acceptable levels.

Any increased turbidity would be unlikely to be visible or detectable beyond 800 meters below the site of the disturbance (see Foltz and Yanosek, 2005), and would not likely exceed the standards set by the State of Oregon. Because the projects are greater than 800 meters (approximately 0.5 mile) upstream of the main North Santiam and Little North Fork Santiam channels, it is highly unlikely increased turbidity would reach these rivers. Therefore, water quality standards would be maintained and beneficial uses protected on streams adjacent to treated forest.

Sediment Regime (ACS Objectives 5)

Tree harvest, including ground based logging, would not increase sediment supply to streams because of factors discussed previously, including: forest cover would be retained with at least 40 percent canopy closure; water would normally infiltrate rather than runoff and erode soil; untreated SPZ would further filter any runoff or subsurface flow during high rainfall events; and design features would prevent concentrating runoff from roads and areas compacted by logging operations.

Skyline yarding, similarly, would not increase sediment supply to streams because of the above factors. Additionally, the Water Erosion Prediction Project (WEPP) modeling demonstrated that thinning and skyline yarding done with the proposed project design features would result in surface erosion sediment yields that would not be detectable relative to background sediment transport in the main channels of the project area watersheds.

Research in the Pacific Northwest has demonstrated over time that WEPP over-estimates sediment yields (Geren, 2006). Consistent with these findings, the Cascades Resource Area Hydrologist has conducted field reviews of skyline logging on similar sites in the Cascades Resource during multi-day rain storms and found no evidence of overland flow or sediment transport where WEPP had predicted sediment transport under similar conditions (Hydro Report pp. 25-26; Hawe, 2011).

This proposal would not increase bank erosion or channel cutting by altering channel roughness, redirecting flows or altering bank-stabilizing vegetation. Project design features, including the SPZ around all streams, would eliminate disturbance to stream-side vegetation, protecting stream banks, wetlands and channel beds from direct physical alteration that may increase erosion.

Pile burning would not have any effect water quality, stream channels or watershed hydrology and any effects to soils and hydrology would be short term and limited to the immediate site. Piles to be burned would be located on level ground outside of riparian areas so there is no delivery mechanism by which ash or soil from the pile locations could reach stream channels. Other fuel treatment methods (e.g. lop and scatter,) would not create ash or erosion.

Cumulative Effects

Channel and Wetland Morphology/Physical Integrity (ACS Objective 3)

With the exception of disturbance to the channel at the culvert replacement sites, this proposal would not result in any direct effects to channel or wetland morphology and therefore would have no cumulative effect. At the locations of culvert replacements, adjustments would be limited to the site of disturbance (i.e., not extend more than 100 feet downstream or upstream from the disturbance) and unlikely to result in any alterations to channels or floodplains downstream or elsewhere in the watershed. Channel adjustments, if they occur at all, would be of relatively low magnitude and short duration (one year). Channels in the project are currently properly functioning dimensions and form (see discussion in Affected Environment). This project would maintain the properly functioning condition.

Water Quality (ACS Objective 4)

The proposed actions would not have any measurable direct or indirect effect on stream temperatures, pH, or dissolved oxygen. Current conditions and trends in water quality would be maintained under the Proposed Action. Therefore, the proposal has little potential for contributing to any cumulative effects to these water quality attributes in these watersheds.

Short term (during the action and the first winter following) increases in stream turbidity as a result of road repair and hauling may contribute to increased turbidity levels directly below road/stream intersections (i.e., direct effect). Turbidity levels would be maintained below the limits required by the Oregon State DEQ. Cumulatively the limited magnitude (not visible more than 800 meters downstream of the crossing) and duration (primarily in the first winter following road repairs) of this effect would be non-detectable on the scale of the seventh field watershed and would not contribute cumulatively to turbidity levels in the watershed.

Sediment Regime (ACS Objectives 5)

Field reviews (Hawe, 2012) of past cable logged units on BLM land during intense rainstorm events from 2007-2012 found no evidence of overland flow or sediment transport on cable yarding corridors where WEPP had predicted sediment transport under similar conditions. This included a cable yarded unit on 50-70% slopes that received a nearly 100 year 24-hour precipitation intensity event on January 19, 2012 (5-6 inches in 24 hours).

Due to the high infiltration capacity of native soils, heavy vegetative growth, and deep soil-duff layer, the Proposed Action is unlikely to increase surface erosion. In addition BMPs listed as project design features would eliminate and/or limit delivery of sediment delivery to streams in the project area. Therefore, the Proposed Action would not lead to a measurable short- or long term alteration in sediment delivered to streams, stream turbidity, stream substrate composition, or sediment transport.

Watershed Hydrology (ACS Objective 6)

Since the analysis found no measurable direct or indirect effects to peak flow due to the proposed action it would not contribute to any potential cumulative effects to peak flows in the Little NF Santiam. The current conditions of the watersheds in the project area indicate a low risk for augmentation of peak flows due to forest openings. Implementing the proposed actions would maintain this low risk.

This proposal would result in no net increase in forest openings in ROS areas with crown closure <35% and would be unlikely to contribute cumulatively to the augmentation of peak flows even if they were occurring in these watersheds as a result of past forest harvest. Proposed road use and temporary construction is unlikely to alter surface or subsurface hydrology or to contribute cumulatively to any change from current conditions in the watershed. As there would be no measurable direct or indirect effect to the watershed's ground water, the Proposed Action carries no risk for effects to groundwater.

Connected Actions

Road Closure/Treatments (Road 8-3E-24.1)

The proposal would improve hydrologic processes along 0.5 miles of the road surface and adjacent slopes by reducing compacted surface area, removing/stabilizing failing road fill and routing surface flow to stable surfaces or original channels. Sediment delivery off the road surfaces into headwater streams would be reduced. Native riparian vegetation would be promoted which would further stabilize surfaces and reduce erosion.

Although soil surfaces and adjacent vegetation would be disturbed, runoff and sedimentation would be reduced over the long term by rehabilitation of soil structure and surface drainage.
Over the short term (< 1 year) some additional turbidity may result at sites which intersect stream channels and running water. Turbidity is not likely to be visible more than 800 meters downstream from the road restoration activity.

No Action Alternative

The No Action alternative would result in the continuation of current conditions and trends at this site as described in the Affected Environment. Specifically, peak flow enhancement would remain at low risk, turbidity levels would remain in the current range, as would water quality and channel morphology. Road sections with surface erosion or that are routing water and sediment to streams would continue.

3.1.3 Fisheries and Aquatic Habitat

Sources Incorporated by Reference: *Evans Mountain Thinning Fisheries Specialist Report, Zoellick, 2010) (Fisheries Report), Hydrology/Channels/Water Quality: Specialist Report for the Proposed Evans Mountain Thinning Project, (Hawe, 2010) (Hydro Report), Additional Sources Referenced: Logging Systems Report*

Methodology: BLM Fisheries Biologists conducted surveys of project area streams during the 2010 field season.

Affected Environment

Fish and Aquatic Habitat

Coastal cutthroat trout (*Oncorhynchus clarki clarki*; Behnke 1992) are uncommon in the project area, as most project streams are 1st and 2nd order headwater tributaries. These streams are generally too steep to support fish populations, and many have near vertical drops over bedrock ledges (BLM fish inventories 2010). Cutthroat trout are known to inhabit several larger tributary streams adjacent to units 19, 24, 29 and 30, including lower Evans Creek downstream of several large waterfalls, and an unnamed tributary to the Little North Fork Santiam River. Cutthroat trout are common in the Little North Fork Santiam River. Other resident fish known to inhabit the Little North Fork Santiam River include longnose dace (*Rhinichthys cataractae*), resident rainbow trout (*O. mykiss*), and mountain whitefish (*Prosopium williamsoni*; USBLM 1997).

Threatened and Endangered Species

Upper Willamette River (UWR) winter run steelhead trout (*O. mykiss*), and UWR spring Chinook salmon (*O. tshawytscha*) are listed as "threatened" under the Endangered Species Act of 1973 (ESA). Salmon and steelhead populations in the Upper Willamette River evolutionary significant unit (ESU) are substantially reproductively isolated from other populations and are an important component in the evolutionary legacy of those species (NOAA 2005). The Little North Fork Santiam River and the lower 0.5 mile of Evans Creek provide habitat for steelhead, and are in the Santiam River subbasin of the Upper Willamette River ESU. A large waterfall on Evans Creek prevents steelhead from accessing more than the lower 0.5 mile of the stream. The Oregon Department of Fish and Wildlife manages North Fork Santiam River as a wild steelhead fishery, and is a key area for winter steelhead spawning and rearing (USBLM 1997). Chinook salmon also inhabit the Little North Fork Santiam River in the vicinity of the project area.

Spring Chinook salmon and winter steelhead trout are distributed in the Little North Fork Santiam River from the confluence with the North Fork Santiam River past the eastern boundary of Unit 29 (Streamnet 2006), upstream to a barrier falls near the Stack Creek confluence. Timber thinning units are generally located 1 to 3 miles upstream of listed fish habitat (Table 12). An exception is unit 29C, which is located 0.7 mile upstream of winter steelhead habitat in lower Evans Creek (Table 12).

Table 12. Distances (in miles) from proposed project units downstream to resident cutthroat trout and ESA listed fish habitat[a]

Unit Number	Stream	Distance to Cutthroat trout habitat	ESA Listed Fish Species	
			Distance to Steelhead trout habitat	Distance to Chinook salmon habitat
24A	Evans Creek	1.9	1.9	2.4
24B	Unnamed tributary to Little North Fork Santiam R	0.2	1.6	1.6
25	Unnamed tributary to Little NF Santiam R	0.1	1.5	1.5
19	Evans Creek	1.4	1.4	1.9
29	Evans Creek tributary	0.7	0.7	1.2
	Unnamed tributary to Little NF Santiam R	1.0	1.0	1.0
30	Evans Creek	1.2	1.2	1.7
	Unnamed tributary to Little NF Santiam R	0.2	1.5	1.5

[a] Upstream limits of anadromous fish distribution were obtained from Streamnet (2006) or Oregon Department of Fish and Wildlife (ODFW) data, if ODFW data indicated fish were distributed further upstream than delineated by Streamnet.

Aquatic Habitats

Stream channels in the project area are stable (generally gravel or cobble dominated; BLM Fish Inventories 2010, USBLM 1997), well-shaded (>90% effective shading; Hydrology Specialist Report 2010), and streambanks are stable (>90% of banks vegetated with riparian and streamside vegetation; BLM Fish Inventories 2010). The Little North Fork Santiam River adjacent to the project area flows through a moderately confined valley (gradients of 2-4%; Rosgen C-channel type; Rosgen 1994) with local areas of wider floodplains and riffle-pool channels (Rosgen C-channel type; Rosgen 1994). Tributary streams to the Little North Fork Santiam River, including Evans Creek, drop steeply to the river with gradients of 5 to 20%. Evans Creek has at least 3 barrier falls to fish movement in the project area.

In-stream habitats of the Little North Fork Santiam River are rated in fair to good condition (USBLM 1997). Pool frequency and area is generally good, but large woody debris (LW) levels are low.

Environmental Effects

Proposed Action

Unit 24

Stream Channels, Stream Shading, and Temperature

Unit 24A is located >600 feet from Evans Creek and about 200 feet from the headwaters of the nearest intermittent tributary. Unit 24B is bordered on the northeast by a 1st order drainage with intermittent

flows, and by a small perennial 2nd order tributary to the West. SPZs on the perennial stream would minimally be 85 feet wide, and most of the SPZ would be 100 to 200 feet wide. These SPZs are wide enough to prevent sediment from moving from thinning units to stream channels and also prevent increases in stream temperature (Groom et al. 2011, BLM Temperature Sufficiency Analysis). SPZs widths of 50 feet on the intermittent channel are adequate to intercept and infiltrate water carrying sediment preventing its delivery to streams and aquatic habitats (Olson and Rugger 2007, Rashin et al. 2006, CH2MHILL et al. 1999). Summer stream temperatures would not be affected by thinning adjacent to this intermittent channel as it does not have surface flow during the summer. Unit 24B would be thinned using ground-based equipment, and about one-half of unit 24A would be logged using a cable logging system. One-end of the logs would be suspended above ground when cable-yarded. Thus, little ground would be disturbed and sediment would not move >600 feet to Evans Creek.

Large Wood (LW)
Stream flows in 1st and 2nd order tributary streams are too small to move large wood to the Little North Fork Santiam River. SPZs are wide enough that large wood supplies on perennial tributary streams would be unaffected by tree thinning.

Sediment and Roads
Two spur toads would be constructed to thin units in section 24 totaling about 0.7 mile of road. Temporary roads would not cross any drainages, would be located on gentle to moderate slopes, and are all located >200 feet from stream channels. Road surfaces of temporary and renovated roads would be constructed to drain surface water to adjacent gentle slopes where it would infiltrate into the soil and groundwater. Thus, sediment produced by the roads would not reach stream channels and would not impact aquatic habitats or fish populations.

Unit 29

Stream Channels, Stream Shading, and Temperature
Stream Protection Zones (SPZs) on two 1st and 2nd order tributaries to Evans Creek in Unit 29A would be about 85 to 125 feet in width. These streams have intermittent to perennial flows, and stream buffers would be wider than the minimum applied under the BLM's temperature sufficiency analysis because tree densities are generally low within 125 feet of these channels (ie. RR adjacent to the channels do not need thinning). The Evans Creek tributary in Unit 29C, which is located 0.7 mile upstream of steelhead trout habitat in Evans Creek, would have 200 foot wide SPZ's. Logs would not be yarded through RR, and one-end of the logs would be suspended above ground when skyline-yarded. Landings would be on existing roads and 220 feet from channels. These SPZs are wide enough to prevent sediment from moving from thinning units to stream channels and also prevent increases in stream temperature (Groom et al. 2011, BLM Temperature Sufficiency Analysis). About one-half of Unit 29A has slopes <35% and would be thinned using ground based equipment. SPZs widths of 50 feet on two intermittent channels in Unit 29A are adequate to intercept and infiltrate water carrying sediment preventing its delivery to streams and aquatic habitats (Olson and Rugger 2007, Rashin et al. 2006, CH2MHILL et al. 1999). Summer stream temperatures would not be affected by thinning as these channels are dry in the summer.

Large Wood (LW)

Stream flows in 1st and 2nd order tributary streams are too small to move large wood to Evans Creek. SPZs are wide enough that large wood supplies on the perennial tributary streams would be unaffected by the proposed tree thinning.

Sediment and Roads
One spur road about 0.1 mile long would be constructed to thin Unit 29A. The road would not cross any drainages, would be located on gentle to moderate slopes, and is located >200 feet from streams. Road surfaces of temporary and renovated roads would be constructed to drain surface water to adjacent gentle slopes where it would infiltrate into the soil and groundwater. Thus, sediment produced by the roads would not reach stream channels and would not impact aquatic habitats or fish populations.

Unit 30

Stream Channels, Stream Shading, and Temperature
Stream Protection Zones (SPZs) on perennial 1st and 2nd order tributaries located on the southern boundary of Unit 30A would be minimally 85 feet wide. These SPZs are wide enough to prevent sediment from moving from thinning units to stream channels and also prevent increases in stream temperature (Groom et al. 2011, BLM Temperature Sufficiency Analysis). Most of the unit has slopes <35% and would be logged with ground-based equipment. When cable logging, logs would not be yarded through RR, and one-end of the logs would be suspended above ground when yarded. Landings would be on existing roads and generally >200 feet from channels. Thus, little ground would be disturbed and SPZs would be adequate to prevent sediment from moving to stream channels.

Large Wood (LW)
Stream flows in 1st and 2nd order tributary streams are too small to move large wood to the Little North Fork Santiam River. SPZs are wide enough that large wood supplies on the perennial tributary streams would be unaffected by tree thinning.

Sediment and Roads
Two temporary spur toads would be constructed to thin Unit 30A totaling about 0.2 mile of road. The temporary roads would not cross any drainages, would be located on gentle to moderate slopes, and are located >200 feet from stream channels. Road surfaces of new and renovated roads would be constructed to drain surface water to adjacent gentle slopes where it would infiltrate into the soil and groundwater. Thus, sediment produced by the roads would not reach stream channels and would not impact aquatic habitats or fish populations.

Threatened and Endangered Species

Proposed tree thinning (about 252 acres total) would not impact listed fish habitat due to minimum no-disturbance buffers (Stream Protection Zones [SPZs] of 85 to 125 ft on perennial streams, and 50 ft on intermittent 1st and 2nd order tributaries that are located 1 to 1.9 miles upstream of steelhead habitat. SPZ's would be ≥ 200 ft wide within 1 mile of steelhead habitat. These SPZs widths are adequate to intercept and infiltrate water carrying sediment preventing its delivery to streams and aquatic habitats (Olson and Rugger 2007, Rashin et al. 2006, CH2MHILL et al. 1999). No disturbance to primary shade zones (within 60 to 85 ft of channels), and retaining >50% canopy closure in the secondary shade zone, would result in no change in stream temperatures of perennial headwater tributaries (Groom et al. 2011, BLM temperature sufficiency analysis). Thinning in headwater tributaries would

not affect LW supplies in Evans Creek and Little North Santiam River as flows are too small to deliver LW to the rivers from the areas being thinned.

About 1 mile of new road would be constructed. Construction would not increase the size of the stream network (Wemple et al. 1996). Additionally, new road surfaces would be designed to drain surface water to adjacent gentle slopes where it would infiltrate into the soil and groundwater. Thus, little sediment would be produced by the new roads and will not reach stream channels and impact LFH.

Culvert replacement on three 1st order tributaries with intermittent flow and one perennial tributary would not deliver sediment/turbidity to LFH habitat in the Little North Santiam River and Evans Creek as these culverts are located 1.6 to 2.1 mile upstream of LFH. Sediment impacts from culvert installation would likely not extend >800 meters downstream of crossings (Foltz and Yanosek 2005).

Steelhead and salmon habitat in the Little North Santiam River and Evans Creek would not be impacted by log hauling from units in Section 29 since hauling is restricted to dry soil conditions. Thus, no sediment would move from the road surface to tributary channels at road crossings. The haul route from Units 24 and 30 (Fawn Creek Road) only crosses one intermittent tributary stream within 1 mile of listed fish habitat. The road is graveled, with well-vegetated ditchlines. Thus, likelihood of sediment moving from the road to stream channels is low, and would not occur by limiting log hauling to dry road conditions. Thus, log hauling will not deliver sediment to salmon and steelhead habitat in the Little North Santiam River.

Cumulative Effects

The proposed action would have no direct impacts to channel morphology (channel shape and form) of streams on the project areas and hence no cumulative effects to channel morphology. With no direct or cumulative impacts to channel morphology, instream fish habitat (ie. pool habitat, instream cover, stream depth, etc.) would not be affected.

Indirect impacts of the proposed action to fish habitat and fish populations would likely be limited to a potential short term increase in suspended sediment and turbidity in about 0.1 mile of coastal cutthroat trout habitat in an unnamed tributary to the Little North Fork Santiam River in section 25 that is <0.5 mile downstream of a culvert installation. Short-term increases in sediment delivery and turbidity could occur with the culvert installations.

No direct or cumulative impacts to peak flows are expected (See Evans Mountain Thinning Hydrology Specialist Report).

Over the long term, road repairs should help reduce risks to water quality and watershed hydrology that these roads currently pose. Cumulatively, the limited magnitude and duration of sediment effects from roads in the project area would be unlikely to affect spawning and rearing success of fish populations.

No Action Alternative

Populations of aquatic species would undergo natural increases and declines related to changes in stream temperature, sediment delivery events, and peak winter flows. Stream temperatures increase when shade from riparian canopy is lost (Johnson 2004). Substantial increases in stream temperatures can increase the metabolic costs of trout (Li et al. 2004), resulting in lower survival and recruitment, and consequently reduced population abundance (Hicks et al. 1991). During periods of accelerated sediment delivery (flooding), recruitment success would be lower because of fine sediment reducing intragravel oxygen levels resulting in higher embryo mortality, and reduced population abundance (Bjornn and Reiser 1991). High winter flows likely reduces overwinter survival of cutthroat trout in western Oregon streams (House 1995). Under the No Action Alternative, canopy closure in primary and secondary shade zones along stream channels would remain similar to current levels, except for changes to tree canopy and consequently stream shade levels resulting from snow or ice break, wind storms, and wildfire. Stream temperatures would follow changes in stream shading (Johnson 2004). Dense stands of riparian trees would self-thin over time, contributing LWD to stream channels, and windthrow from storms would also contribute LWD to streams. Natural sediment inputs to streams would vary as sediment contributing events (flooding) occur within RR.

Threatened and Endangered Species - This alternative would have "no effect" on UWR steelhead trout and UWR spring Chinook salmon. Project areas are located 0.7 to 3 miles upstream of salmon and steelhead habitat in the Little North Santiam River and lower Evans Creek.

3.1.4 Soils

Source Incorporated by Reference: *2010 Soils Specialist Report for the Proposed Evans Mountain Thinning Project (Soils Report)*

Assumptions:

- Harvest operations would be done only on lands classified by the BLM as Suitable[5] for timber production (including Suitable Fragile).
- Impacts and potential reductions in growth and yield, are within the standards analyzed in the RMP/FEIS (less than one percent) when no more than 10 percent of the ground surface is compacted (soils are generally considered compacted if there is more than 10 percent increase in density) by logging operations (RMP/FEIS G-2).

Methodology:

- Soil maps and descriptions of project soil characteristics used for the project area are available at the Natural Resource Conservation Service web site: http://www.or.nrcs.usda.gov/pnw_soil/or_data.html.
- Site specific conditions on BLM lands in the project area were mapped and field-verified in the Timber Production Capability Classification (TPCC) database (USDI BLM 1987).
- BLM Resource Specialists for soil and hydrology visited the project area multiple times, performing both formal surveys and informal reconnaissance, including digging small pits, to evaluate site specific conditions.

[5] All lands on the BLM are classified as, *Suitable* for timber production, *Suitable [but] Fragile* for a variety of reasons (e.g., nutrient status, compacted surfaces, slope gradient, etc.) or *Non-suitable*. The BLM practice is to locate proposed timber harvest unit boundaries to avoid areas that are Non-suitable.

AFFECTED ENVIRONMENT

Soils

Typical soils in these project areas formed in colluvium (i.e., material rolling downhill) from sedimentary, tuffaceous, basalt, and andesite rock and volcanic ash. Soils in river floodplains formed in alluvium (i.e., water transported materials). Soils series mapped (Table 12) in the project area are primarily Henline very stony sandy loam loams, Stony rock land and Whetstone stony loam on the steeper slopes (>30%) with Horeb loam and Kinney cobbly loam on slopes <30%. In the steeper forested slopes near the ridgeline, soils tend toward stony loams on 30-60% slopes with slightly higher hazard of erosion. Project soils are well-drained to moderately well-drained and shallow to moderately deep, with some local areas of rock outcropping on ridge tops. Project soils are suited for growing Douglas fir and western hemlock.

Based on GIS mapping of slope classes in the project area, approximately 50% of the project proposal is on ***low*** slope gradient (i.e., 0-35%) suitable for ground based treatment. The remaining 50% proposed for treatment are on ***moderate*** slopes (i.e., 35-65%) and suitable for cable yarding. A few steeper areas (i.e., >65%) are primarily located on slopes adjacent to Evans Creek, southern slopes above the escarpment in Section 29 and eastern slopes in Unit 24A.

Table 13. Project specific soils series (NRCS 2005)

Unit	Soil Series	Slope	% Clay	Erosion Factor (*Kw*)[1]	Coarse Fragments[2]
HEF/HEG	Henline vry stony loam	30-80%	7-10%	0.10	15-50%
WHE/WHF	Whetstone stony loam	3-50%	10-20%	0.10	15-50%
KCF	Kinney cobbly loam	20-50%	18-30%	0.10	15-30%
HRD	Horeb loam	2-20%	20-30%	0.28	<10%

[1] Soil erodibility factor, Revised Universal Soil Loss Equation (RUSLE); 0.0-0.2 = readily infiltrated, 0.2-0.3 = intermediate infiltration and moderate structural stability, >0.3 = more easily eroded with low infiltration capacity (Brady 1996, Wischmeier and Smith 1978).

[2] Rock fragments greater than 3 inches in diameter in A and B horizons.

Timber Production Capability Classification (TPCC)

Because soil mapping in forested regions of Western Oregon were typically done on a large scale with minimal site verification, site specific conditions on BLM lands in the project area are mapped and field-verified in the Timber Production Capability Classification (TPCC) database (Power 1987). TPCC mapping and classification is both more precise and accurate than county soil maps and is focused on forest productivity. From the TPCC preface: "The purpose of the TPCC is to interpret soil and land characteristics to assist in timber management planning and in the application of practices which will maintain or enhance production over a long period of time".

All lands on BLM are classified as either, s*uitable* for timber production, *suitable but fragile* for a variety of reasons (e.g., nutrient status, compacted surfaces, slope gradient, etc.) or *non-suitable*. All of the proposed treatments are within areas classified as suitable or suitable but fragile. Areas that are *suitable but fragile* would utilize the soil protection design features listed in table 5 to reduce/eliminate potential effects to soils.

Non-suitable lands in the project area are wet areas, areas with high gradient and areas prone to mass movement. Proposed unit boundaries were developed to avoid areas that are non-suitable. Most of the wet areas (FWNW) are adjacent to streams and wetlands, all of which are within stream protection zones (SPZ) and would not be treated. Fragile withdrawn areas due to high slope gradient (FGNW and FMNW) are concentrated along steep escarpments in the south of section 29, along Evans Creek in section 19, and in portions of section 24; these areas are also excluded from treatment.

The TPCC identified compaction as a limiting factor in the project area: 72% of the 176 acres of the lower gradient slopes proposed for treatment are mapped as fragile restricted due to compaction exceeding 10% of the area. This mapping unit includes areas that were heavily compacted during previous management or areas that were "scarified" (essentially the surface was tilled and all competing vegetation removed). Based on field review by area specialists, soil surfaces generally appear to be in a non-compacted state and are covered with a moderately deep layer of surface "duff" (i.e., partially decomposed organic material, mostly needles, bark and wood, that protects the mineral soil surface). Some slight compaction (increase in bulk density of less than 10% relative to un-compacted soils) may persist in the area outside of the visible skid trails and roads as a result of previous logging that was accomplished with heavy ground based equipment. However, it is difficult to assess how much if any of this disturbance remains because it is obscured by tree growth and the surface duff layer, indicating good soi productivity. Random small pits dug by area specialists did not reveal any compacted soil surfaces beneath the duff and thus it is reasonable to conclude that compaction outside of road and skid trail surfaces, if it remains at all, is discontinuous and of no consequence to soil properties or fertility.

There are over 50 acres of FMR1 (Fragile: surface erosion potential) in unit 24A and Section 29. Some of these soils are proposed for harvest. FMR1 sites have soils with surface horizons that are highly erodible and subject to dry-raveling, especially when clear-cut harvested and subjected to broadcast burning or natural fires. However, there are no proposed clear-cuts and the project would retain surface duff layers and partial to full suspension of logs during cable yarding operations.

There are approximately 2 acres of FPR3 (Fragile: Mass wasting potential) in Unit 29A. These sites are subject to slumping and earth-flow processes and display typical patterns of "hummocky" topography with "pistol-butting" trees. The FPR3 in Unit 29A is associated with a small surface stream and is excluded from treatment.

Road Surfaces and compaction

There are approximately 87 miles of roads in the Elkhorn sixth field watershed. Assuming an average 25 foot wide "footprint" of road surface (covering 264 acres) 1.5% of the surface area in this watersheds is road surface. However, based on field observation by area specialists, the condition of these road surfaces varies widely from paved highways (e.g., North Santiam county road) to barely discernible natural surface "roads" that were utilized at one point in time to haul cut trees to market.

A few moderately compacted soil surfaces (i.e., bulk density of the soil has been increased by over 10-20% relative to un-compacted soils) have visibly persisted in some of the skid trails. Moderately compacted soils are primarily located along skid trails (i.e., sites where trees were dragged along the ground) and are generally less than 10 feet in width and discontinuous since large portions of former skid trails have been obscured by the growth of trees and development of the duff layer. Based on the

proceeding observations, a conservative estimate is that approximately <2% of the soils in the project area are slightly to moderately compacted (bulk density increase of 10-20%) Therefore, with the addition of road density estimates from above, a rough estimate of total compacted surfaces is approximately 4% of the sixth field watershed.

ENVIRONMENTAL EFFECTS

Proposed Action Alternative

Direct Effects

Compaction and disturbance/displacement of soil:

Following completion of the harvest, the majority of understory vegetation and root systems would remain, along with surface soil litter and slash from harvested trees. Consistent with RMP standards and guidelines (p.C-1-2) the expected amounts of surface soil displacement and soil compaction from harvest operations would not exceed 10% of each harvest area.

Compaction, displacement and disturbance of surface soils from ground based yarding varies with soil moisture, the quantity and type of organic material on the surface (i.e., duff and slash layer), slope gradient, the type of equipment used and the operator of the equipment. If yarding is done using crawler tractors for all the proposed ground-based units (156 acres), the percentage of total tractor unit area impacted by surface disturbance and soil compaction as a result of designating skid roads would be approximately 6%-8% (between 9-13 acres). This is a high estimate as approximately 50% of skid trail need would use existing trails, resulting in little to no increase in compaction at these sites. On the soils disturbed by crawler tractor skid trails, a moderate amount of top soil displacement and moderate to heavy soil compaction would be expected to occur assuming operation during low soil moisture conditions, slopes under 35%, and an experienced operator.

If a harvester/forwarder system is used for the entire proposed ground-based area (156 acres), the percentage of total ground based unit area impacted by surface disturbance and soil compaction as a result of skid roads would be approximately 2%-5% (between 3-9 acres). In mechanical harvester systems operating between skid trails, soil displacement would be minor and soil compaction would be light to moderate (not likely to measurably effect the reestablishment or growth of vegetation). This assumes operation on top of a slash mat, low soil moisture conditions, slopes generally less than 35%, and an experienced operator.

Some of the potentially impacted acreage listed above for ground-based yarding systems includes existing skid roads from previous logging. Where practical, portions of these existing skid roads would be used for skid roads for this project. As a result, the amount of acreage for new or additional harvest impacts would be less than the totals listed above.

In skyline yarding areas, impacts usually consist of light compaction of a narrow strip less than four feet in width (the skyline road). Compaction and surface disturbance along the skyline corridor (from the bottom of the slope to the landing) would not be uniform, varying with the size and number of logs and suspension characteristics. Typically, short stretches of compacted and disturbed surfaces (<50

feet) would be interspersed with longer stretches (>100 feet) of fairly undisturbed soil. The total area affected would range from 3-7% of the area skyline-yarded (96 acres) or approximately 5-12 acres.

Total construction of temporary roads would displace topsoil and compact subsoil on 4 acres (6,758 ft, average 25 foot "footprint"). The roads to be constructed would be on moderate topography (grades of approximately 3% to 10%), so the total width of the clearing would be expected to be around 25 feet. This narrow clearing would have a minimal effect on overall tree spacing and stocking. All of the temporary construction would be decommissioned following harvest, so some recovery back to a forested condition would occur in this area over time. Placing slash debris over exposed surfaces, water bars, and blocking vehicle access would decrease surface erosion and runoff. This also provides a source of organic material to the disturbed soil. For further erosion discussion see Hydrology Report.

Removal of 0.5 mile of old road would lead, over time, to recovery of full capability of 1.2 acres of forested soil surfaces.

Road improvements would result in no change in the amount of current non-forest land. Some encroaching vegetation along these roads would be removed and surface rock would be added where needed. Drainage structure improvements and/or replacement would occur at several locations. These actions would improve drainage and road surface conditions, resulting in less road surface erosion into the surrounding area and streams. The improvement work would be expected to result in some minor short term roadside erosion; this would be most likely to occur when the established vegetation in the ditch and culvert catchment areas would be removed in affiliation with the road cleaning, reshaping, or culvert installment operations. Litter-fall accumulations and the growth of vegetation generally re-establish within one to two seasons and erosion rates would be expected to return to very low levels thereafter.

Log landing construction and use would compact the soil and displace top soil at the site. However, about half of the surface area used for landings would be the existing road surface (which is already compacted). The additional area adjacent to roads that would be needed for the landing area is estimated to be approximately 1% of the total project area (3.5 acres). The degree of soil disturbance and compaction in areas where logs are sorted or decked would be expected to be low (shallow and relatively quick to recover). However, where equipment turns or backs around multiple times, soil surfaces would experience heavy compaction and disturbance to the top soil layer (which could persist for several years following project completion). Soil disturbance from landings would be local to the landing area and would not affect soil resources on a watershed or landscape scale.

For this proposal, the total area of disturbed surfaces would range from a low of 14 acres to a high of 37 acres representing 6-17% of the 219 treatment acres. The assessment recognized that existing skid trails would be used, reducing new compaction. Therefore, consistent with the RMP the proposal would be expected to maintain surface disturbance/compaction at or below the district guidelines limiting compaction to 10% of ground-based logging units.

Indirect Effects on Site Productivity due to disturbance of Soils

For skyline yarding systems, measurable long term effects on site productivity from light compaction on approximately 5-12 acres would be minimal to none. Alternatively, with mechanized harvester systems operating on slash, soil impacts *between skid roads* are expected to result in light compaction in two discontinuous, narrow strips less than three feet in width. The effect on overall site productivity

from light compaction is expected to be low (no expected measurable reduction in overall yield for the project area).

For crawler tractor or rubber tire skidders, yarding soil impacts would be expected to result in moderate to heavy, fairly continuous compaction within the main 10 foot wide skid roads which would cover no more than 10% of the ground based units. Impacts would be light to moderate and less continuous on less-traveled portions of skid roads. The estimated reduction in growth rate for newly planted trees on moderate to severely impacted areas is 15%-30% during the first 10-20 years of growth.

For this review, no research was identified that has documented a reduction in tree growth of the retained stand following stand thinning that was attributable to compacted surfaces or soil disturbance. In addition, the proposed action would maintain sufficient mycorrhizae populations because the root systems of most vegetation would remain undisturbed and there is no evidence that past disturbance of the area has affected mycorrhizae populations.

Therefore, it is reasonable to assume that this proposal will have no negative effect on tree growth in the residual stand that is a result of compacted surfaces on adjacent skid roads.

Heavily compacted log landing areas would remain far below potential site productivity levels for many decades unless they are actively recovered and restored.

Surface Erosion Potential: **Water Erosion Prediction Project (WEPP)**

The WEPP soil erosion model was used to predict potential changes in erosion and sediment yield from actions proposed in this EA. Documentation of the WEPP model is available at the following web site: http://fsweb.moscow.rmrs.fs.fed.us/fswepp. The WEPP model is a physically-based soil erosion model developed by an interagency group of scientists from the U.S.D.A. Agricultural Research Service, Forest Service, and Natural Resources Conservation Service and the U.S.D.I. Bureau of Land Management, and Geological Survey. See the hydrology specialist report(available in the project record) for a discussion of the WEPP model and how it was used to predict surface erosion in the project area.

Predicted "upland erosion rates" for the proposal are:
Current condition- 0.320 t-ac^{1}
Proposal- .392 t-ac^{1}

Degradation of soil by erosion is of concern because soil formation is slow. Typical renewal rates for topsoil range from 0.12-0.8 t/ac/yr. (Pimentel, 1987). Estimated background surface erosion rates in the project area are in the range of the assumed rate of soil formation. The proposal is estimated to increase surface erosion, the predicted erosion rate under the "worst case scenario," to 0.392 t ac^{-1} which remains within the range of soil renewal rates.

If surfaces remained disturbed over time these erosion rates could have an effect on soil productivity if maintained over the course of time. However, typically sediment yields from forest harvest decrease over time as a negative exponential (Dissmeyer, 2000). The quantity of surface erosion during large storm events would likely drop back to current levels (0.320 tons/acre/year (t/ac/yr)) within three to five years as the replanted forest and competing vegetation provide full cover over the soil surface.

By way of comparison, in the United States surface erosion on croplands (44.5 t/ac/yr) ***averages*** more than 20 times the top rate estimated for this action (Pimentel, 1987). Therefore, the rate of surface soil erosion under this proposal is unlikely to have any long term deleterious effect on soil productivity.

The Cascades Resource Area Hydrologist has conducted field reviews of skyline logging on similar sites in the Cascades Resource during multi-day rain storms and found no evidence of overland flow or sediment transport where WEPP had predicted sediment transport under similar conditions (Hydro Report pp. 25-26; Hawe, 2011).

Connected Actions

Pile Burning:

On the sites where piles are burned, surface organic material (O-horizon) would be removed, increasing localized potential for soil detachment. However, sediment delivery to streams is highly unlikely, since burn-pile areas are outside riparian reserves, widely dispersed, and typically smaller than 20 feet in diameter. Pile burning and rain impact on burned spots can decrease infiltration capacity until natural re-vegetation occurs. Displaced soil would be filtered and retained by the intact vegetation immediately surrounding the burn pile spot. Since burning would occur during wet soil conditions, heat damage to the upper soil layer (A-horizon) would be moderated and only occur in scattered localized sites.

Skid Trail Construction& Blocking:

Some of the project area has been impacted by past tractor yarding; skid trails can be found in portions of the units proposed to be ground-based yarded. Existing skid trails would be used to the extent possible for this project. The impacts of new skid roads on soils are described above under harvest. Blocking skid trails by water-barring and grass seeding would prevent water from accumulating in large quantities, running down the road surface, and causing erosion. After several seasons, the accumulated liter fall on the road surfaces would further reduce surface erosion potential.

CWD Creation:

CWD generated by logging slash, wind throw, and/or bark beetle infestation left on site following operations would help cover the soil surface and limit surface erosion. Girdling or overtopping trees for snag creation would not be likely to measurably impact soil resources. Felling trees for CWD would cause minor soil displacement and compaction where the tree falls on the ground. CWD would be cut and left in place (no further soil displacement) and the impacts would be similar to natural tree fall.

Cumulative Effects

Proposed Action

The combined effect of the proposed action (tree harvest, road work, fuels treatments, skid trail construction, and CWD creation), would increase the overall amount of compacted/disturbed surfaces in the Elkhorn sixth field watershed. Temporary road surfaces located in the Little North Fork Santiam watershed would be decommissioned following use. Blocking skid trails by water-barring and grass

seeding would prevent water from accumulating in large quantities, running down the road surface and causing erosion; thus preventing any off-site effects to streams and water quality.

There is an overall maximum increase of 37 acres in compaction/disturbance of soils under the proposed action. The extent of compacted/disturbed soil surfaces in these watersheds as a whole was estimated at 4% or approximately 700 acres. Increasing compacted surfaces by 37 acres would result in less than a 0.2% increase in the percentage of compacted surfaces for the sixth field watershed. At the conclusion of the project, the quantity of compacted/disturbed soils would begin to decrease over time from the maximum and will approach current levels within a decade as soil surfaces recover through natural processes (e.g., freeze- thaw, animal and insect burrowing, tree fall, root growth, etc.).

Given the limited magnitude (0.2% increase in compacted surfaces) and duration (maximum during the first year following disturbance with a quick decline toward existing levels in the first decade), cumulative increase in compacted/disturbed soil surfaces would be immeasurable or undetectable at the watershed scale.

There is a small risk for a cumulative reduction in overall site productivity from top soil displacement, as the proposed activities have the potential to remove and/or displace soil nutrients. However, the limited magnitude and duration of the effect (the quantity of surface erosion during large storm events, for example, would likely drop back to current levels of 0.302 t/ac/yr within three to five years as the remaining forest stand fills out) would be unmeasurable on both the local and watershed scale.

No Action Alternative

Under this alternative soil conditions on the project site would continue their current conditions as described in affected environment.

3.1.5 Wildlife

Sources incorporated by reference:

USDI Bureau of Land Management, Salem District, Cascades Resource Area; and USDA, Forest Service, Detroit Ranger District. December 1997. Little North Santiam Watershed Analysis (LNS).

USDA, Forest Service; USDI, Bureau of Land Management; Fish and Wildlife Service. August 2012. Biological Assessment of Likely to Adversely Affect (LAA) Projects with the Potential to Modify the Habitat of Northern Spotted Owls, Willamette Planning Province - FY 2013 (BA).

USDI, U.S. Fish and Wildlife Service. October 2012. Biological Opinion (BO) Regarding the Effects of Habitat Modification Activities on the Northern Spotted Owl and its Critical Habitat within the Willamette Province, FY 2013, FWS Reference # 01EOFW00-2012-F-0158.

Methodology:

The effects of the Evans Mountain Thinning Proposal on wildlife habitat and Special Status species documented or suspected to occur was analyzed in the Evans Mountain Wildlife Report (England 2012). The Project areas were visited and habitats in and adjacent to proposed Evans Mountain Thinning units were examined during the 2009, 2010 and 2011 field seasons. A list of Special

Status/species of concern documented or suspected to occur in the Evans Mountain Thinning Project Areas was compiled based the proposal's geographic location, elevation, existing literature, and knowledge of habitats present gained through air photo interpretation, stand exam data, GIS information, and field reconnaissance.

Affected Environment

The stands proposed for thinning in the Evans Mountain area originated between the early 1900s to the late 1960s after the mature/old growth forest was logged. Canopy closures are high and range from 70-90 percent, and understory development is limited. Units 8S-3E-24A, 8S-4E-29A have very limited, sparse understories due to high canopy closures.

Forest management during the period when these stands were established was designed and intended to maximize timber production. Forestry practices that were applied to these stands included clear-cutting, broadcast burning and soil scarification to remove slash and prepare for regeneration, seeding and replanting with Douglas-fir, herbicide applications, fertilization, and animal damage control to ensure survival and rapid tree development. This has resulted in even-aged stands lacking species diversity, and structural heterogeneity, especially large remnant overstory trees, and standing dead material (snags).

Variation in forest stand conditions within stands and at the landscape level have been identified as a key factor in providing habitat for a diversity of forest organisms (Hayes et.al. 1997; Muir et.al., 2002). Certain structural and compositional aspects that have been found to be important contributors to habitat diversity and species richness include dead wood in the form of snags and down logs, remnant live trees, and vertical and horizontal variation in tree and understory canopies. Also, hardwood trees and shrubs in particular have been found to be important contributors to forest biodiversity, providing habitat substrate, food sources, foraging substrate, and nesting opportunities. All of these features are generally lacking in the managed stands proposed for thinning.

Residual Old Growth Trees, Coarse Woody Debris (CWD)

Table 14 summarizes the presence of old-growth remnants, special habitats, and the amount of CWD present in the units prior to thinning. The presence of old-growth remnants, snags, CWD, and special habitats is based on stand exam data, aerial photos, and field review by specialists. CWD must be at least 20 inches in diameter at the large end, 20 feet in length, and in decay classes 1 and 2, to satisfy management direction as described in the Salem Resource Management Plan (RMP, p. 21). Material of this size that is in more advanced stages of decay is summarized as well, since this material is valuable habitat for such species as Oregon slender salamander, and will contribute to forest floor wildlife habitat conditions for some decades.

There are residual old-growth trees present in unit 8S-4E-29C. Units 8S-4E-29B and D have old-growth remnants, but these units have been dropped from the proposal. There are no old-growth remnants present in the other units of Evans Mountain Thinning.

Large CWD that would meet RMP management direction (240+ linear feet per acre of material in decay classes 1 or 2, at least 20 inches in diameter at the large end, and 20 feet in length) is currently lacking in all of the units proposed for thinning (RMP, p. 21). Throughout the project areas, CWD in a less decayed condition (class 1 and 2) is primarily limited to smaller diameter material than would be

considered adequate to meet RMP management direction. These less-decayed logs in smaller size classes are mostly the result of recent self-thinning in crowded overstocked stands. They are much less useful as habitat for forest floor-associated animal species because they have less volume, and persist for shorter time spans (usually less than two decades) than the larger material.

CWD in more advanced stages of decay (classes 3-5) are usually remnants of old-growth "cull" trees that were not removed after the previous harvest, and are often in larger diameter classes. These logs provide valuable habitat for a whole host of CWD associated wildlife species (O'Niell et.al. 2001), and they persist for many decades before passing through advanced decay classes to become unrecognizable as down logs. An abundance of large CWD in advanced stages of decay is present in 8S-3E-24A and B; 8S-4E-29A, and 30A. There are moderate amounts of this material in 8S-4E- 29C.

Special Habitats

There are no special habitats present in the proposed thinning units. There are cliffs below 8S-4E-29C, and wetlands in the vicinity of 8S-3E-24B. There is an excellent hardwood component in 8S-3E-24B composed of red alder and big-leaf maple.

Table 14: Summary of Special Habitats, Remnants, and Coarse Woody Debris (CWD) present by project unit.

Name/ Unit#	Location	Seral Stage	Remnant Old Growth	Special Habitats*	CWD*** (feet)
					Hard / soft
24A	8S-3E-24	Mid Seral	No	No	0/480+
24B	8S-3E-24&25	Mid Seral	No	Yes#	0/320
29A	8S-4E-29	Mid Seral	No	No	0/300
29C	8S-4E-29	Early mature	Yes	Yes#	<30/152
30A	8S-3E-24&25 8S-4E-30	Mid Seral	No	No	0/480+

Seral Stage Age Classes (years) based on Stand Exam data: Early Seral = 0-30; Early Mid Seral = 31-40; Mid Seral = 41 – 60; Late Mid Seral = 61 -80; Early Mature Seral = 81 - 120; Mature = 121 - 200; Old Growth =201+

* Special habitats within the units include: wet and dry meadows, wetlands, talus, cliffs & rock outcrops.

\# Presence of adjacent special habitat, wetland, pond adequately protected with no treatment buffer.

*** Linear ft/acre >=20 inches in diameter large end & >=20 feet long, hard (decay classes 1-2)/soft (decay classes 3-5) logs.

0+ denotes when there are trace amounts of CWD present that may not have shown up on the plots.

Snags and Snag-Associated and Cavity Nesting Species

Table 15 summarizes the number of snags necessary to meet management direction in the RMP (p. 21) for five cavity-excavating woodpecker species which are referred to in Neitro et al (1985). Table 16 summarizes the snags present prior to thinning. A diameter of 15+ inches was used because most wildlife species that utilize snags are associated with snags greater than 14.2 inches (Rose et. al., 2001). The presence of snags and standing dead material is based on stand exam data and field review by specialists. Stand exam data is based on a statistical sample from plots.

The hairy woodpecker, red-breasted sapsucker and pileated woodpecker are species associated with conifer stands in the western Cascade Mountains, and are present in the Evans Mountain Thinning

Project Area. Northern Flicker and Downy woodpecker are not typically associated with closed-canopy conifer-dominated stands in the western Cascades, though both species are found in or around the project area.

Snag habitat does not meet the 40 percent of maximum population densities requirement for the five woodpecker species throughout most of the project areas (RMP, p.21). Most of the snags that are present are small (less than 20 inches in diameter) and/or highly decayed. In general stands throughout the project areas are in a condition in which there is a near-term (less than three decades) snag deficit (RMP, p. 21).

Table 15: Minimum Number of Snags Necessary to Support Species of Cavity Nesting Birds at 40 Percent of Potential Population Levels (RMP p. 21, as per Neitro et al, 1985).

Diameter class (inches dbh)	***Snag Decay Stage*** ***Hard 2-3***	***Soft 4-5***	***Total by diameter class (per 100 acres)***
11+		Downy woodpecker (6)	6
15+	Red-breasted sapsucker (18)	Hairy woodpecker (77)	95
17+		Northern flicker (19)	19
25+	Pileated woodpecker (2)		2
Total – all diameter and decay classes			**122**

Table 16: Summary of Snags Currently Available by Project Unit.

Snags at least 15 feet tall/100 acres						
Township, Range and Section Unit#	Hard snags 15-25 inches	Soft snags 15-25 inches	Hard snags 25 inches+	Soft snags 25 inches +	Total hard snags 15 inch+	Total soft snags 15 inch+
8S-3E-24A	0+	0	0	0	0+	0
8S-3E-24B	0+	0	0	0	0+	0
8S-4E-29A	0	0	0	0	0	0
8S-4E-29C	0+	0+	0	80	0+	80+
8S-4E-30A	0+	0	0	90	0+	90

0+ denotes when there are trace numbers of snags present that did not show up on the plots.

Federally Listed Species: Northern Spotted Owls

The proposed thinning units provide 12 acres of suitable and 238 acres of dispersal habitat in the Matrix and Riparian Reserve Land Use Allocations in the Little North Watershed. There are two known spotted owl sites in the vicinity of the proposed units, Evans Creek and Henline. Evidence of nesting activity has never been documented at these sites, and the true center of activity or site center for both of these sites is unknown.

There was a response from a pair of spotted owls in Evans Creek known spotted owl site during 2010, and there were single responses during 2008, 2009, 2011 and 2012. A site center for Evans Creek was placed in 8S-4E-29B, based on the observation of a single male in July 2008. This site center was placed here because it constitutes the best quality habitat available. Units 8S-4E-29B and D, the highest quality habitat, have been dropped from the proposal. The habitat in portions of 8S-4E-29A and C are located within 300 meters of this site center. Units 29Aand C are within 0.5 miles of this site center. Units 29A and C; and portions of 30A are located within the provincial home range (1.2 miles) of the Evans Creek site.

A site center for Henline was placed about a mile northeast of unit 29C based on the observation of a pair in August 2008. The site was surveyed in 2009, 2010 and 2011, and there were no spotted owl responses. There was a single response from a female in 2012. Unit 8S-4E-29A and portions of 29C are located within 1.2 miles of the Henline site. There are no units within 0.5 miles of the site center. The presence of barred owls was documented at Evans Creek during 2010 and 2011; and Henline during 2008, 2009, 2010 and 2011. There has been a fairly consistent presence of barred owls in the Fawn Creek area in the vicinity of 8S-3E-24A and B; and 8S-4E-30A since the mid-1990s. Both the Henline and Evans Creek sites likely do not provide enough suitable nesting, foraging and roosting habitat necessary for maintaining spotted owl life history functions (Courtney et. Al. 2004, Swindle 1999; Bart and Forsman 1992; Bart 1995; BO pp. 63-66, 69). None of the units are located in Critical Habitat and or unmapped Late Successional Reserves (LSRs) which are 100 acre core areas of known spotted owls as of January 1994.

Special Status, Survey and Manage, and other Species of Concern

Bureau Sensitive – Peregrine falcon
There is a series of cliffs which are suitable for nesting peregrine falcons below 8S-4E-29C. Peregrine falcons have not been observed, however, the cliffs have never been surveyed for the presence of peregrine falcons.

Former Bureau Sensitive – Oregon Slender Salamander
Oregon slender salamander, a former Bureau Sensitive Species, was found in 8S-4E-29C, and is expected to occur in all units of the project area where larger CWD in advanced stages of decay is present (Table 14). Oregon slender salamander has been found throughout the Cascades Resource Area in stands across the full range of seral stages. Its distribution on BLM lands within the Cascades Resource Area appears to be limited by dry conditions at low elevations along the Willamette Valley floor, and by cold conditions at higher elevations (Dowlan, unpublished 2006).

Habitat is generally described as conifer stands dominated by Douglas-fir with large amounts of large rotten (decay class 3 to 5) Douglas-fir down logs. Old logs, stumps and large woody material piles around stumps, and exfoliated tree bark on the ground are used for cover, feeding and breeding. Larger material that can hold moisture through summer drought is generally considered to be most important in maintaining moderate subsurface microclimate conditions. Optimal habitat for these animals is generally described as late-successional forest conditions with cool, moist microclimates and large down wood.

Survey and Manage – Red Tree Vole and Certain Mollusk Species
On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in Conservation Northwest, et al. v. Rey, et al., No. 08-1067 (W.D. Wash.) (Coughenour, J.), granting

Plaintiffs' motion for partial summary judgment and finding a variety of NEPA violations in the BLM and USFS 2007 Record of Decision eliminating the Survey and Manage mitigation measure. Previously in 2006, the District Court (Judge Pechman) had invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. On October 11, 2006, following the District Court's 2006 ruling, parties to the litigation entered into a stipulation exempting certain activities from the Survey and Manage standard (Pechman exemptions), including thinning projects in stands less than 80 years old. Units 8S-4E-29B, C and D are over 80 years of age, and Survey and Manage surveys were completed. No surveys for red tree voles or Survey and Manage mollusks are planned in 8S-3E-24A and B; 8S-4E-29A; and 30A because all of these stands are under 80 years of age (Pechman exemption, 2006). Following the Court's December 17, 2009 ruling, the Pechman exemptions are still in place.

The **red tree vole** is an arboreal vole associated with conifer forests west of the Cascades summit, below about 3,500 to 4,500 feet in elevation. The project area is within the "Northern Mesic Zone" of the range identified for the species, and red tree voles could occur. Red tree vole surveys were conducted during the fall of 2010 in units 8S-4E-29B and C; and during the summer of 2011 in 29D. Active red tree vole nests were confirmed in Units 29 B and D. Two ten acre plus red tree vole reserves have been established, resulting in dropping units 29 B (17 acres) and 29D (17 acres) from the proposal. In addition, 45 acres of Unit 29C and unit 29F (32 acres) have been dropped, all of which is suitable red tree vole habitat over 80 years of age. All of the other units (8S-3E-24A and B; 8S-4E-29A; and 30A) proposed for thinning are under 80 years of age and do not meet the stand-level criteria described in the Red Tree Vole Protocol (Huff et al 2012). Since these stands don't meet these criteria, habitat for red tree vole is marginal at best.

Units 8S-4E-29B, C and D were surveyed for Survey and Manage and Bureau Sensitive mollusks. None were found.

Bats

No Bureau Sensitive bat species are known or suspected to occur in the Evans Mountain Thinning Project Area. Four bat species of concern are suspected to occur in the Evans Mountain Area (silver-haired bat, long-eared myotis, long-legged myotis, and Yuma myotis). These species are associated with caves and mines, bridges, buildings, cliff habitat, or decadent live trees and large snags with sloughing bark. Decadent live trees and large snags, particularly ones with bark attached that extend above the tree canopy, are used variously as solitary roosts, maternity roosts, and hibernacula by these species, and other bat species associated with Douglas-fir forests (Christy and West 1993, Waldien et. al. 2000). Although roost sites are poorly characterized in Pacific Northwest forests, existing information indicates that old-growth forests provide higher quality roost sites than younger forests and that many species prefer older forests (Thomas and West 1991, Perkins and Cross 1988). Old-growth and tall snags with sloughing bark are rare in the project areas (Tables 1 and 3), and these species are likely to be present in low numbers.

Migratory and Resident Bird Species

The proposed thinnings are located in the Western Oregon Cascades Physiographic region. The Partners in Flight (PIF) conservation plan which addresses the Western Oregon Cascades is the Conservation Strategy for Land birds in Coniferous Forest of Western Oregon and Washington (Altman 2008).

Most of the proposed thinning areas are in mid seral stands in the stem exclusion stage. These forest conditions are structurally simple and characterized by an even-aged, single-layered, closed-canopy with poor understory development, and are low in landbird species richness. Bird species richness at the stand level has been correlated in some recent studies with habitat patchiness, densities of snags, and density by size-class of conifers (Hagar, McComb, and Emmingham 1996, Hayes et al. 2003). Even-aged conifer stands provide habitat for a relatively high abundance of a few bird species, many of which feed on insects gleaned from conifer foliage. The most common species include chestnut-backed chickadee, Pacific-slope flycatcher, hermit warbler, golden-crowned kinglet, varied thrush, winter wren, red-breasted nuthatch, and Swainson's thrush, however, these species are also common or more abundant in mature conifer stands as well (Hansen et.al., 1995).

Big Game

Big game species that are found in the project areas include Roosevelt elk (Cervus elaphus roosevelti) and black-tailed deer (Odocoileus hemionus). The project areas are in mid seral to early mature stands which provide hiding and thermal cover. The highest value cover for big game is in the Fawn Creek area, which includes 8S-3E-24B and 30A. Here, the road system is gated and disturbance factors are low. Elevations range from 2,100 to 2,600 feet, and big game use these areas most of the year unless snow depths push them to lower elevations. Big game use is low in 8S-4E-29 due to less favorable steep and broken topography, and higher elevations (up to 3,400 feet). The road system to these stands is open and disturbance factors are higher. The Salem District Record of Decision and Resource Management Plan (RMP) approved May 1995, identifies no critical winter or summer range in the project areas (RMP p.26).

Environmental Effects

Overall, short term (less than 5 years) canopy cover reduction, disturbance, and reduction of understories and ground vegetation would occur due to thinning. The long term (more than 5 years) effects would be to increase structural complexity and improve habitat quality for wildlife.

Research that has occurred since the 1980s has determined that it is possible to develop desired structural and compositional diversity in young managed stands through specific actions (Bailey and Tappeiner 1997, Chan et.al.2006). Thinning forest stands produces what has been described as "cascading ecological effects" (Hayes, Weikel and Huso, 2003) that result from reduced competition between overstory trees and increased availability of solar radiation to the forest floor. Growth, size, branch diameter, and crown ratio of the remaining trees is increased, and development of understory and ground cover vegetation is stimulated. These changes effectively increase structural complexity and alter habitat quality. The increase in structural diversity would improve wildlife habitat by providing more opportunities for foraging; nesting/breeding activities; and resting, hiding and escape cover/habitat for a variety of species in the forest environment, including invertebrates, songbirds, and small mammal species. These changes are considered to be beneficial since there is an abundance of simplified structure habitats in the vicinity of the project area (LNSWA Ch. 5, pp.7-9).

Proposed Action

General Habitat

Vegetation, Riparian Reserves and associated Wildlife Species
Proposed road construction and renovation, skid trails and skyline corridors under the various alternatives would create narrow linear openings through the vegetation, disturbing, reducing or removing ground vegetation and creating breaks in the canopy, which allow more light to reach the forest floor. The effects on wildlife habitat would be a short term (less than 5 years) disturbance and reduction in ground vegetation and canopy closure that would increase access to the stand by certain wildlife species, specifically larger mammals such as big game, coyotes, and avian predators. In the long term (more than 5 years), ground vegetation would become re-established due to increased light to the forest floor and the breaks in the canopy would close.

The age classes proposed for thinning provide the greatest opportunities for acceleration of tree diameter growth and understory development through thinning and density management (LNSWA Ch. 7, pp. 5-6). It is anticipated that thinning could improve habitat conditions in the Riparian Reserves for wildlife by accelerating development of late seral forest stand characteristics. Desirable late seral forest stand characteristics include larger trees for a large green tree component and recruitment of large standing dead and down CWD in future stands, multi-layered stands with well developed understories, and multiple species that include hardwoods and other minor species (LNSWA Chp. 7, pp. 5). Several low density thinning patches are proposed to create variable densities and openings (LNSWA Ch. 7, pp. 5-6). These openings would result in more vertical understory layering and ground cover, adding complexity to future forest stands.

At the landscape level, connectivity for species such as the spotted owl is expected to improve as late successional conditions develop in the Riparian Reserves. Other species which would benefit from the development of older forests in the Riparian Reserves include many species of mollusks, amphibians, bats, the red tree vole, blue grouse, red-breasted sapsucker, pileated woodpecker, Cooper's hawk, Pacific-slope flycatcher, Swainson's thrush, black-throated gray warbler, and black-headed grosbeak, olive-sided flycatcher, brown creeper, and hermit warbler. Species which are expected to benefit from canopy gaps are ruffed grouse, Wilson's warbler, warbling vireo, song sparrow and big game species.

Units 29A and C are the only proposed units adjacent to mature stands. Unit 29C is 92 years old and is located adjacent stands of similar age and structure. Unit 29A is a mid seral stand located adjacent to a 102 year old stand. All of these adjacent stands were dropped from the proposal due to the presence of red tree voles. No low density thinning patches are proposed in or adjacent to mature habitat. The stands proposed for thinning adjacent to mature stands would retain approximately 50 to 60 trees per acre and no edge habitat would be created as a result of thinning. The other stands proposed for thinning are adjacent to other mid seral stands.

Old-growth Remnants, Snags and Coarse Woody Debris (CWD)
There would be no effects to existing old-growth remnants in the Evans Mountain Thinning area. All old-growth remnants would be reserved and/or posted out of the units. It has been determined that it is feasible to reserve these structures standing and protect them from logging activities due to their location and logging methods.

Thinning these stands would reduce the number of small diameter (less than 15 inches DBH) snags over the next 20 years because thinning from below removes the smaller suppressed and intermediate trees that would be most likely to die from suppression mortality and become snags within that time period. Also, more of the existing smaller diameter/taller snags (<12 inches diameter and >25 feet tall), would be felled for safety reasons, or fall incidental to thinning operations. These smaller snags are less important for wildlife species than the larger material over 15 inches (Rose et. al., 2001). The benefit of smaller snags to wildlife is limited. In unmanaged forests the presence of cavity nesting birds has been linked to the presence of snags, particularly >50cm (19.26 inch) (Carey et al. 1991, Huff and Raley 1991). Chestnut backed chickadees, red breasted nuthatches, brown creepers and hairy woodpeckers all show selectivity to foraging habitats based on deciduous trees, large diameter conifers, and large diameter heavy decayed snags and logs (Weikel, 1999). Within thinning units, most existing snags in all sizes over 15 inches diameter would be retained. It is anticipated that 90+ percent of these snags would remain standing after treatment. This would effectively reserve the best existing habitat features for bats, primary excavators (woodpeckers), and secondary cavity users, such as songbirds and small mammals. The remaining 10 percent or less of these snags may need to be felled for safety, road construction, skid roads, skyline corridors or would fall incidental to logging operations. Any snag that falls for any reason as a result of thinning operations would remain on-site as CWD, providing important habitat for a different, but also, key group of dead-wood associated species, including the Oregon slender salamander.

Management direction for the Matrix LUA is to provide a renewable supply of snags and down logs well-distributed across the landscape (RMP p. 21). Most units throughout the project area are expected to remain in a snag deficit condition (RMP, p. 21) until live trees become large enough (at least 20 inch diameter) to provide for recruitment of large snags and CWD which will meet RMP requirements. As a result of thinning, growth of residual live trees would be accelerated, so that larger trees would be available sooner than without thinning to contribute additional large snags and CWD in the future stand. The RMP guidelines for snags (40 percent maximum population densities) and CWD (240+ linear feet per acre of material in decay classes 1 or 2, at least 20 inches in diameter at the large end, and 20 feet in length), could be met in two to four decades. Large diameter CWD in more advanced decay conditions would persist and contribute to forest floor wildlife habitat conditions for many decades before passing through decay class five to become unrecognizable as down logs.

It is anticipated that less than ten percent of existing CWD would be directly impacted by logging. Less than ten percent of the thinning area would be directly impacted by skidding, which is the operation with the highest potential impact to existing CWD. BLM oversight of skid trail locations would ensure that skid trails were located to avoid impact to high value CWD whenever feasible, reducing the anticipated impacts below the ten percent level that would be expected from locating skid trails without concern for CWD. The same principles generally apply to snag retention.

Special Habitats

The cliffs below 8S-4E-29C would be posted out of the unit. No effects from logging activity would occur as the cliffs are located downhill from the unit. The wetland areas in the vicinity of 8S-3E-24B would be posted out of the unit and buffered by a 100 foot no treatment buffer. Most of the hardwoods in the vicinity of 8S-3E-24B would be posted out of the unit, and the hardwood component in 24B would be retained.

Federally Listed Species - Northern Spotted Owl

Refer to Table 17 for a summary of the Evans Mountain Thinning project, its effects on spotted owl habitat, and definition of terms. In the short term, 238 acres of dispersal and 14 acres of suitable habitat in the Matrix and Riparian Reserve Land Use Allocations in the Little North Santiam Watershed would be altered as a result of thinning. Approximately 14 acres of suitable within the provincial home range (1.2 miles) of the Evans Creek known spotted owl site would be altered as a result of thinning, all of which is located within 0.5 miles of the site center. Approximately 5 acres of suitable habitat within 1.2 miles of the Henline known spotted owl site would be altered as a result of thinning, none of which is located within the core area. The amount of dispersal and suitable habitat within the provincial home range of these two known spotted owl sites would not change as a result of thinning. Available scientific literature provides support for the finding that forest stands can be altered in a manner that is not necessarily expected to change the habitat function for spotted owls (BO p.17-18, Forsman et al. 1984, USFWS 2007c). Examples of silvicultural activities that may fall into this category are light to moderate thinning, down salvage, individual tree removal, and prescribed burning. None of the proposed units are located in LSR or Critical Habitat for the Northern spotted owl.

In the short-term, seasonal restrictions on habitat modification activities (felling, yarding, burning, and road building) in 8S-4E-29A and C would minimize the risk of disturbance to known northern spotted owls during the critical nesting season and delay habitat modification activities later into the nesting season when spotted owls are less sensitive to disturbance. Disturbance associated with thinning (logging, road-building, etc.,) may have temporary effects on the presence or movement of spotted owls.

In the long term, such treatments can have long-term benefits to spotted owls by encouraging late-successional characteristics to occur more rapidly (BA p. 12, BO p. 22). Thinning could accelerate the development of suitable habitat characteristics. As thinned stands mature, habitat conditions are expected to improve. Canopy closures would increase and thinned dispersal habitat would attain suitable habitat conditions within 20 to 40 years. These stands would develop foraging and nesting structure and residual trees will increase in size and be available for recruitment of snags, culls and CWD for prey species and nesting opportunities for spotted owls.

No suitable habitat would be downgraded or removed as a result of thinning. However, 14 acres of suitable habitat would be altered which is located within 1.2 miles of two known spotted owl sites. The quality of a spotted owl site is related to the amount of available suitable habitat. The sites likely do not provide enough suitable nesting, foraging and roosting habitat necessary for maintaining spotted owl life history functions (Courtney et. al. 2004, Swindle 1999; Bart and Forsman 1992; Bart 1995; BO pp. 63-66, 69). About 34% of the habitat within 0.5 miles of Evans Creek, and 36% of the home range are suitable habitat acres. About 47% of the habitat within 0.5 miles of Henline, and 35% of the home range are suitable habitat acres. Both the Evans Creek and Henline known spotted owl sites will continue to be below the recommended level of suitable habitat within the core area or home range post-harvest functions (BO pp. 63-66, 69). Incidental take is unlikely since units 8S-4E-29B, most of C, D and F have been dropped from the proposal and the remaining portion of 29C (14 acres) would be maintained as suitable habitat; and a seasonal restriction on operations would be in place during the critical nesting season.

Current habitat conditions for the spotted owl would be maintained in all of the proposed thinning units after treatment. "Maintain" habitat means light to moderate thinning in which forest stand characteristics are altered but the components of spotted owl habitat are maintained such that spotted owl life history requirements are supported. As a result, the functionality of the habitat used by spotted owls remains intact post treatment. A canopy cover of >40 percent for dispersal habitat, and a canopy cover of >60 percent for suitable habitat, along with other habitat elements (e.g. including snags, down wood, tree-height class-diversity, and older hardwoods) would be maintained post treatment. In addition, trees larger than 36 inches would be reserved and retained.

Table 17. Spotted Owl Habitat Modification by Treatment type, Land Use Allocation, Pre/Post Treatment Habitat Type, Habitat Modification Type 4, and Effect Determination

5th. Field Watershed	Township-Range-Section#	Proposed Treatment (1)	Acres	Land Use Allocation (2)	Pre/Post Treatment Habitat Type (3)	Habitat Modification (4)	Effect
Little North Santiam	8S-4E-29C	Light to moderate thin	14ac	CONN/RR	Suitable/Suitable	Maintain	LAA
Little North Santiam	8S-3E-24A,B; 8S-4E-29A and 30A	Light to moderate thin	238ac	CONN/RR	Dispersal/Dispersal	Maintain	NLAA
TOTAL			**252 ac**				

Notes and definitions for Table 4 (BA, pp. 3-4; BO, pp. 15-18).

1 Treatment Type:
Light to moderate thinning in dispersal or suitable habitat can be for forest health or to improve the structural characteristics of a stand or to provide commodity. Such treatments may be described as commercial thinning, density management, selective cut, partial cut, or mortality (standing) salvage. Such thinnings maintain a minimum of 40 percent average canopy cover. Light to moderate thinnings can have long-term benefits to spotted owls by encouraging late-successional characteristics to occur more rapidly.
2 Land Use Allocations: CONN=Connectivity Area Matrix; RR=Riparian Reserve.
3 Habitat Types: Suitable habitat consists of conifer-dominated, 80 years old or older and multi-storied in structure, and have sufficient snags and downed wood to provide opportunities for owl nesting, roosting and foraging. The canopy cover generally exceeds 60 percent.
Dispersal habitat consists of conifer and mixed mature conifer-hardwood habitats with a canopy cover greater than or equal to 40 percent and conifer trees greater than or equal to 11 inches average diameter at breast height (DBH). Generally, spotted owls use dispersal habitat to move between blocks of suitable habitat, roost, forage and survive until they can establish a nest territory. Juvenile owls also use dispersal habitat to move from natal areas. Dispersal habitat lacks the optimal structural characteristics needed for nesting.
4 Habitat Modifications:
Maintain habitat means to alter forest stand characteristics but maintain the components of spotted owl habitat within the stand such that spotted owl life history requirements are supported (i.e. the functionality of the habitat used by spotted owls remains intact post treatment). A canopy cover of >40 percent in dispersal, and >60% in suitable habitat, along with other habitat elements (e.g. including

snags, down wood, tree-height class-diversity, and older hardwoods) will be maintained post treatment to adequately provide for spotted owl dispersal and/or suitable habitat. In addition, trees larger than 36 inches would be reserved and retained.

5 Effect: NE=No effect; NLAA=May affect, but not likely to adversely affect; LAA=May affect and likely to adversely affect.

Special Status Species

Bureau Sensitive – Peregrine falcon

The Evans Mountain Thinning project would have no effects on peregrine falcons or their habitat. The placement of a seasonal restriction from February 1 to July 31 on 8S-4E-29C would protect cliffs from disturbance during the breeding season and thus reduce disturbance to peregrine falcons that could be present. The topography and location of the cliffs downhill from the proposed unit is favorable. No disturbance would occur in the immediate vicinity of the cliffs, or below the cliffs where noise is of greatest concern.

Former Bureau Sensitive – Oregon Slender Salamander

It is not expected that thinning these stands would result in measurable effects to Oregon slender salamanders or their habitat. Post-thinning treatment surveys in the Keel Mountain Density Management Study Area indicate that Oregon slender salamanders are not adversely affected by thinning (Rundio and Olson 2007). Oregon slender salamanders would be expected to persist at sites within stands where CWD of adequate size (RMP requirements >20 inches in diameter at the large end, >20 feet in length) currently exists. The CWD currently on-site prior to thinning would continue to provide refuge for terrestrial salamanders many years after treatment.

These results are consistent with survey results elsewhere in Cascades Resource Area from stands that had been subjected to timber harvest in the past (Dowlan, unpublished 2006). Stands in similar age classes had been subjected to clearcut harvest with no green tree retention, similar to the proposed thinning units. Logging practices of the time resulted in heavy concentrations of large logs, or "culls" which were cut, but not removed from the site. This large woody material lasts for many decades, and provides moderating microclimates in which Oregon slender salamanders can persist.

In the short term, direct effects (disruption or mortality) to Oregon slender salamanders may occur during logging operations. Ground based logging would result in the most impact due to higher ground disturbance, and skyline logging would have fewer impacts due to less ground disturbance. Due to seasonal restrictions on ground based logging, activity would occur during the drier seasons when amphibians are less active.

Project design features common to all actions would minimize disturbance to existing CWD. Ground disturbance from tractor skidding trails and other ground-based logging equipment would be limited to ten percent of project unit areas, and therefore, no more than ten percent of potential Oregon slender salamander habitat within any unit.

Survey and Manage – Red Tree Vole and Certain Mollusk Species

In the short-term, undetected red tree vole nests within marginal habitat (habitat less than 80 years of age); and suitable habitat over 80 years of age could be destroyed or disturbed during thinning. The largest most dominate trees over 36 inches dbh would be reserved, which will retain a valuable

element of red tree vole habitat. Habitat conditions for red tree voles would gradually become more suitable after thinning as the stands continue to mature.

No Bureau Sensitive or Survey and Manage mollusk species were detected during surveys. In general habitat for mollusk species could be disturbed as a result of ground disturbance from logging operations. Due to seasonal restrictions on ground based logging, activity would occur during the drier seasons when mollusks are less active. In the long term, mollusk species are expected to persist as habitat conditions gradually improve after thinning as the stands continue to mature.

Bats

Old-growth forests provide higher quality roost sites than younger forests and many species prefer older forests (Thomas and West 1991, Perkins and Cross 1988). No old-growth forests are proposed for thinning, however, unit 8S-4E-29C is over 80 years of age. Bat species which use snags would be affected due to a loss of 10 percent or less of the standing dead material within the thinning units. Most existing snags in all sizes over 15 inches diameter would be retained. It is anticipated that 90+ percent of these snags would remain standing after treatment. The remaining 10 percent or less of these snags may need to be felled for safety, road construction, skid roads, skyline corridors or would fall incidental to logging operations. Bat activity appears to be higher in thinned versus unthinned stands. Structural changes in stands caused by thinning may benefit bats by creating habitat structure in young stands that bats are able to use more effectively (Humes, Hayes, Collopy 1999). Bat species which are more closely associated with buildings, bridges, mines, cliff crevices and caves than snag habitat would not be affected. None of these features are present in the Evans Mountain Thinning project area. The cliffs below 8S-4E-29C would be protected by a no treatment buffer and favorable topography.

Migratory and Resident Birds

Unintentional take of nests, eggs, nestlings and nesting failure would be likely if harvest operations occur during active nesting periods. However, the impacts would be short term, involving loss of nests and unintentional take during one nesting season, and would not reduce the persistence of any bird species in the watershed or populations at the regional scale. In the western Oregon Cascades there is temporal variability of breeding bird species and individuals of the same species in forested habitats. For example some owls and woodpeckers begin breeding in February or March while some flycatchers do not finish breeding until August. The majority of birds in the Pacific Northwest complete their breeding cycle within the April 15 to July 31 time period (Altman, Hagar 2007).

Some individual birds may be displaced during harvest operations in the project area due to disturbance. Adjacent untreated areas and areas where active operations are not occurring would provide refuge and nesting habitat, which would help minimize short term disturbance.

Changes in habitat structure are expected to have immediate effects on bird communities in thinned stands. Thinning densely-stocked conifer stands would be expected to immediately enhance habitat suitability for species which prefer a less dense conifer canopy, and reduce habitat suitability for species that prefer continuous conifer canopies. Reducing the canopy closure and opening up stands is expected to have short term negative effects on the brown creeper, golden-crowned kinglet, hermit warbler, Pacific-slope flycatcher and varied thrush however, these species are also common or more abundant in mature conifer stands as well (Hansen et.al., 1995). The thinning would have no effects or even positive long term effects on this same set of species as understories develop and habitat quality improves.

Overall bird species richness (a combination of species diversity and abundance) would be expected to gradually increase for up to 20 years as hardwood components of stand structure develop, plant species composition becomes more complex, and hardwood shrub layers, epiphyte cover, and snag density become more prominent within the stands. The future development of hardwood/deciduous tree/bush components and canopy layers would favor species such as the band-tailed pigeon, ruffed grouse, red-breasted sapsucker, Wilson's warbler, Hutton's Vireo and black-throated gray warbler.

Big Game

Big game species could be temporarily disturbed during the implementation of the proposed action. Logging equipment noise and human presence may cause animals to avoid or disperse from the project areas temporarily. Thermal and hiding cover would be maintained after harvest, however, cover quality would decrease in the short-term as a result of thinning, opening new roads, renovating roads and road improvements (Cole, et al. 1997, Trombulak and Frissell 1999). Vegetative forage such as saplings, shrubs, grasses and forbs would increase as a result of thinning, creating openings and road closures after thinning. As a result of increased light, forage quantity would increase and attract early successional species such as elk and deer to the thinned areas.

In the long term (5+ years), thermal and hiding cover quality would increase and vegetative forage such as saplings, shrubs, grasses and forbs would gradually decrease as a result of canopy closure decreasing the amount of light reaching the forest floor.

Cumulative Effects

Cumulative Effects

Snags and CWD

Thinning these stands would reduce the number of small diameter (less than 15 inches DBH) snags over the next 20 to 40 years that would otherwise die from suppression mortality and become snags. Analysis of the Evans/Fawn Creek sub basin shows that 70 percent of the stands in the sub basin of similar age classes as those proposed for thinning would remain untreated. Small dead wood would still be present and available in adjacent untreated areas. Design features would retain existing CWD and snags 15+ inches diameter. It is expected that 90+ percent of these snags would remain standing after treatment. Some snags, especially smaller diameter/taller snags (<12 inches diameter and >25 feet tall), would be felled for safety reasons, or fall incidental to thinning operations. Any snag that falls for any reason as a result of thinning operations would remain on-site to become CWD, providing important habitat for a different, but also, key group of dead-wood associated species (Aubry 2000, Bowman et.al. 2000, Butts and McComb 2000).

Beneficial cumulative effects to CWD, snag habitat and associated species may occur as a result of implementing the projects, since larger trees would be available sooner than without thinning to contribute additional large snags and CWD recruitment in future stands.

Northern Spotted Owl

The scale for cumulative effects for the northern spotted owl is the provincial home range of known spotted owl sites, 1.2 miles for the Cascades of Western Oregon (BA, p. 3; BO, p. 16), and the location of the project in relationship to adjacent known spotted owl sites and Late Successional Reserves (LSRs). The scale was chosen because the Northwest Forest Plan (NWFP) goal for conservation and

recovery for spotted owls is to maintain suitable owl habitat within LSRs and the provincial home range of known owl sites; and maintain dispersal habitat between LSRs and known owl sites (BO pp.71-75).

Cumulative effects to spotted owls and their habitat were analyzed thoroughly at multiple scales in the BA, including the current Environmental Baseline (BA pp. 16-26), and Cumulative Habitat Effects Summary (BA pp. 65). Unit Specific Data, including the environmental baseline and effects of proposed projects that are likely to adversely affect spotted owls, are summarized by Administrative Units in the Willamette Province (BA pp. 71-119), including the Cascades Resource Area where the Evans Mountain Thinning Project is located (BA pp. 79-86). The BO issued by the USFWS concurred with the analysis in the BA that the combined effects to spotted owl habitat and populations of all of the actions proposed in the Willamette Province (including the Evans Mountain Thinning Project) are not likely to jeopardize the continued existence of the spotted owl and are not likely to adversely modify spotted owl critical habitat (BO p. 114), and would not likely diminish the effectiveness of the conservation program established under the NWFP to protect the spotted owl and its habitat (BO pp. 114-115).

The proposed project would not contribute to cumulative effects to spotted owl habitat because suitable and dispersal habitat within and between known owl sites would be maintained, and no suitable habitat would be removed or downgraded within known owl sites. The amount of suitable habitat within the provincial home range of the Evans Mountain and Henline known spotted owl sites would not change as a result of thinning. Silvicultural prescriptions that promote multi-aged and multi-storied stands may increase the quality of spotted owl habitat over time (BO p. 84).

BLM Special Status Species and Survey and Manage

Thinning in the project areas, either individually or collectively, would not be expected to contribute to the need to list any Bureau Sensitive species under the Endangered Species Act (BLM 6840) because habitat for the species that are known to occur in the project areas would be not be eliminated, habitat connectivity would not be changed, any habitat alteration would have only short-term negative effects, and long-term effects could be beneficial.

The proposed action alternative would not contribute to cumulative effects to CWD associated species. Suitable habitat conditions would be maintained in the short term in the project areas, providing refugia for low-mobility amphibians and invertebrates. In the long term, larger trees would be available sooner than without thinning to contribute additional large CWD in future stands. Implementation of the project would not eliminate connectivity between proposed units or adjacent untreated stands under BLM management.

Adverse cumulative effects to red tree vole habitat is not expected because red tree voles are considered to be a late successional associate and only 14 acres of stands over 80 years old would be thinned. These stands would remain older forest cover after treatment. Undisturbed habitat in the same or similar age classes with connectivity to the thinning units exists within the project area, elsewhere within the affected sections. In the long term, thinned mid seral stands would attain older forest conditions sooner as a result of thinning, particularly in Riparian Reserves.

Migratory and Resident Birds

The proposed action would not reduce the persistence of any bird species in the watershed or populations at the regional scale. Habitat changes resulting from the proposed action would not

eliminate any forest cover type, change any habitat type or patch size, and therefore would not contribute to fragmentation of bird habitat. Thinning would not contribute to a fundamental change in the species composition of existing bird communities within the watershed. Therefore, no adverse cumulative effects would occur to migratory birds.

Big Game
No adverse cumulative effects to big game species populations are expected. The proposed action would not fundamentally change or eliminate any forest cover type or change any habitat patch size. Therefore, thermal and hiding cover present before treatment would be maintained after harvest. Also, the proposed action would not increase human traffic and disturbance in the long term because new roads would be blocked after use and access to existing road systems would remain unchanged.

No Action Alternative

Habitat Structure, Snags and Coarse Woody Debris
Overcrowded stands with low vigor and small crowns would grow more slowly compared to thinned stands. Self thinning would occur, but diameter growth would not accelerate as fast as in thinned stands. Snags and CWD created by self thinning mortality would not be large enough to meet RMP standards until later in the life of the stand (approximately 20 to 60 years) when suppressed co-dominates achieve these diameters before dying. Understory and ground cover development would take longer than if these stands were thinned. Without management intervention, stands would take longer to develop late successional habitat conditions and remain less diverse for a longer period of time.

Federally Listed Species: Northern Spotted Owl
There would be no immediate change in spotted owl habitat and no effect to spotted owls caused by management action. Habitat conditions would remain as described in the Affected Environment, and would continue to develop slowly over time for reasons stated above. In unthinned areas, it would take approximately 20 to 60 years to develop suitable habitat conditions if left untreated.

BLM Special Status and Survey and Manage Species
In the short term, there would be no immediate change in current habitat conditions for Survey and Manage and BLM Special Status Species. In the long term (20 to 60 years) trees will grow more slowly, and material available for CWD recruitment would average smaller in diameter than if thinning were to occur. Development of Oregon slender salamander habitat conditions would likely be delayed without the addition of new large woody material to replace existing well-decayed material that will eventually disappear. Since no new disturbance to the conifer canopy would occur, no undetected red tree vole nests would be affected. Optimal red tree vole habitat conditions, presumed to be older forest conditions, would develop more slowly without thinning.

Migratory and Resident Birds
Habitat conditions would remain as described in the Affected Environment, and would continue to develop slowly over time. Species richness of bird communities would reflect the simple mid seral stages for a longer period of time, and overall bird species richness would be less than if these stands were thinned. Bird species richness may not noticeably increase, and legacy features in the future stand would likely be smaller and less persistent, especially those that provide habitat for cavity-nesting species.

Big Game
In the short term (less than 5 years), there would be no disturbance effects due to the proposed action. Thermal and hiding cover quality would remain the same as current conditions. There would be no increase in vegetative forage due to increased light to the forest floor. In the long term (5+ years), thermal and hiding cover quality could gradually decrease as overstocked stands mature. Forage quantity would continue to decrease over time as less light reaches the forest floor.

3.1.6 Air Quality / Fire Hazard/Risk

Source Incorporated by Reference: *Evans Mountain Air Quality, Fire Risk, and Fuels Management Specialist Report., Mortensen (Fuels Report)*

Affected Environment

Air Quality
The major source of air pollutants within the Evans Mountain analysis area would come from potential wildfire starts, resource management activities including prescribed burning (hand, machine, and landing piles), and dust from the use of natural-surfaced roads.

The Willamette Valley experiences periods of air stagnation. When this occurs during winter months, cold air often becomes trapped near the valley floor with slightly warmer air aloft, creating temperature inversion conditions, causing air pollutants to become trapped near the ground. Wintertime temperature inversions contribute to high particulate levels. Stagnant periods in the summertime contribute to increases in ozone levels, causing the local air quality to deteriorate. The State of Oregon has designated the Willamette Valley as a Smoke Sensitive Receptor Area.

Fire Risk
The climate in Northwest Oregon is generally mild and wet in the winter. In the North Cascade mountain range, snowfall remains at higher elevations for an extended period of time. Summers are warm with periods of dry weather usually during the months of July, August, and September. Summer temperatures during this period average approximately 60° F with high temperatures reaching the mid to upper 90s, and occasionally topping 100° F for short periods of time. During average weather years, the conditions under the forest canopy remain relatively moist.

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

The main cause of wildfires across the analysis area is people. Dry lightning (lightning without rain) that occurs during the summer months is rare in Northwest Oregon. Within the Oregon Department of Forestry's Northwest Oregon Area - North Cascades District - Santiam Unit over the last ten years one-fire start is attributed to lightning. The average size of all the fires in the analysis area is approximately 2.25 acres. (http://oregon.gov/ODF/FIRE/HLCause.pdf). The entire analysis area is located behind locked private gates further reducing access by the public, and the risk of a fire start.

Fire Regime and Condition Class (FRCC)
The Fire Regime classifies the role fire would play across the landscape in the absence of modern human intervention. The Condition Class classifies the amount of departure from the natural fire regime. The modeling predictions for fire regime and condition class come from the LANDFIRE Rapid Assessment Vegetation Models.
(http://www.fs.fed.us/database/feis/fire_regime_table/fire_regime_table.html)

The model identifies the analysis area as falling within the Pacific Northwest Forested landscape. The analysis area's potential natural vegetation group is listed as Douglas-fir-western hemlock (dry mesic) and Douglas-fir-western hemlock (wet mesic), and it falls within two different Fire Regimes. For a description of Fire Regimes and Condition Class see:
http://www.nwcg.gov/teams/wfewt/archive/message/FrccDefinitions.pdf

Fire Regime III is characterized by a moderate to low fire return interval with a mixed severity and is associated with south and west facing slopes. Fire Regime V is characterized by a low fire return interval with a high severity and is associated with north facing slopes. More than 80% of fires are characterized as mixed or low severity.

The timber stands in the analysis area generally fall within Condition Class 2 or 3 with species composition and structure functioning outside their natural (historical) range due to overstocking and past harvest treatments.

Management of the surrounding private land affects the Condition Class to such an extent that actions within the Evans Mtn. project area are unlikely to change the Condition Class rating across the landscape.

Timber Stand and Fire History
The fire history of the Evans Mountain Thinning analysis area is not well documented, although it is known that Native Americans burned within the Willamette Valley, to what extent this burning extended into the valley foothills and up the river corridors is not specifically known. Fire does play a major role as a natural disturbance agent, as do people. The Oregon Dept. of Forestry has documented that in 1951 the Sardine Creek Fire burned 21,400 acres to the northeast of Mehama. The fire was noted to have started from a discarded cigarette. The analysis area has experienced forestry related management activities in the past. The northwest ¼ of Section 29 was harvested in the early 1950's and planted with Douglas-fir seedlings in 1954. Section 24 appears from 1955 aerial photos to have had parts of the analysis area harvested, and then in the mid 1960's the area was reharvested and the remaining trees were removed. The sale was then aerially seeded with Douglas-fir seed in 1967 and replanted in 1972. Many harvest units of this time period had broadcast burning or spot burning associated with them, both for hazard reduction and for site preparation prior to planting. Tree cores and fire scars collected throughout the Willamette Province from trees harvested from 1950 to 1980 provide evidence that historic fire return intervals in the analysis area range from 50-150 years in the lower elevations and south facing aspects, and up to 300 years in the higher elevations and north aspects.

The average fire return interval increased following the advent of fire suppression in 1910. It has been decades since the most recent man-caused disturbance (logging) occurred. Although fire has been excluded from the landscape, the analysis area is still well within the range of a normal fire return interval.

Environmental Effects

Proposed Action

Air Quality

Travel would occur over BLM and other roads. Dust created from vehicle traffic from proposed project activities on gravel or natural-surface roads would contribute short-term (during project work) effects to air quality. These effects would be localized to the immediate vicinity of the operations.

Following treatment, the fuel load would increase. Post treatment fuels surveys would be conducted and 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. If these methods determine that an increased fire hazard exists, prescribed burning would be conducted and smoke would be generated.

Hand, machine, and landing pile construction and burning in the commercial and low density thinning areas, and along roads or property lines would be targeted for treatment because human activity and the risk of ignition is greatest in these areas. Approximately 30 acres could be treated with prescribed fire. This would remove approximately 55tons of slash per acre or approximately 1700 total tons from the highest risk areas within the project.

All prescribed burning would require a project level Prescribed Fire Burn Plan that adhere to smoke management and air quality standards, meet the objectives for land use allocations, and maintain or restore ecosystem processes or structure. The burn plan would comply with the NWOR Fire Management Plan for the Eugene District BLM, Salem District BLM, Siuslaw National Forest, and the Willamette National Forest dated May 20, 2009. 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.

Burning would be conducted when the prevailing winds are blowing away from Smoke Sensitive Receptor Areas (SSRAs) in order to minimize or eliminate the potential for smoke intrusions. The potential for a smoke intrusion would be further reduced by burning under atmospheric conditions that favor good vertical mixing so that smoke and other particulate matter is borne aloft and dispersed by upper elevation winds.

Prescribed burning would cause short-term impacts to air quality that would persist for one to three days within one-quarter to one mile of units. None of the treatment units are sufficiently close to any major highways that motorist safety would be affected. The overall effects of smoke on air quality is predicted to be local and of short duration. Activities associated with the proposed action would comply with the provisions of the Clean Air Act.

Fire Risk
Following treatment the fuel load, risk of a fire start, and the ability to control a fire, would all increase as a result of the proposed action, and would be greatest during the first season following treatment when needles dry but remain attached to tree limbs. The modeling predictions for fire behavior (Anderson, April 1982) based on the National Fire Danger Rating System (NFDRS) fuel models would move the variable density thinning stands from a Fuel Model 8 (Closed timber litter) to Fuel Model 11 (Light logging slash), or Fuel Model 12 (Medium logging slash). All treatment areas would see a short-term (0-5 year) increase in fire ignition potential because of the increase in fine dead fuels.

Thinning trees would decrease both the amount of potential ladder fuels and the available fuel density in the canopy (canopy bulk density). A relative density of 35-45% basal area 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 for all of the units in the analysis area falls within or below this range.

The project proposes to reduce the risk of a fire by decreasing the fuel load in areas that are accessible to people. Surface fuels would be reduced in strategic locations such as along roads, property lines, and within low density thinning areas. The treatments would reduce surface fuels resulting in lower fire intensity, rates of spread and flame lengths. In addition the entire analysis area is located behind locked private gates further reducing access by the public, and the risk of a fire start.

The Oregon Department of Forestry has responsibility for fire protection on BLM managed land in western Oregon. Their ability to successfully control wildfires in the fuels treatment areas as small, low intensity, ground fires would remain high. For the short-term (0-5 years), the fire risk would increase in the commercial thinning and low density treatment areas, however due to decreased crown density and reduction in ladder fuels, containment of wildfires at less than 10 acres in size should continue to be attainable during initial attack.

Cumulative Effects

There would be no cumulative effects to air resources, as the direct and indirect effects from the project would be local and of short duration, and there would be no other uses in the project area affecting this resource. Based on past experience with handpile burning in this and other similar areas, confirming the short duration of smoke and effectiveness of adherence to smoke management plans, there are no expected cumulative effects on air quality from the planned fuels treatment under this proposal.

There would be an increase in fuel loading and resultant fire hazard in the short-term (0-1 year). In the commercial thinning, low density thinning areas, along roads, and property lines, the hazard and risk would be minimized by the use of fuels reduction treatments. The localized increase in fire risk would diminish to background levels over time as slash decomposes. There would be positive benefits to the thinned stands in the longer term due to the wider spacing between tree crowns and the removal of most of the ladder fuels that are conducive to the spread of fire into the tree canopy. At a watershed scale, the thinning of approximately 252 acres of forest habitat would have very little effect on fire intensity or starts . However, due to reduced bulk density and ladder fuels, the potential for the stand to carry a crown fire would reduce in the long term(>5 years).

No Action Alternative

Air Quality
Under the No Action alternative there would be no commercial thinning, road construction, log hauling, or any need for prescribed burning and; therefore, there would be no localized effects to air quality. However, as the timber stands continue to grow, the increased stocking density would cause the stands to become more susceptible to a stand replacement fire event. In the event of a wildfire, poor air quality is expected due to the high volume of smoke produced.

Fire Risk
The analysis area would continue on its current trend. The current risk of a fire start would remain low. There would be a slow increase in the coarse woody fuel load (1000 hour fuel class and in the smaller size fuel classes, (1, 10, and 100 hour fuels) in these timber stands as stress-induced mortality within the stands increases. Ladder fuel densities would increase as trees are suppressed in the understory, shade tolerant species seed in, and dominant trees grow larger. The potential for these stands to eventually succumb to a wildfire would continue to increase as they near the maximum fire return interval and the condition class departs further from the natural fire regime.

3.1.7 Recreation, Visual Resources and Rural Interface, Wilderness Characteristics

Source incorporated by reference: Recreation/Visual/Rural Interface Report, Meredith 2010.

Affected Environment

Recreation
The project areas are within a forest setting accessed by gravel roads. Evidence of man-made modifications (roads, timber harvest activities, utilities, buildings, houses) is visible from both private and public lands within or in the vicinity of the project area. The project area has dispersed recreation with no developed recreation sites. The Little North Fork road has designated recreation sites and a large amount of dispersed recreation along the roadway. Four recreation sites, North Fork and Bear Creek County Parks, Canyon Creek, and Elkhorn Valley are over four miles to the southwest of the proposed units. The Little North Fork Special Recreation Management Area encompasses these recreation sites continuing up the canyon to forest service lands. A special recreation management area designates where dollars and resources are spent managing recreation.

The off-highway vehicle (OHV) designation of the project area restricts vehicle use to existing roads and designated trails however many roads are gated. No designated OHV trails are within the project area. Activities that may occur in the area include OHV riding, biking, hunting, target shooting, driving for pleasure, and special forest product harvest. Trails exist over ½ mile to the east within the Opal Creek Wilderness and on Forest Service lands.

Visual Resources
Visual Resource Management (VRM) of this area is VRM class 3 based on the current project location and the provisions of the Salem RMP. On VRM 3 lands: "Manage visual resource class 3 lands for moderate levels of change to the characteristic landscape. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements of

form, line, color, and texture found in the predominant natural features of the characteristic landscape (RMP p. 37)."

Rural Interface Areas (RIAs)
The proposed project area is not within a rural interface zone as defined in the Salem District Resource Management Plan page 39. Rural interface zones are BLM-administered lands where they intersect a created half-mile buffer around county zoning. The BLM must take into account homes located near proposed projects even though a project is outside of a rural interface zone, such as the homes in section 32. The closest rural interface zones are more than a tenth of a mile away. The haul route would pass residential houses and pass through rural interface zones.

In general, the concerns of property owners near timber harvest and hauling activities tend to be associated with noise, traffic, and dust from logging and hauling activities, effect to scenic, water and wildlife values, increased public access that may lead to problems with fire hazard, garbage, dumping, and vandalism. Roads surrounding these proposed units have historically experienced log truck traffic.

Wilderness Characteristics
There is no designated wilderness within the project area. The Forest Service's Opal Creek Wilderness is adjacent east of unit 29. An evaluation of wilderness characteristics in 2006 found wilderness character within Township 8 South, Range 4 East, Section 29, which is part of a larger Bull of the Woods/Opal Creek Addition.

Other Resources
There are no designated Wild and Scenic Rivers within the project area. Elkhorn Creek Wild and Scenic River boundary is over 1.7 miles to the south of the proposed units. The outstandingly remarkable values if this wild designated river include scenery and other values. Little North Santiam River is an eligible recreational Wild and Scenic River along the North Fork County Road over ½ mile to the south.

Environmental Effects

Proposed Action

Recreation
Dispersed recreation use within the proposed units would be restricted approximately three to five years during timber management activities but would return to prior usage upon completion of harvest. Other BLM lands nearby would remain available for recreational opportunities. Recreational users in the vicinity would hear the noises of the timber sale operations and may experience traffic delays of minutes to hours. Tree removal from the proposed units would leave the undergrowth vegetation crushed. Most undergrowth vegetation would return within five years. No reconstruction of unauthorized trails would be allowed. If present, Harvest operations may damage or obliterate unauthorized trails.

Off-highway vehicle (OHV) use would be expected to increase if gates, roads, and skid trails remain open and are not locked or blocked after harvest operations. Passing vehicles and OHVs could create a fire ignition source from vehicle sparks, heating grasses (fine fuels) from idle vehicles, or tossing out

burning materials such as cigarettes. Approximately half of the area is behind locked gates, reducing the potential for OHV damage or fire risk.

Visual Resources
The project units are in the background to middle ground. Using visual simulation, portions of units 24A, 24B, and 29A are visible in the distance when looking from major public travel routes, and may not be observable since the rolling mountains, remaining trees, and vegetation block the view (Table 18). For the most part BLM lands are unidentifiable from other lands when looking at the landscape from any vantage point. Traffic speeds reduce the time any unit is visible. No special visual features or specific concerns were identified in scoping.

Table 18. Unit visibility from public travel

Visibility					
	24A	24B	29A	29C	30A
Percent Visible	31	64	12	0	0
Acreage Visible	16.2	32	8.65	0	0

The proposed projects would comply with VRM objectives. Visual disturbance of the project area would be associated with modifications to vegetation and other ground disturbing activities from timber sale operations. Evidence of harvest activities would not be observable within five years as understory vegetation returns to a more natural appearance and the remaining stand continues to mature. A forest setting and much of the canopy would remain. Harvest activities would remove a portion of trees from the proposed units leaving undergrowth vegetation crushed. Logging debris and crushed undergrowth vegetation would continue turning brown to red as it dies leaving the view of the units undesirable. Fuel treatment of logging debris if burned would result in short-term decline in visual quality from smoke leaving the units blackened. Fuel treatments would comply with state smoke management regulations, reducing the affect to visual quality to a few days. Understory vegetation and the remaining trees would rebound, grow, and continue to green up covering logging debris and burn pile scars. Project design features, time in view and unit locations minimize any adverse effect to scenic resources and thus would meet VRM class 3 objectives.

Rural Interface Areas (RIAs)
There would be no affect to rural interface areas since they are not present within the project area. Since the BLM has the responsibility to take into account homes outside of RIA, residences along the haul route and in close proximity to timber harvest activities may hear equipment harvesting trees, noise from log truck traffic, experience dust from gravel road traffic, and experience delays for safety. Disturbance from this proposed timber harvest would be short-term lasting a few weeks to months. The project would have no effect on rural interface zones other than increased log truck traffic with their associated effects including noise, dust and traffic impacts.

Wilderness Characteristics
The removal of lands containing wilderness characteristic from timber harvest activities results in no affect to this resource. Harvest operations on adjacent uphill portions may have an effect by falling timber downhill towards the lands with wilderness characteristics by having limbs, vegetation, and tree boles damaged. In addition, these lands contain no roads or skyline corridors.

Cumulative Effects

Timber harvest would intermittently interrupt recreation activities for approximately three to five years. Following activities, recreation use is expected to return to current levels. Additional road closures may occur upon completion of harvest activities. This project would have minimal to no impact on recreational uses due to the fact there are other opportunities available.

Looking at aerial photos it is evident that timber management / harvest activities have occurred for many years. It is reasonable to assume such activities will continue to occur in the view shed, both thinning and regeneration harvest activities. Timber management activities are likely to continue on both private and public lands in the vicinity. Timber management activities would continue to result in temporary changes to visual resources while logging debris and crushed undergrowth vegetation dies turning brown to red. If logging debris piles are burned blackened areas would be visible until vegetation growth covers the scars. Smoke would dissipate. Vegetation would green up and return within five years leaving the units less noticeable from roads and residences.

No Action Alternative

With the exception of unexpected changes (i.e. wildfire or disease), the proposed units would continue to provide a forest setting for dispersed recreation opportunities and local residents. A three to five year increase in log truck traffic, noise and other disturbances related to the harvest of the proposed units would not occur. Timber management activities and log truck traffic would continue on both private and public lands in the vicinity. No modifications to the landscape character of the project area would be expected to occur. Modifications to the landscape character in the area around the projects would still be expected, as a result of activities on other lands.

3.1.8 Project's Compliance with Authorities or Management Direction

Table 19. Project's Compliance with Authorities or Management Direction

Authorities or Management Direction	Compliance / Effects
Aquatic Conservation Strategy	All the EA section show how the Evans Mountain Thinning project complies with the Aquatic Conservation Strategy especially 3.1.9.
Air Quality (Clean Air Act as amended (42 USC 7401 et seq.)	This project complies with this direction because air quality impacts would be of short duration. Addressed in EA section 3.1.6
Cultural Resources (National Historic Preservation Act, as amended (16 USC 470) [40 CFR 1508.27(b)(3)], [40 CFR 1508.27(b)(8)]	Cultural resource inventories were conducted in compliance with Section 106 of the National Historic Preservation Act according to Appendix A of *The Protocol for Managing Cultural Resources on Lands Administered by the Bureau of Land Management in Oregon.* In addition to the inventories, record searches have determined that there are no known cultural resources existing within the project area. Ea Section 1.3.3, #3
Cumulative Effects [40 CFR 1508.27(b)(7)]	Addressed in EA section 3.1
Ecologically critical areas [40 CFR 1508.27(b)(3)]	This project would have no effect on this element because there are no ecologically critical areas present within the project area.
Energy Policy (Executive Order 13212)	This project complies with this direction because this project would not interfere with the Energy Policy (Executive Order 13212).
Environmental Justice (E.O. 12898, "Environmental Justice" February 11, 1994)	This project complies with this direction because project would have no effect on low income populations.

Authorities or Management Direction	Compliance / Effects
Fish Habitat, Essential (Magnuson-Stevens Act Provision: Essential Fish Habitat (EFH): Final Rule (50 CFR Part 600; 67 FR 2376, January 17, 2002)	This project complies with this direction because EFH would not be affected. Addressed in EA section 3.1.3
Farm Lands, Prime [40 CFR 1508.27(b)(3)]	The project would have no effect on this element because no prime farm lands are present on BLM land within the project area.
Floodplains (E.O. 11988, as amended, Floodplain Management, 5/24/77)	This project complies with this direction because the proposed treatments would not change or affect floodplain functions.
Hazardous or Solid Wastes (Resource Conservation and Recovery Act of 1976 (43 USC 6901 et seq.) Comprehensive Environmental Repose Compensation, and Liability Act of 1980, as amended (43 USC 9615)	This project would have no effect on this element because no Hazardous or Solid Waste would be stored or disposed of on BLM lands as a result of this project.
Healthy Forests Restoration Act (Healthy Forests Restoration Act of 2003 (P.L. 108-148)	This project complies with this direction because treatments would decrease the risk of wildfire and help restore forests to healthy functioning condition (EA Section 3.1.1, 3.1.6)
Migratory Birds (Migratory Bird Act of 1918, as amended (16 USC 703 et seq)	This project complies with this direction because treatments would increase the overall habitat diversity for migratory birds and increase overall bird species richness in the long term (20 years). Addressed in text (EA Section 3.1.5)
Native American Religious Concerns (American Indian Religious Freedom Act of 1978 (42 USC 1996)	This project complies with this direction because no Native American religious concerns were identified during the scoping period (EA section 1.3.1).
Noxious weed or non-Invasive, Species (Federal Noxious Weed Control Act and Executive Order 13112)	This project complies with invasive/non-native species policies and direction because Project Design Features would help in preventing the establishment of new populations of invasive plant species and because native vegetation development would result in decline in both number and vigor of invasive plant populations in the project area. Addressed in EA section 3.1.1
Oregon Smoke Management Plan (OR Dept. of Environmental Quality)	Burning of slash would be conducted in accordance with the Oregon State Smoke Management Plan. (EA section 3.2.6)
Park lands [40 CFR 1508.27(b)(3)]	The project would have no effect on this element because there are no parks within or adjacent to the project area.
Public Health and Safety [40 CFR 1508.27(b)(2)]	The project would have no effect on this element because the public would be restricted from the project area during operations and the project would not create hazards lasting beyond project operations.
Threatened or Endangered Species (Endangered Species Act of 1973, as amended (16 USC 1531)	This project complies with this direction because effects of the project were considered and consultation under section 7 has been completed (EA section 3.1.1; 3.1.3; 3.1.5).
Water Quality –Drinking, Ground (Safe Drinking Water Act, as amended (43 USC 300f et seq.) Clean Water Act of 1977 (33 USC 1251 et seq.)	This project complies with this direction because ODEQ water quality standards would be adhered to and the area hydrology would not be changed measurably. Addressed in EA section 3.1.2
Wetlands (E.O. 11990 Protection of Wetlands 5/24/77) [40 CFR 1508.27(b)(3)]	This project complies with this direction because wetlands are excluded from treatment, and would be protected by buffers. (EA section 3.1.2)
Wild and Scenic Rivers (Wild and Scenic Rivers Act, as amended (16 USC 1271) [40 CFR 1508.27(b)(3)]	This project complies with this direction because there are no Wild and Scenic Rivers within or adjacent to the project area. (EA section 3.1.7)

Authorities or Management Direction	Compliance / Effects
Wilderness (Federal Land Policy and Management Act of 1976 (43 USC 1701 et seq.); Wilderness Act of 1964 (16 USC 1131 et seq.)	This proposed action complies with this direction because there are no Wilderness Areas, areas being considered for Wilderness Area status, or lands containing wilderness characteristics in the project area.
Federal, State, and Local law and requirements imposed for the protection of the environment.	This proposal and the no action alternative each fully comply with applicable Federal, State and Local laws including requirements for the protection of the environment.

3.1.9 Compliance with the Aquatic Conservation Strategy

Based on the environmental analysis described in the previous sections of the EA, Cascades Resource Area Staff have determined that the project complies with the ACS on the project (site) scale. The project complies with the four components of the Aquatic Conservation Strategy, as follows:

ACS Component 1 - Riparian Reserves

The project would comply with Component 1 by maintaining canopy cover along all streams and wetlands, which protect stream bank stability and water temperature. Stream Protection Zones (SPZ) would protect streams from direct disturbance from logging. Road and landing locations have been minimized in Riparian Reserves. Addressed in text (EA sections 3.2.2-3.2.3).

ACS Component 2 - Key Watershed

The Little North Santiam 5th field watershed is a Tier 1 Key Watershed (RMP p. 6, ROD p. B-18). The project would comply with Component 2 because the project would not result in a net increase in road mileage. (EA section 2.2.2).

ACS Component 3 – Watershed Analysis

The project would comply with Component 3 by incorporating the following recommendations from the Little North Santiam Watershed Analysis (LNSWA). Density management and thinning in Riparian Reserve to develop older forest stand characteristics in younger age classes. Thinning in this project is designed to develop the large tree component faster, leading to earlier potential for recruiting CWD, snag, and large tree habitat and to develop understory vegetation. Maintains 50 percent average crown closure in Riparian Reserve. Untreated areas provide additional range of species and density mix.

In the LNSWA, Recommendation #5 addresses thinning younger stands in Riparian Reserve: "Implement density management prescriptions in RR, LSR to develop and maintain older forest stand characteristics in younger age classes. Desirable stand characteristics include larger trees for a large green tree component and recruitment of large standing dead/down CWD in future stands, multi-layered stands with well developed understories, and multiple species that include hardwoods and other minor species (LNSWA Chapter 7, page 5).

Recommendations for management in Riparian Reserve include implementing density management prescriptions to develop and maintain older forest stand characteristics in younger age classes. Desirable stand characteristics include larger trees for a large green tree

component and recruitment of large standing dead/down CWD in future stands, multi-layered stands with well developed understories, and multiple species that include hardwoods and other minor species" (chapter 7, page 5).

ACS Component 4 – Watershed Restoration

The project would comply with Component 4 by the combination of thinning and unthinned areas in Riparian Reserves, which would further enhance terrestrial habitat complexity in the long and short term. Thinning in all LUAs would be expected to result in long-term restoration of large conifers and the potential for material that would contribute to in-stream habitat complexity in the long-term.

Aquatic Conservation Strategy Objectives (ACSO)

1. **ACSO 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.** Addressed in Text (EA sections 3.1.1, 3.1.5). In summary:

   No Action Alternative: The No Action alternative would maintain the development of the existing vegetation and associated stand structure at its present rate. The current distribution, diversity and complexity of watershed and landscape-scale features would be maintained. Faster restoration of distribution, diversity, and complexity of watershed and landscape features would not occur.

   Proposed Action: The proposed combination of thinning from below and unthinned areas in the Riparian Reserve Land Use Allocation (RR) would result in forest stands that exhibit attributes typically associated with stands of a more advanced age and stand structural development (larger trees, a more developed understory, and an increase in the number, size and quality of snags and down logs) sooner than would result from the No Action alternative.

   Since Riparian Reserve provides travel corridors and resources for aquatic, riparian dependent and other late-successional associated plants and animals, the increased structural and plant diversity would ensure protection of aquatic systems by maintaining and restoring the distribution, diversity and complexity of watershed and landscape features.

2. **ACSO 2: Maintain and restore spatial and temporal connectivity within and between watersheds.** Addressed in Text (EA sections 3.1.1,3.1.3, 3.1.5) In summary:

   No Action Alternative: The No Action alternative would have little effect on connectivity within the affected watershed except in the long term.

   Proposed Action: Long term connectivity of terrestrial watershed features would be improved by enhancing conditions for stand structure development. In time, the Riparian Reserve LUA would improve in functioning as refugia for late successional, aquatic and riparian associated and dependent species. Both terrestrial and aquatic connectivity would be maintained, and over the long-term, as the Riparian Reserve LUA develops late successional characteristics, lateral, longitudinal and drainage connectivity would be restored.

3. **ACSO 3: Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations**. Addressed in Text (EA sections 3.1.2, and 3.1.3). In summary:

   No Action Alternative: The current condition of physical integrity would be maintained.

   Proposed Action: Physical integrity of channels at existing stream crossings would be altered for one to several years following maintenance and/or installation of stream crossings. Within the road prism (estimated at 30 feet maximum width), the channel surface, banks, bed and vegetation would be disturbed by the removal of fill material and culverts. The bed/banks would be reshaped and stabilized with woody debris and vegetation when the crossing is permanently removed and/or re-buried with the installation of a new culvert. Disturbance would be limited to the original "footprint" at the site. Due to the stable nature of channels at these locations, little to no additional disturbance to channel morphology would be expected either upstream or downstream from the proposed culvert work.

4. **ACSO 4: Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems.** Addressed in Text (EA sections 3.1.2, and 3.1.3). In summary:

   No Action Alternative: It is assumed that the current condition of the water quality would be maintained. Since at least one culvert is plugged and eroding the roadbed, it is reasonable to assume that one or more culvert failures could cause short term degradation of water quality at some time.

   Proposed Action: Stream Protection Zones (SPZs) in the Riparian Reserve LUA (RR) would be maintained. The proposed new roads are on ridge top or upper-slope locations with no hydrologic connections to streams. Overall, the Proposed Action would have no measurable effect on stream temperatures, pH, or dissolved oxygen. Sediment transport and turbidity in the affected watersheds is likely to increase over the short term as a direct result of road renovation/culverts at stream crossings. Turbidity increases would not be visible beyond 800 meters (0.5 mile) downstream from road/stream intersections and would not be expected to affect beneficial uses. Over the long-term (beyond 3-5 years), current conditions and trends in turbidity and sediment yield would likely be maintained under the Proposed Action.

5. **ACSO 5: Maintain and restore the sediment regime under which aquatic ecosystems evolved.** Addressed in Text (EA sections 3.1.2, 3.1.3, and 3.1.4). In summary:

   No Action Alternative: It is assumed that the current sediment regime would be maintained. Since at least one culvert is plugged and eroding the roadbed, it is reasonable to assume that one or more culvert failures could cause short term increase in sediment at some time.

   Proposed Action: Stream protection Zones (SPZs) in RRs would be a minimum of 85 feet wide on perennial streams and 50 feet on intermittent streams in treatment areas, and within 1 mile of listed fish habitat SPZs would be a minimum of 100 feet on perennial streams, and 50 feet on intermittent streams. Hauling restrictions and best management practices would maintain the sediment delivery within its natural range.

6. **ACSO 6: Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing.** Addressed in Text (*EA sections 3.1.2, and 3.1.3*). In summary:

   No Action Alternative: No change in in-streams flows would be anticipated.

   Proposed Action: A preliminary analysis for the risk of increases in peak flow as a result of forest harvest was conducted using the Oregon Watershed Assessment Manual watershed analysis methods for forest hydrology (OWEB, 1997). Because the proposed project would maintain canopy cover greater than 35% and would not build permanent roads, and improve failing culverts, it is unlikely to produce any measurable effect on stream flows.

7. **ACSO 7: Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.** Addressed in Text (*EA sections 3.1.2*). In summary:

   No Action Alternative: The current condition of flood plains and their ability to sustain inundation and the water table elevations in meadows and wetlands is expected to be maintained.

   Proposed Action: With the exception of road renovation at stream crossings, all operations, equipment and disturbances would be kept a minimum of 85 feet from all wetlands and perennial stream channels, and 50 feet from all intermittent stream channels. The proposed action would maintain the current condition of floodplain inundation and water tables.

8. **ACSO 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.** Addressed in Text (EA sections 3.1.1; 3.1.2; and 3.1.3). In summary:

   No Action Alternative: The current species composition and structural diversity of plant communities would continue along the current trajectory. Diversification would occur over a longer period of time.

   Proposed Action: Biological and physical riparian areas would be contained entirely within stream protection zones (SPZ). SPZ and other untreated areas would maintain the current species composition and structural diversity of plant communities in riparian areas and wetlands from 50 feet (intermittent streams) to 85 feet (perennial streams) in treatment areas. SPZ minimum widths are wider within one mile of listed fish habitat, as described in the text (EA section 2.2.1).

9. **ACSO 9: Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.** Addressed in Text (EA sections 3.2.1; 3.2.2; 3.2.3 and 3.2.5). In summary:

   No Action Alternative: Habitats would be maintained over the short-term and continue to develop over the long-term with no known impacts on species currently present.

Proposed Action: The Proposed Action would have no adverse effect on riparian dependent species. Although thinning activities in the short term may affect some species within the treatment areas, adjacent non-thinned areas should provide adequate refugia for these species. In the long term, the treatments would restore elements of structural diversity to treatment areas in the Riparian Reserve LUA. These attributes would help to provide resources currently lacking or of low quality, and over the long-term, would benefit both aquatic and terrestrial species.

4.0 LIST OF PREPARERS

Table20. List of Preparers

Resource	Name	Initials	Date
Writer/Editor	Mike Mathews / David Simons	DLS	7/1/13
NEPA Review	David Simons	DLS	7/1/13
Botany	Terry Fennell	TGF	6/26/13
Cultural Resources	Heather Ulrich	HAU	06/26/2013
Engineering	Amy Herburger	ALH	6/12/13
Fire/Fuels	Kent Mortensen	KCM	7/1/13
Fisheries	Bruce Zoellick	BWZ	6/28/13
Hydrology/ Water Quality	Patrick Hawe	WPH	6/27/13
Logging Systems	Bonnie Trefren	BJT	6/28/13
Recreation, Visual Resources Management and Rural Interface	Traci Meredith	TMM	6/28/13
Silviculture	Dugan Bonney	DPB	7/2/2013
Soils	Patrick Hawe	WPH	6/27/13
Wildlife	Jim England	JSE	6/28/2013

Reviewed and released for public comment by the Cascades Resource Area Field Manager

Date: 9/18/2013

John Huston,
Field Manager, Cascades Resource Area

5.0 CONTACTS AND CONSULTATION

5.1 Consultation

5.1.1 US Fish and Wildlife Service

The Evans Mountain Thinning Project was submitted for Formal Consultation with U.S. Fish and Wildlife Service (USFWS) as provided in Section 7 of the Endangered Species Act (ESA) of 1973 (16U.S.C. 1536 (a)(2) and (a)(4) as amended) during the FY 2013 consultation process. The *Biological Assessment of Likely to Adversely Affect (LAA) Projects with the Potential to Modify the Habitat of Northern Spotted Owls, Willamette Planning Province - FY 2013* (BA) was submitted in August 2012. Using effect determination guidelines, the BA concluded that the Evans Mountain Thinning may affect, but is not likely to adversely affect the northern spotted owl due to the modification of suitable habitat within 300 meters of a site center (BA, pp. 28-30, 33-34, 56-57).

The *Biological Opinion (BO) Regarding the Effects of Habitat Modification Activities on the Northern Spotted Owl and its Critical Habitat within the Willamette Province, FY 2013* (BO) associated with the Evans Mountain Thinning Project was issued in October 2012 (FWS reference #01EOFW00-2012-F-0158). The BO concurred that the habitat modification activities described in the BA, including the Evans Mountain Thinning, are not likely to jeopardize the continued existence of the spotted owl and are not likely to adversely modify spotted owl critical habitat (BO pp. 92-93). Furthermore, the proposed action is not likely to diminish the effectiveness of the conservation program established under the NWFP to protect the spotted owl and its habitat on federal lands within its range (BO pp. 114-115).

The proposed thinning and connected actions described in this EA have incorporated the applicable General Standards that were described in the BA (p. 10) and BO (BO, pp. 19-20); and comply with all reasonable and prudent measures outlined in the BO (BO, pp. 116-118). This includes delaying proposed activities to avoid disrupting owls at known or predicted owl sites until after the critical nesting season, and monitoring/reporting on the implementation of this project to the U.S. Fish and Wildlife Service.

5.1.2 National Marine Fisheries Service

Consultation with the National Marine Fisheries Service (NMFS) on effects of the Evans Mountain Thinning project on Upper Willamette River (UWR) Chinook salmon and UWR winter steelhead trout is not required because the thinning sale would have no effect on these species or on essential fish habitat. Most thinning units are more than one mile upstream of steelhead and salmon habitat in lower Evans Creek and the Little North Santiam River. One project unit is located 0.7 mile upstream of listed fish habitat. No-disturbance buffer widths on tributaries within one mile of listed fish habitat of 200 feet on perennial streams, and 50 feet on intermittent 1st and 2nd order tributaries would be adequate to maintain stream shading and thus stream temperature, and intercept and infiltrate water carrying sediment preventing its delivery to listed fish habitats (LFH). Thinning in headwater tributaries would not affect LW supplies in LFH in Evans Creek and Little North Santiam River as flows are too small to deliver LW to LFH from the areas being thinned.

5.1.3 Cultural resources

Section 106 Consultation with State Historical Preservation Office Compliance was completed according to Appendix A of the Protocol for Managing Cultural Resources on Lands Administered by the BLM in Oregon. Cultural resource inventories conducted according to protocol did not yield any cultural resources, a cultural resources inventory report (Greatorex, 2012) is being finalized and will be mailed to the State Historic Preservation Office and no further consultation is necessary. EA section 1.3.3 #3 contains more detail.

5.2 Public Scoping and EA Public Comment Period

For the results of project scoping, see EA section 1.3. The EA and FONSI will be made available for public review from September 25, 2013 to October 25, 2013 and posted at the Salem District website at http://www.blm.gov/or/districts/salem/plans/index.php.

The notice for public comment will be published in a legal notice in the ***Stayton Mail*** newspaper. Written comments should be addressed to John Huston, Field Manager Cascades Resource Area, 1717 Fabry Road SE., Salem, Oregon 97306. Emailed comments may be sent to BLM_OR_SA_Mail@blm.gov. Attention: John Huston

6.0 LIST OF INTERDISCIPLINARY TEAM REPORTS INCORPORATED BY REFERENCE

The Interdisciplinary team reports can be found in the Evans Mountain Thinning EA project file and are available for review at the Salem District Office.

Tanner, A., & Soo, L., 2012 Evans Mountain Silvicultural Prescription – Commercial Thinning, Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

England, J., 2012. Cascades Resource Area Wildlife Report Evans Mountain Project, Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Fennell, T., 2010. Cascades Resource Area Botanical Report Proposed Evans Mountain Thinning Timber Sale, Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Greatorex, Fred., 2012, Cultural Resource Inventory Reports, Evans Mountain Timber Sale Pre-project Surveys. Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Hawe, W. P., 2011. Hydrology/Channels/Water Quality: Specialist Report for the Evans Mountain Thinning Project, Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Hawe, W.P. 2010. Soils Environmental Assessment for the Proposed Evans Mountain Thinning Project, Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Greatorex, Fred., 2011, Cultural Resource Inventory Reports, Evans Mountain and Power House Thinning Timber Sale Pre-project Surveys. Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Meredith, T., 2010. Recreation, Visual and Rural Interface Resources Report. Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Mortensen, K., 2012. Evans Mountain Thinning: Air Quality and Fire Hazard/Risk Specialist Report, Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Soo, L. et. al, 2012. Evans Mountain Silvicultural Prescription-Commercial Thinning Specialist Report, Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

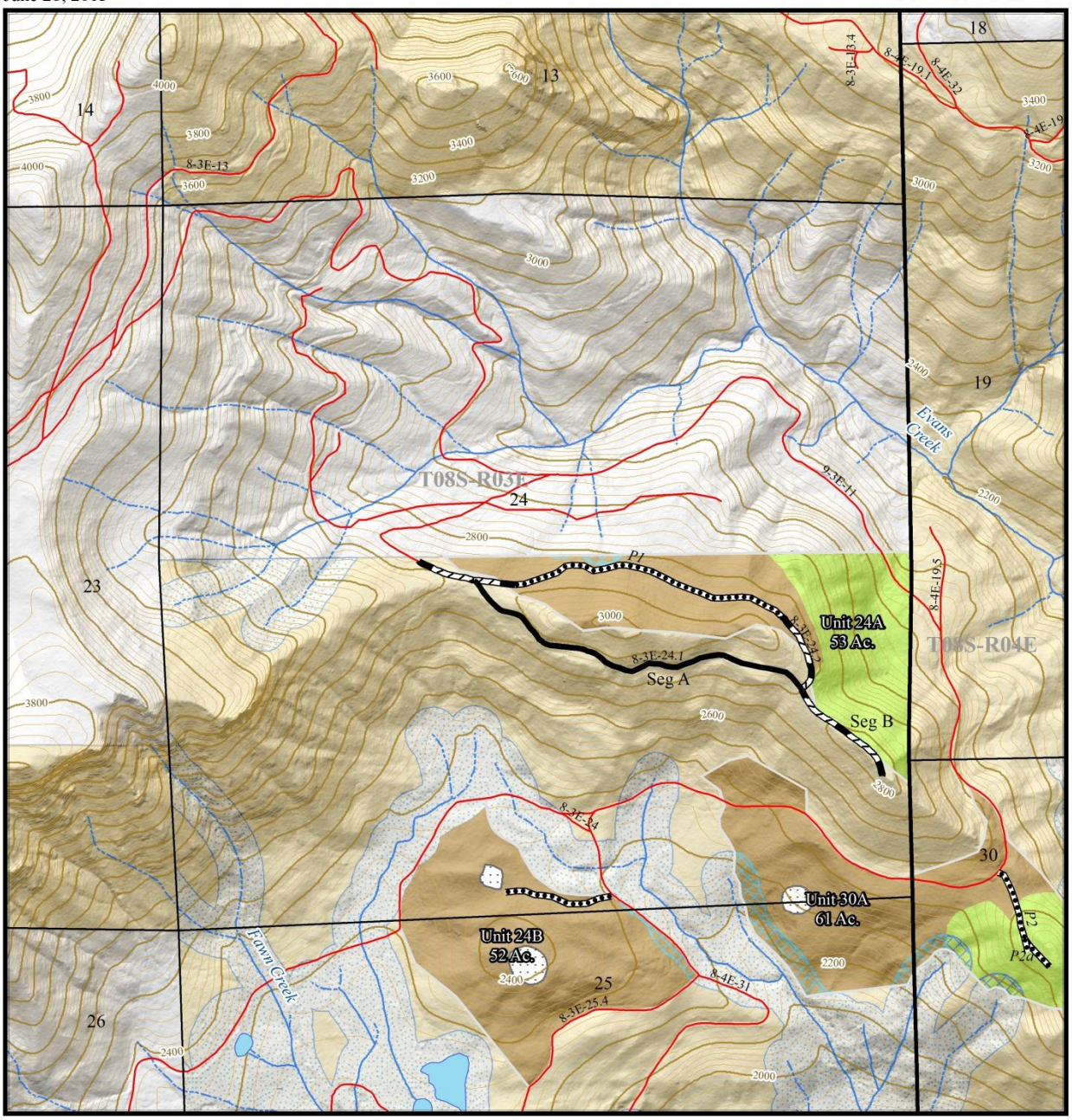
Trefren, B.., 2011. Evans Mountain Logging Systems Report, Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Zoellick, B., 2011 Evans Mountain Thinning Fisheries Specialist Report, Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Evan's Mtn Proposed Projects

June 28, 2013

T08S-R03E Sec 24



Contour Interval: 20'

1,000 500 0Feet

N W E S

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.

- Roads
- Intermittent Stream
- Perennial Stream
- Water\Wet area
- New Construction
- Renovate
- Decommission
- Low Density Thinning Area
- Untreated RR

Proposed Thinning Areas

- Cable
- Cable/Riparian
- Ground
- Ground/Riparian
- BLM
- Private/Unknown

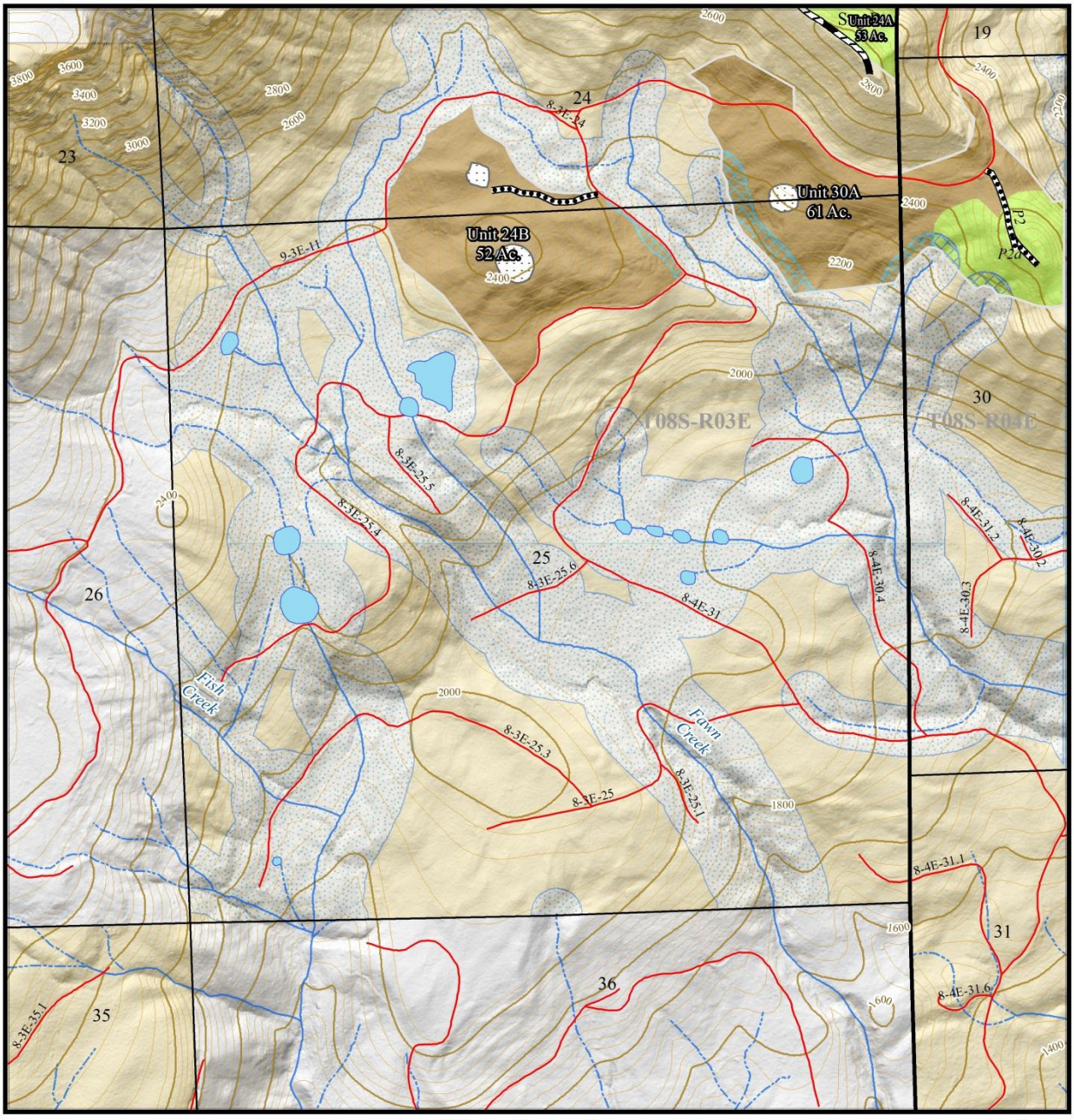
NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Map 3

Evan's Mtn Proposed Projects

June 28, 2013

T08S-R03E Sec 25



Contour Interval: 20'

1,000 500 0Feet

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- Roads
- Intermittent Stream
- Perennial Stream
- Water\Wet area
- New Construction
- Renovate
- Low Density Thinning Area
- Untreated RR

Proposed Thinning Areas

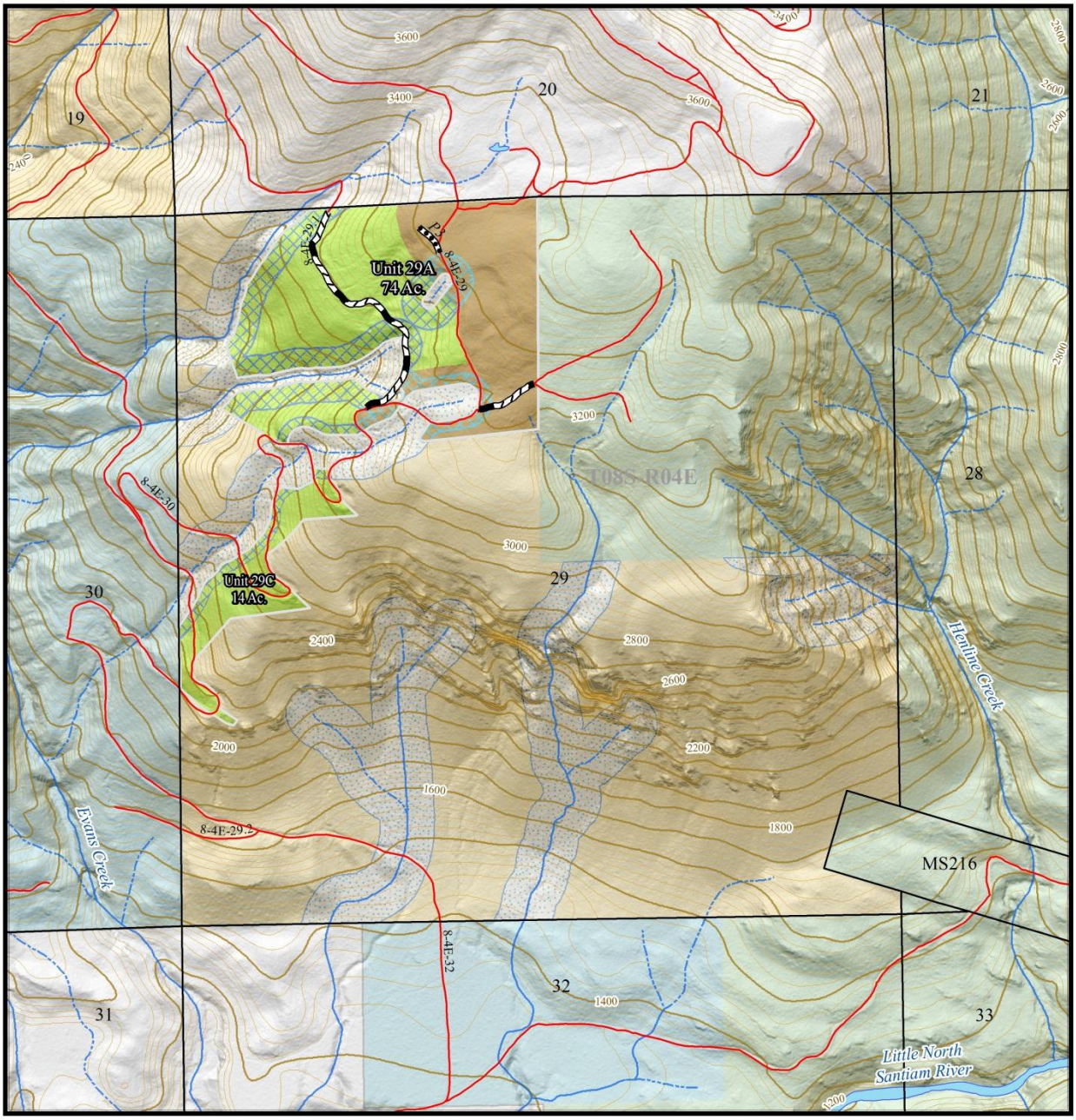
- Cable
- Cable/Riparian
- Ground
- Ground/Riparian
- BLM
- State
- Private/Unknown

Map 4

Evan's Mtn Proposed Projects

June 28, 2013

T08S-R04E Sec 29



Contour Interval: 20'

1,000 500 0Feet

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- Roads
- Intermittent Stream
- Perennial Stream
- Water\Wet area
- New Construction
- Renovate
- Untreated RR

Proposed Thinning Areas

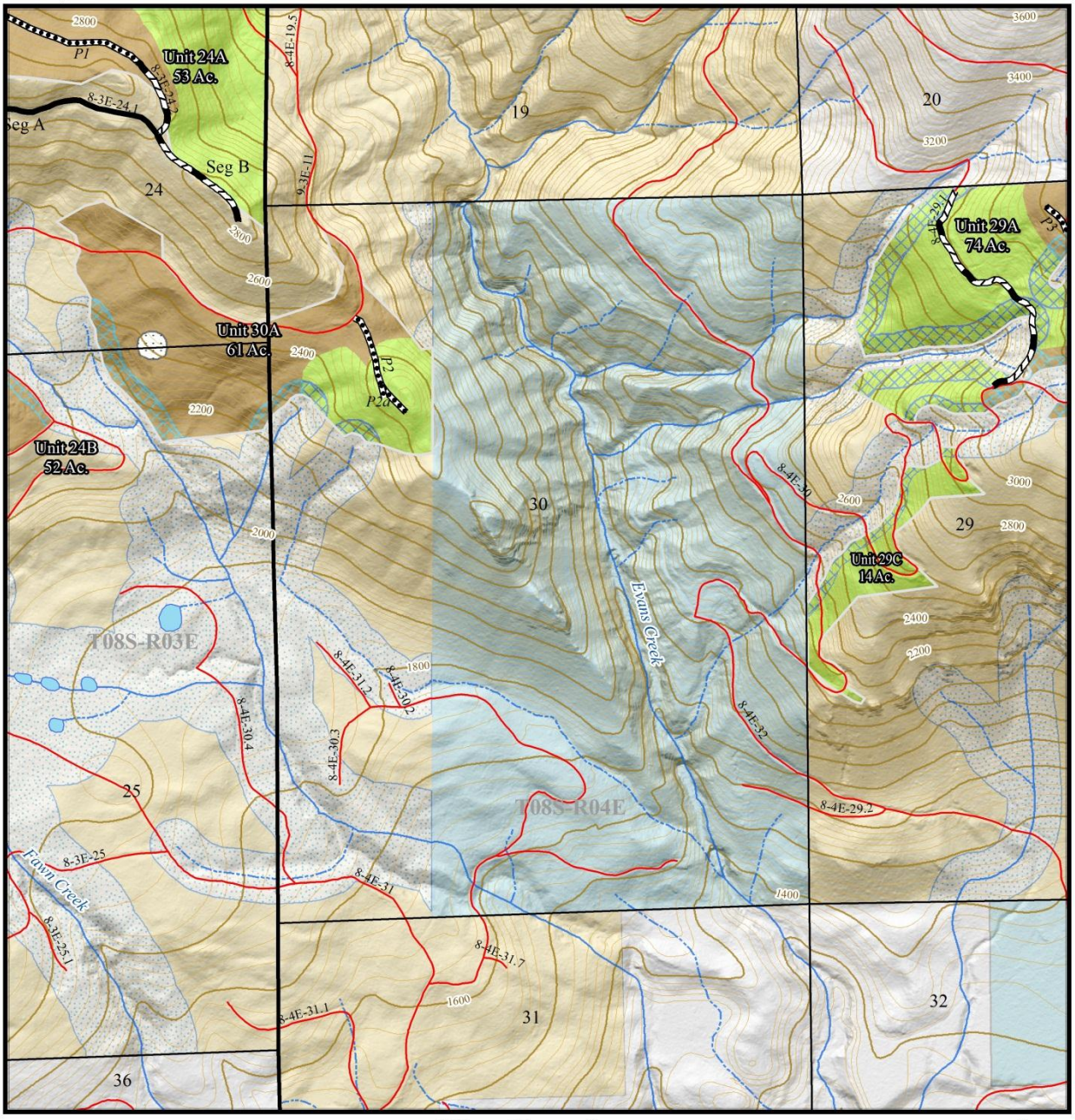
- Cable
- Cable/Riparian
- Ground
- Ground/Riparian
- BLM
- U.S. Forest Service
- State
- Private/Unknown

Map 5

Evan's Mtn Proposed Projects

June 28, 2013

T08S-R04E Sec 30



Contour Interval: 20'

1,000 500 0Feet

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.

- Roads
- Intermittent Stream
- Perennial Stream
- Water\Wet area
- New Construction
- Renovate
- Decommission
- Low Density Thinning Area
- Untreated RR

Proposed Thinning Areas

- Cable
- Cable/Riparian
- Ground
- Ground/Riparian

- BLM
- State
- Private/Unknown

7.1 Glossary

Activity fuel - Debris (wood chips, bark, branches, limbs, logs, or stumps) left on the ground after management actions, such as logging, pruning, thinning, or brush cutting, versus debris left after storms or fires.

Alternative - One of several proposed management actions that have been studied and found to meet the goals and objectives of a project's purpose and need and, as a result, is suitable to aid decision-making.

Anadromous fish - Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce, including species such as salmon and steelhead.

(ACS) Aquatic Conservation Strategy - A Northwest Forest Plan methodology designed to restore and maintain the ecological health of watersheds and aquatic ecosystems, consisting of four components: riparian reserves, key watersheds, watershed analysis, and watershed restoration.

Beneficial use - In water use law, such uses include, but are not limited to: instream, out of stream, and ground water uses; domestic, municipal, and industrial water supplies; mining, irrigation, and livestock watering; fish and aquatic life; wildlife watering; fishing and water contact recreation; aesthetics and scenic attraction; hydropower; and commercial navigation.

(BMPs) Best Management Practices - BMPs are defined as methods, measures, or practices selected on the basis of site-specific conditions to ensure that water quality will be maintained at its highest practicable level. BMPs include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (40 CFR 130.2, EPA Water Quality Standards Regulation).

Canopy cover - The ground area covered by the crowns of trees or woody vegetation as delimited by the vertical projection of crown perimeter and commonly expressed as a percent of total ground area.

(CWD) coarse woody debris - That portion of trees that has naturally fallen or been cut and left in the forest. Usually refers to pieces at least 20 inches in diameter. There are four classes used to describe coarse woody debris. The classes range from Class I (which has the least decay, intact bark, and a hard log) to Class IV (i.e., the coarse woody debris has decayed to the point of nearly being incorporated into the forest floor).

Cumulative effect - The impact on the environment that results from incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions regardless of which agency or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Diameter at breast height (DBH) - The diameter of the stem of a tree measured at 4.5 feet above the ground level on the uphill side of the stem.

Dispersal habitat (spotted owl) - Forest habitat that allows northern spotted owls to move (disperse) across the landscape; typically characterized by forest stands with average tree diameters of greater than 11 inches, and conifer overstory trees having closed canopies (greater than 40 percent canopy closure) with open space beneath the canopy to allow owls to fly.

Dropped – dropped from this proposed action. The actions may be considered in the future and would be documented in an environmental analysis with a new decision. Dropping these areas does not constitute a change in land use allocations.

Effective shade - The proportion of direct beam solar radiation reaching a stream surface to total daily solar radiation.

Environmental effects - The direct, indirect and cumulative effects of a proposed action or alternative on existing conditions in the environment in which the action(s) would occur.

Fine sediment (i.e. Fines) - Fine-grained soil material, less than 2mm in size, normally deposited by water, but in some cases by wind (aeolian) or gravity (dry ravel).

Land use allocation - A designation for a use that is allowed, restricted, or prohibited for a particular area of land, such as the matrix, adaptive management, late-successional reserve, or critical habitat land use allocations.

Late-successional forest - A forest that is in its mature stage and contains a diversity of structural characteristics, such as live trees, snags, woody debris, and a patchy, multi-layered canopy.

Long term - A period of time used as an analytical timeframe; starts more than 10 years after implementation of a project, depending on the resource being analyzed. Also see short term.

Mass wasting - The sudden or slow dislodgement and downslope movement of rock, soil, and organic materials.

Old-growth forest - A forest stand usually at least 180-220 years old with moderate to high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground.

Overstory - That portion of trees forming the uppermost canopy layer in a forest stand and that consists of more than one distinct layer.

Relative density (RD) -is a measure of crowding in a stand of trees, expressed as a percentage of density (based on number and size of trees) relative to a theoretical maximum density. Curtis Relative Density (RD) is calculated by dividing the basal area per acre by the square root of the quadratic mean diameter. Other common ways of communicating density in a forest stand include trees/acre, basal area/acre, average spacing and crown or canopy closure.

Short term - A period of time used as an analytical timeframe and that is within the first 10 years of the implementation of a resource management plan. Also see long term.

Silvicultural prescription - A planned series of treatments designed to change current stand structure to one that meets management goals.

Snag - Any standing (upright) dead tree.

Thinning - A silvicultural treatment made to reduce the density of trees primarily to improve tree/stand growth and vigor, and/or recover potential mortality of trees, generally for commodity use.

(USFWS) United States Fish and Wildlife Service - A federal agency under the United States Department of the Interior that is responsible for working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats.

Watershed - All of the land and water within the boundaries of a drainage area that are separated by land ridges from other drainage areas. Larger watersheds can contain smaller watersheds that all ultimately flow their surface water to a common point.

(WUI) wildland/urban interface - The area in which structures and other human development meet or intermingle with undeveloped wildland. The term used primarily for wildfire prevention and suppression. Rural/Urban Interface is used primarily for other recreation and forest management activities.

Windthrow - A tree or trees uprooted or felled by the wind.

7.2 Additional Acronyms

FONSI – Finding of No Significant Impact

GFMA – General Forest Management Area land use allocation (Matrix)

ODEQ – Oregon Department of Environmental Quality

RIA – Rural-Urban Interface (recreation, visual and sociological issues)

ROW – right-of-way (roads)

RR – Riparian Reserve Land Use Allocation (Riparian Reserves)

SPZ – Stream Protection Zone (no-cut protection zone)

8.0 Response to Issues/ Comments Raised in Scoping

Table 20: Response to Scoping Comments

#	Comment	Response
	Water Quality / Domestic Water - EA Section 1.4.2/ Issue 1	
1	Concerned about any activities in the proposed management units that have potential to adversely impact source water quality, the operational capacity of the City's drinking water treatment facility, and the City's ability to provide quality drinking water services to its customers. In particular, the City is concerned about road building and other activities that may contribute toward increased sediment loading, turbidity, land movement, and peak flows. (City of Salem)	Hydrology – addressed in EA and Specialist Report
2	Concerned about Units located east of Evans Creek because of steep terrain and the BLM's previous recognition of slope instability, turbidity-causing events, and existing riparian roads. (City of Salem)	Hydrology – addressed in EA and Specialist Report
3	Recommends the BLM minimize road-building impacts and provide adequate riparian buffers. (City of Salem)	Hydrology – addressed in EA and Specialist Report
4	Evans and Botsford Creek provide our drinking water Request a minimum of 200 foot buffer on these creeks. Request advanced notification of chemical use. Concerned about the volume of water runoff and increase in debris or water turbidity (Elkhorn Corporation)	Hydrology – addressed in EA and Specialist Report
5	Concerns about mudflows / landslides on Evans Creek and the slide area and its effects on Evans Creek Concerns that timber harvesting will add to the slide problem (Individual Commenter B).	Hydrology – addressed in EA and Specialist Report
6	Address effects of project on Slide. Is the slide a cumulative effect, If not, why?	Hydrology – addressed in EA and Specialist Report
7	Buffer streams to protect WQ, sediment, WL habitat (Oregon Wild)	Hydrology – addressed in EA and Specialist Report
8	Large no-cut buffers in Riparian Areas(Individual Commenter A)	Buffers discussed in Hydrology/Fisheries EA and specialist reports
	Wilderness & Wilderness Characteristics - EA Section 1.4.2/ Issue 2	
9	The potential impact on the nearby Opal Creek Wilderness which lies immediately adjacent to the proposed thinning in the #29 units (T.8 S., R.4 E., Sec 29). Take the steps to assure that no timber is cut within the Opal Creek Wilderness Area. (Forest Service)	The timber sale is on BLM lands and not within Opal Creek Wilderness Area. Those adjacent lands mentioned are withdrawn from the sale.

Table 20: Response to Scoping Comments		
#	**Comment**	**Response**
10	Exclude units 29B&29F (Individual Commenter A)	29B and 29F have been dropped from the proposed action.
11	Address effects of thinning on adjacent mature & old-growth habitat (Oregon Wild)	Thinning will have no effects on adjacent mature and old growth habitat Addressed in EA Section 3.1.5.1
12	Place a diameter limit on trees taken out (Individual Commenter A)	The Marking guides in the silvicultural prescription require all trees 36 inches DBH and larger to be marked for retention
13	Leave minor tree species (Individual Commenter A)	A PDF
14	Employ Variable density thinning (Individual Commenter A)	The marking guides specify a range of densities from approximately 25-35 There are also three low density thinning areas identified each approximately 1 acre in size
15	Support for thinning treatments in the riparian areas (AFRC)	Proposed action
16	To increase early seral stage vegetation in the thinning area we recommend reducing crown closure to 40% in order to allow necessary sun light for early seral vegetation species to become established. (RMEF)	Silviculture prescription and Wildlife Report specifies retaining 40 to 60% canopy cover
17	Address future recruitment of large and small snags in riparian thinning units (Oregon Wild)	Addressed in EA Section 3.1.5.1
18	Snags and coarse wood both distributed and in clumps (Oregon Wild)	Addressed in EA Section 3.1.5.1
19	Retain extra snags and wood(and green trees for recruitment) in riparian areas (Oregon Wild)	Addressed in EA Section 3.1.5.1
20	Retain large trees felled for safety for CWD (Individual Commenter A)	Addressed in EA Section 3.1.5.1
21	Support for the proposed creation of multiple small gap cuts (1 acre in size). creating early successional habitat for species such as Columbian black-tailed deer (*Odocoileus hemionus columbianus*) and Roosevelt Elk (*Cervus elaphus roosevelti*) (AFRC)	Up to 4 gaps 1 to 2 acres in size would be implemented Addressed in EA Section 3.1.5; proposed action
22	We would like to see gaps created that are at least two acres in size, free of conifers. Gaps should be located away from open roads, on slope of less that 28%. In the gaps, consider planting native shrubs which produce fruit, nuts and or browse for wildlife. (RMEF)	Addressed in EA Section 3.1.5; proposed action
23	Make sales economically viable; Light thinning of 4 -8 mbf /acre makes it difficult to economically log. (AFRC)	In proposed action

Table 20: Response to Scoping Comments		
#	**Comment**	**Response**
24	Allow winter harvesting on improved roads; the loggers need winter work and the mills generally need winter wood (AFRC)	PDF
25	Allow wet weather haul on the steeper portions of the 8-4-32 road, provide a good ditch and cross drains. (AFRC)	PDF
26	Support for road construction, reconstruction, and maintenance (AFRC)	In proposed action
	Carbon/Climate EA Section 1.4.3, #2	
27	Develop an alternative that addresses carbon and climate by (a) deferring harvest of older forests to store carbon and provide biodiversity and connectivity and (b) thin younger stands to increase forest resilience and diversity and connectivity. (Oregon Wild)	Considered but eliminated. See section 1.4.3
	Other Comments	
28	Avoid road construction (Oregon Wild, Individual Commenter A)	A proposal without new or temporary roads would not provide access to meet the need to treat many forest units. Further, a proposal with no roads would not provide an economically viable sale. See proposed action, purpose and need
29	Address Effects of roads on connectivity, soils, weeds (Oregon Wild)	Addressed in Sections 3.1.2, 3.1.3, 3.1.4, 3.1.5.
30	Implement other critical aspects of watershed restoration especially pre-commercial thinning, restoring fish passage, reducing the impacts of the road system, and treating invasive weeds (Oregon Wild)	Addressed in Text ACS – Component 4 – Watershed Restoration – and in proposed actions
31	Minimize traffic impacts on recreational areas/ uses in the area (Individual Commenter A)	Proposed actions and PDFs
32	Re-vegetate disturbed soils - skid trails, landings, cut banks – using a native forage seed mix of species of high food value for deer and elk. If roads are to be decommissioned, in addition to seeding with native forage species, consider planting native shrubs which produce fruit, nuts and browse for wildlife. (RMEF)	Native vegetation would be used on disturbed sites. See PDFs

9.0 Literature Cited

Adamus, P., Larsen, K., Gilson, G., and Miller, C. 2001. Oregon Breeding Bird Atlas. Oregon Field Ornithologists, Eugene, OR.

Agee, J. K. 1996. The influence of forest structure on fire behavior. In: Proceedings of the 17th annual forest vegetation management conference;1996 January 16-18; Redding, CA: 52-68. (Agee, 1996)

Altman, Bob. 2008. Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington, Version 2. American Bird Conservancy, Oregon-Washington Partners In Flight. (Altman 2008)

Altman, B., Hagar, J. 2007. Rainforest Birds: A Land Manager's Guide to Breeding Bird Habitat in Young Conifer Forests in the Pacific Northwest. U.S. geological Survey, Scientific Investigations Report 2006-5304. Prepared in cooperation with American Bird Conservancy. (Altman and Hagar 2007)

Anderson, Hal E., April 1982. Aids to Determining Fuel Models For Estimating Fire Behavior General Technical Report INT-122 National Wildfire Coordinating Group U.S. Department of Agriculture, U.S. Department of the Interior, National Association of State Foresters. National Interagency Fire Center, the BLM Warehouse, Boise, Idaho (Anderson, 1982)

Bailey, J., and Tappeiner, J. 1997. Effects of Thinning on Structural Development in 40 to 100 Year-old Douglas-fir Stands in Western Oregon. Forest Ecology and Management, 108 (1998) 99-113. (Bailey and Tappeiner 1997)

Bart, J. and E.D. Forsman. 1992. Dependence of Northern Spotted Owls, *Strix occidentalis caurina*, on Old-Growth Forests in the Western United States. Biological Conservation 62(2):95-100

Bart, J. 1995. Amount of Suitable Habitat and Viability of Northern Spotted Owls. Conservation Biology 9(4):943-946

Behnke, R.J. 1992. Native trout of Western North America. American Fisheries Society Monograph 6. p.275. (Behnke 1992)

Benda, Lee, R.D., M.A. Hassan M. Church, and C.L. May. 2005. Geomorphology of Steepland Headwaters: The Transition From Hillslopes to Channels. Journal of the American Water Resources Association. August, 2005. Pps. 835-851. (Benda et al., 2005)

Biswell, B., Blow, M., Breskel, R., Finley , L. and Lint, J. 2002. Survey Protocol For the Red Tree Vole, Arborimus Longicaudus (= Phenacomys Longicaudus In the Record Of Decision Of The Northwest Forest Plan), Version 2.1, October 2002. (Biswell et. al.,2002)

Bjornn, T.C. and Reiser, D.W. 1991. Habitat requirements of salmonids in stream: Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19. p. 83-138. (Bjornn and Reiser 1991).

Bowman, J., Sleep, D., Forbes, G., and Edwards, M. 2000. The Association of Small Mammals with Coarse Woody Debris at Log and Stand Scales. Forest Ecology and Management. 129(1-3): 119-124. (Bowman et.al. 2000)

Brady, N. C and Weil, R. R. 1996. The Nature and Properties of Soil – 11th Edition. Prentice-Hall, Inc.

Bragg, H.M., Sobieszczyk, Steven., Uhrich, M.A., and Piatt, D.R., 2007, Suspended-sediment loads and yields in the North Santiam River basin, Oregon, water years 1999–2004: U.S. Geological Survey Scientific

Investigations Report 2007-5187, 26 p.

Butts, S., and McComb, W. 2000. Associations of Forest-Floor Vertebrates with Coarse Woody Debris in Managed Forests of Western Oregon. Journal of Wildlife Management. 64(1): 95-104. (Butts and McComb 2000)

Carey, A., Hardt, M., Horton S., Biswell, B. 1991. Wildlife and Vegetation of Unmanaged Douglas-Fir Forests. U.S. Dept. Agric. Gen. Tech. Rep. PNW-GTR-285 page 122-142.

CH2MHILL and Western Watershed Analysts. 1999. FEMAT Riparian Process Effectiveness Curves: What is Science-Based and What is Subjective Judgment? Oregon Forest Industries Council. Salem, OR. (CH2MHILL et al. 1999)

Chan, S., Larson, D., Maas-Hebner, K., Emmingham, W., Johnston, S., and Mikowski, D. 2006. Overstory and Understory Development in Thinned and Underplanted Oregon Coast Range Douglas-fir Stands. Canadian Journal of Forest Research. 36: 2696-2711 (Chan et.al. 2006)

Christy, R.E., and S.D. West. 1993. Biology of bats in Douglas-fir forests. PNW-GTR-308. U.S.D.A. Forest Service, Pacific Northwest Research Station (Christy and West 1993)

Cole, E., Pope, M., and Anthony G. 1997. Effects of Road Management on Movement and Survival of Roosevelt Elk. Journal of Wildlife Management. 61(4): 1115-1126 (Cole, et al. 1997)

Courtney, S.P., J.A. Blakesley, R.E. Bigley, M.L. Cody, J.P. Dumbacher, R.C. Fleischer, A.B. Franklin, J.F. Franklin, R.J. Gutiérrez, J.M. Marzluff, L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institute. Portland, Oregon. September 2004.

Curtis, R.O. 1982. A simple index of stand density for Douglas-fir. Forest Science. 28(1): 92-94 (Curtis RD)

Dissmeyer, George E.[Editor]. 2000. Gen. Tech. Rep. SRS-039. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 246 p. Available at: http://www.srs.fs.usda.gov/pubs/viewpub.jsp?index=1866 (Dissmeyer, 2000)

Dowlan, S. 2006. Conservation Assessment and Management Recommendations for Oregon slender salamander, Batrachoseps wrightorum (wrighti). Cascades Resource Area, Salem District, Bureau of Land Management. Unpublished. (Dowlan, unpublished 2006)

Elliot, W. J., and D. E. Hall. 1997. ***Water Erosion Prediction Project (WEPP) forest applications***. General Technical Report INT-GTR-365. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

E & S Environmental Chemistry, Inc. and North Santiam Watershed Council .2002. North Santiam River Watershed Assessment. (E & S Environmental Chemistry, Inc. 2002)

Foltz, R.B. and Yanosek, K.A.. 2005. Effects of Road Obliteration on Stream Water Quality. Managing Watersheds for Human and Natural Impacts Engineering, Ecological, and Economic Challenges Watershed 2005 Glenn E. Moglen - Editor, July 19–22, 2005, Williamsburg, Virginia, USA. (Foltz and Yanosek, 2005)

Forsman, E., Meslow, E., and Wight, H. 1984. Distribution and Biology of the Spotted Owl in Oregon. Wildlife Monographs 87: 1-64. (Forsman et al. 1984)

Geren, Barbara,A. 2007. ***Predicting Sediment Delivery From Small Catchments In The Western Cascades Of Oregon Using The U.S.F.S. Disturbed Water Erosion Prediction Project (WEPP) Model.*** Research Thesis submitted to Department of Geosciences Oregon State University. Corvallis, Oregon

Groom, J.D., L. Dent, L.J. Madsen and J. Fleuret. 2011. Response of western Oregon (USA) stream temperatures to contemporary forest management. Forest Ecology and Management 262:1618-1629.

(Groom et al. 2011)

Hagar, J., McComb, W., and Emmingham, W. 1996. Bird Communities in Commercially Thinned and Unthinned Douglas-fir stands of Western Oregon Wildlife Society Bulletin 24(2).(Hagar, McComb, and Emmingham 1996)

Hann, Ritchie, Wang, Zumrawi. 2006. Oregon Growth Analysis and Projection System, Growth and Yield Project for Northwest Oregon Forests (ORGANON), NW Oregon Version Edition 8.2, College of Forestry, Oregon State University. (Hann, et. al.,2006)

Hansen, H., McComb, W., Vega, R., Raphael, M., and Hunter, M. 1995. Bird Habitat Relationships in Natural and Managed Forests in the West Cascades of Oregon. Ecological Applications. 5:3. Ecological Society of America. (Hansen et al. 1995)

Hawe, Patrick 2012, Round Mountain Timber Sale Post Treatment Monitoring. Cascades Resource Area, Salem District, Bureau of Land Management. Internal Memo, Unpublished. (Hawe, 2012)

Hayes, Weikel, J., and Huso, M. 2003. Response of Birds to Thinning Young Douglas-Fir Forests. Department of Forest Science, Oregon State University, Corvallis, OR (Hayes, Weikel and Huso, 2003)

Hayes, J., Chan, S., Emmingham, W., Tappeiner, J., Kellog, L., and Bailey, J. 1997. Wildlife Response to Thinning Young Forests in the Pacific Northwest. Journal of Forestry, August 1997. (Hayes et.al. 1997)

Hicks, B.J., J. D. Hall, P.A. Bisson, and J.R. Sedell. Responses of salmonids to habitat changes. pp. 483-518 *in* Influences of forest and rangeland management on salmonid fishes and their habitats, Meehan, W.R., editor. American Fisheries Society Special Publication 19.

House, R. 1995. Temporal variation in abundance of an isolated population of cutthroat trout in western Oregon, 1981-1991. North American Journal of Fisheries Management 15:33-41.

Hudiburg, T., Law, B., Turner, D. Campbel, J. Danato, D. and Duane, M. 2009. Carbon dynamics of Oregon and Northern California forests and potential land-based carbon storage. Ecological Applications, 2009: 163-180. (Hudiburg, et al. 2009)

Huff, M., Raley, C. 1991. Regional Patterns of Diurnal Breeding Bird Communities in Oregon in Washington. U.S. Dept. Agric. Gen. Tech. Rep. PNW-GTR-285 page 177-205.

Humes, M., Hayes, J., and Collopy, M. 1999. Bat Activity in Thinned, Unthinned, and Old-growth Forests in Western Oregon. Journal of Wildlife Management 63(2): 553-561. (Humes, Hayes, Collopy 1999)

Johnson, S.L. 2004. Factors influencing stream temperatures in small streams: substrate effects and a shading experiment. Canadian J. Fisheries and Aquatic Science 61:913-923. (Johnson 2004)

Li, H.W., G.A. Lamberti, T.N. Pearsons, C.K. Tait, J.L. Li, and J.C. Buckhouse. 1994. Cumulative effects of riparian disturbances along high desert trout streams of the John Day basin, Oregon. Transactions of the American Fisheries Society 123:627-640.

Marshall, D., Hunter, M., and Contreras, A. 2003. Birds of Oregon: A General reference. Oregon State University Press, Corvallis, OR. (Marshall et. al. 2003)

Matthews, Emily, Richard Payne, Mark Rohweder, and Mark Murray. 2000. Pilot Analysis of Global Ecosystems: Forest Ecosystems. Washington D.C.: World Resources Institute 2000. (Matthews et al, 2000)

Montesi, J., K. Elder, R. A. Schmidt, and R. Davis, 2004, Sublimation of intercepted snow within a subalpine canopy at two elevations, J. Hydromet., 5, 763-773. (Montesi et al, 2004)

Montgomery, David R., and John M. Buffington. 1997. Channel-reach morphology in mountain drainage basins. Geologic Society of America Bulletin, May 1997. Pps. 596-611. (Montgomery & Buffington, 1997)

Moore, D. R. and S.M. Wondzel. 2005. Physical Hydrology and the Effects of Forest Harvesting in the Pacific

Northwest: A Review. Journal of the American Water Resources Association. August, 2005. Pps. 763-784. (Moore et al., 2005)

Morris, G. and Fan, J. 1998. Reservoir Sedimentation Handbook: Design and Management of Dams, Reservoirs, and Watersheds for Sustainable Use. Section 7.6 Estimating Sediment Yield. Published by McGraw-Hill Professional, 1998. ISBN 007043302X, 9780070433021 (Morris and Fan, 1998)

Muir, P., Mattingly, R., Tappeiner II, J., Bailey, J., Elliot, W., Hagar, J., Miller, J., Peterson, E., and Starkey, E. 2002. Managing for Biodiversity in Young Douglas-fir Forests of Western Oregon: U.S. Geological Survey, Biological Resources Division, Biological Sciences Report USGS/BRD/BSR-2002-0006. (Muir et.al., 2002)

Neitro, W., Binkley, V., Cline, S., Mannan, R., Marcot, B., Taylor, D., and Wagner, F. 1985. Snags (Wildlife Trees), in: Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington, Part 1, Chapter Narratives. U.S.D.A. Forest Service, Pacific Northwest Region. (Neitro et al, 1985)

NOAA. 2005. Endangered and threatened species; designation of critical habitat for 12 evolutionarily significant units of west coast salmon and steelhead in Washington, Oregon, and Idaho; Final Rule. Federal Register 70(170):52630-52858. (NOAA 2005)

Olson, D.H. and Rugger, C. 2007. Preliminary study of the effects of headwater riparian reserves with upslope thinning on stream habitats and amphibians in western Oregon. Forest Science. Vol. 53 p. 331-342. (Olson and Rugger 2007)

O'Neil, T., Johnson, D., (Manag. Dirs.); and Barrett, C., Trevithick, M., Bettinger, K., Kiilsgaard, C., Vander Heyden, M., Greda, L., Stinson, D., Marcot, B., Doran, P., Tank, S., Wunder, L. 2001. Wildlife-Habitat Relationships in Oregon and Washington (and Matrices). Northwest Habitat Institute. 2001. Oregon State University Press, Corvallis, OR. (O'Neil et.al. 2001)

OR. Oregon Watershed Enhancement Board (OWEB). 1997. Oregon Watershed Assessment Manual. Page IV-11. Salem, Oregon. Available at: http://www.oregon.gov/OWEB/docs/pubs/OR_wsassess_manuals.shtml (OWEB, 1997)

Oregon Natural Heritage Information Center. 2007. Rare, Threatened, and Endangered Species of Oregon. Oregon Natural Heritage Information Center, Oregon State University, Portland, OR (ONHIC 2007).

Ottmar, Roger D., and Hardy, Colin C., 1989. Stereo Photo Series for Quantifying Forest Residues in Coastal Oregon Forests: Second-Growth Douglas-Fir---Western Hemlock Type**,** Western Hemlock---Sitka Spruce Type, and Red Alder Type. General Technical Report PNW-GTR-231 U.S. Department of Agriculture - Forest Service, Pacific Northwest Research Station. Siuslaw National Forest. (Ottmar, Hardy, 1989)

Ottmar, Roger D., and Hardy, Colin C., Vihnanek, Robert E. May, 1990. Stereo Photo Series for Quantifying Forest Residues in Douglas-firhemlock Type of the Willamette National Forest. General Technical Report PNW-GTR-258 U.S. Department of Agriculture - Forest Service, Pacific Northwest Research Station. Siuslaw National Forest. (Ottmar, Hardy, Vihnanek, 1989)

D. Pimental, et al. 1987. World Agriculture and Soil Erosion. BioScience Vol. 37 No.4, pgs.277-283.

Perkins, M., and Cross, S. 1988. Differential Use of Some Coniferous Forest Habitats by Hoary and Silver-haired Bats in Oregon. Murrelet. 69: 21-24. (Perkins and Cross 1988)

Power, W.E., Tausch, W.A.. 1987. ***Timber Production Capability Classification. TPCC Technical Guide***. U.S.D.I. BLM Salem District. OR.

Rashin, E.B., C.J. Clishe, A.T. Loch, and J.M. Bell. 2006. Effectiveness of timber harvest practices for controlling sediment related water quality impacts. J. American Water Resources Association 42(5): 1307-1327. (Rashin et al. 2006)

Rose, C., Marcot, B., Mellen, T., Ohmann, J., Waddell, K., Lindley, D., and B. Schreiber. 2001. Decaying Wood in Pacific Northwest Forests: Concepts and Tools for Habitat Management. Rose et. al., 2001

Rosgen, D.L. 1994. A classification of natural rivers. Catena 22:169-199. (Rosgen 1994, 1996)

Rosgen, David, L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado. (Rosgen 1994, 1996)

Rundio, D., and Olson, D. 2007. Influence of Headwater Site Conditions and Riparian Buffers on Terrestrial Salamander Response to Forest Thinning. Forest Science 53(2), USDA Forest Service, Pacific Northwest Research Station, Corvallis, OR. (Rundio and Olson 2007)

Streamnet. 2006. Gladstone, Oregon. On-line map. Welcome to StreamNet On-line! http://map.streamnet.org (Streamnet 2006)

Swindle, K.A., W.J. Ripple, E.C. Meslow, and D.J. Schafer. 1997. Old-forest distribution around spotted owl nests in the central Cascade Mountains, Oregon. M.s. Thesis, Oregon State University.

Takashi, Gomi, R.D. Moore and M.A. Hassan. 2005. Suspended Sediment Dynamics in Small Forest Streams of the Pacific Northwest. Journal of the American Water Resources Association. August, 2005. Pps. 877-898. (Takashi et al, 2005)

Toman, E. T. 2004. *Forest road hydrology: the influence of forest roads on stream flow at stream crossings*. M.S. thesis. Forest Engineering Department, Oregon State University. Corvallis, Oregon. 78 pp.

Trombulak, S., and Frissell, C. 1999. Review of Ecological Effects of Roads on Terrestrial and Aquatic Communities. Conservation Biology. 14 (1): 18-30. (Trombulak and Frissell 1999)

US EPA, Environmental Protection Agency. 2009. (was U.S. EPA 2007) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2007. U.S. EPA, Washington, D.C. http://www.epa.gov/climatechange/emissions/usinventoryreport.html (US EPA, 2009)

US EPA, Environmental Protection Agency, Region 10. EPA 910/9-91-001. 1991. Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska. Seattle, Washington. p.52-53. (US EPA, 1991)

USDA Natural Resources Conservation Service. 2005. *Soil Data Mart.* Accessed http://soildatamart.nrcs.usda.gov/ December 2005-June 2006.

USDA, Forest Service; USDI Bureau of Land Management. March 2010. Biological Assessment of Not Likely to Adversely Affect (NLAA) Projects with the Potential to Modify the Habitat of Northern Spotted Owls Willamette Planning Province - FY 2011/2012 (BA).

USDA, Forest Service; Bureau of Land Management. 2005. Northwest Forest Plan Temperature TMDL Implementation Strategies. Portland, Oregon. Available at: http://www.blm.gov/nhp/efoia/or/fy2006/ib/p/ib-or-2006-014Att2.pdf (USFS and BLM, 2005)

USDA, Forest Service; USDI Bureau of Land Management. January 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage Mitigation Measures Standards and Guidelines, Forest Service National Forests and Bureau of Land Management Districts Within the Range of the Northern Spotted Owl (2001 ROD).

USDA. Forest Service, USDI Bureau of Land Management. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Documents Within the Range of the Northern Spotted Owl. Portland, Oregon. (NWFP)

USDA, Forest Service; USDI Bureau of Land Management. 1994. Final Supplemental Environmental Impact Statement Management of Habitat for Late Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. Portland, Oregon. (NWFP/FSEIS).

USDI, Bureau of Land Management. 2011. 2011 Settlement Agreement in Litigation over the Survey and Manage Mitigation Measure in Conservation Northwest et al. v. Sherman et al., Case No. 08-1067-JCC (W.D. Wash.), Instruction Memorandum No. OR-2011-063. (IM-OR-2011-063, July 2011).

USDI, Bureau of Land Management. 2008. Special Status Species (SSS). Instruction Memorandum No. OR-2008-038, (BLM IM OR-2008-038).

USDI, Bureau of Land Management, 2008. Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management. Vol. I-III. (2008 RMP/FEIS)

USDI, Bureau of Land Management, 2007. Migratory Bird Treaty Act – Interim Management Guidance. Instruction Memorandum No. WO-2008-050, (BLM WO-2008-050).

USDI, Bureau of Land Management, 2001. Special Status Species Management, BLM Manual Section 6840 (BLM 6840).

USDI, Bureau of Land Management, 1998. Riparian Area Management. A User Guide to Assessing Proper Functional Condition and the Supporting Science for Lotic Areas. TR1737-15. National Applied Resource Science Center. Denver, CO. (USDI, 1998)

USDI, Bureau of Land Management, 1995. Salem District Record of Decision and Resource Management Plan. Salem, Oregon. (RMP)

USDI, Bureau of Land Management, 1994. Salem District Proposed Resource Management Plan/Final Environmental Impact Statement. Salem, Oregon. (RMP/FEIS).

USDI, Bureau of Land Management, 1992. BLM Manual 9015 – Integrated Weed Management Available at: http://www.blm.gov/ca/st/en/prog/weeds/9015.html (BLM Manual 9015)

USDI, Bureau of Land Management, 1987. Timber Production Capability Classification. Salem District. (USDI BLM 1987)

USDI, Bureau of Land Management; USDA, Forest Service. 1997. Little North Santiam Watershed Analysis Salem, Oregon. (LNS) (USBLM 1997)

USDI, U.S. Fish and Wildlife Service, June 2010. Letter of Concurrence (LOC) Regarding the Effects of Habitat Modification Activities within the Willamette Province, FY2011-2012, Proposed by the Eugene District, Bureau of Land Management; Salem District, Bureau of Land Management; Mt. Hood National Forest; Willamette National Forest; Columbia River Gorge National Scenic Area on the Northern Spotted Owl and its Critical Habitat; FWS Reference #13420-2010-I-0092. (LOC)

USDI, U.S. Fish and Wildlife Service, 2007c. Draft: What are the Effects of Habitat Thinning on Northern Spotted Owls? Literature Summarized through 2005. Portland, OR. (USFWS 2007c)

Van Wagner, C.E. 1965. Describing Forest Fires - old ways and new. Forestry Chronicle 41:301-305

Waldien, D., Hayes, J., and Arnett, E. 2000. Day Roosts of Female Long-eared Myotis in Western Oregon. Journal of Wildlife Management 64(3):785-796. (Waldien et.al. 2000)

Walker, G.W., N.S. Macleod. 1991. Geologic Map of Oregon. U.S.D.I. U.S. Geologic Survey.(Walker, 1991)

Wemple, B.C., Jones, J.A. 2003. Runoff production on forest roads in a steep, mountain catchment. Water Resources Research, Vol. 39, No. 8, p. 1220. (Wemple et al, 2003)

Wemple, B.C., J. A. Jones, and G.E. Grant. 1996. Channel Network Extension by Logging Roads in Two Basins, Western Cascades, Oregon. WATER RESOURCES BULLETIN, VOL. 32, NO. 6, 1195.(Wemple et al. 1996)

Weikel, J.M., Hayes, J.P. 1999. The Foraging Ecology of Cavity-Nesting Birds in Young Forests of the Northern Coast Range of Oregon. The Condor, 101(1): 58-66

Wischmeier, W. H. and Smith, D. D. 1978. Predicting Rainfall Erosion Losses – A Guide to Conservation Planning. U.S. Department of Agriculture Handbook 537. Washington, D. C.: USDA.

Wilkerson, E., J.M. Hagan, D. Siegel, and A.A. Whitman. 2006. The effectiveness of different buffer widths for protecting headwater stream temperature in Maine. Forest Science 52:221-231. (Wilkerson et al. 2006)

Evans Mountain Thinning

FINDING OF NO SIGNIFICANT IMPACT

The Bureau of Land Management (BLM) completed an environmental analysis for a proposal to thin approximately 250 acres of 36-92 year old forest stands. The project is located on the BLM lands in T. 8 S., R. 3 E. sections 24 and 25; T. 8 S., R. 4 E., sections 29, and 30 W.M. in Marion County, Oregon. The Evans Mountain Thinning Environmental Assessment (EA) (# DOI-BLM-OR-S040-2010-0006-EA) documents the environmental analysis of the proposed commercial thinning activity. I have attached and incorporated the EA by reference in this Finding of No Significant Impact determination.

The analysis in this EA is site-specific and supplements analyses found in the *Salem District Proposed Resource Management Plan/Final Environmental Impact Statement*, September 1994 (RMP/FEIS). The Resource Area Interdisciplinary Team (IDT) has designed the proposed thinning activities to conform to the *Salem District Record of Decision and Resource Management Plan*, May 1995 (RMP) and related documents, which direct and provide the legal framework for management of the BLM lands within the Salem District (*EA Section 1.3*).

Finding of No Significant Impact[6]

Based upon review of the Evans Mountain Thinning EA and supporting documents, I have determined that the proposed action is not a major federal action. The proposed action would not significantly affect the quality of the human environment, individually or cumulatively with other actions in the area. No environmental effects meet the definition of significance in context or intensity as defined in 40 CFR 1508.27. Therefore, I have determined that there is no need for a environmental impact statement:

Context [40 CFR 1508.27(a)]***:*** Effects resulting from the implementation of the proposed action have been analyzed within the context of the project area boundaries, and the Little North Santiam 5th field watershed. This project would thin approximately 0.5 percent of the 72,157 acres combined 6th field watershed listed above.

Intensity refers to severity of impact [40 CFR 1508.27(b)]. The following text shows how that the proposed project would not have significant impacts with regard to ten considerations for evaluating intensity, as described in 40 CFR 1508.27(b).

1. *[40 CFR 1508.27(b) (1)] –* **Impacts that may be both beneficial and adverse:** The effects of commercial thinning are unlikely to have significant (beneficial and adverse) impacts (EA section 3.0) for the following reasons:

- *Project design features* described in EA section 2.2.3 would reduce the risk of effects to affected resources to be within RMP standards and guidelines and to be within the effects described in the RMP/EIS.

[6] This section of the Evans Mountain Thinning EA is the Draft Finding of No Significant Impact (FONSI). The Cascades Field Manager will finalize the FONSI in the Decision Rationale document after the public comment period.

- *Vegetation and Forest Stand Characteristics (EA section 3.1.1)*: Effects to this resource are not significant because: 1/ Stands proposed for thinning are not presently functioning as late-successional old growth habitat. 2/ Existing snags, remnant old growth trees and coarse woody debris (CWD) would be retained. The few (fewer than 10 percent of existing) large (≥ 15 inches diameter and ≥ 15 feet tall) snags that would be felled for safety or knocked over by falling and yarding operations would be retained as CWD. 3/ Noxious Weeds – Increases in the number of invasive/non-native plants are expected to be short lived because all areas with ground disturbing activities be re-vegetated with native species (*EA section 2.2.3, # 41*); and native species would naturally re-vegetate after thinning activities (*EA section 3.1.1.1*).
- *Hydrology; Fisheries and Aquatic Habitat; and Soils (EA sections 3.1.2-3.1.4):* Effects to this resource are not significant because 1/road construction would occur on gentle slopes with stable, vegetated surfaces. 2/ Stream protection zones (minimum 85 feet to 200 feet maximum) on perennial streams, (50 feet on intermittent streams) would maintain current stream temperatures by retaining the current vegetation in the primary shade zone. Stream protection zones are also expected to further prevent sediment as a result of overland flow or surface erosion in logging units from reaching streams (*EA sections 3.1.2, 3.1.4*). 3/ Timber haul and road maintenance project design features would prevent sedimentation delivery to streams in quantities that would exceed Oregon DEQ requirements. 4/ The proposed action will abide by and meet State of Oregon water quality standards.
- *Soils (EA section 3.2.4):* Effects to this resource are not significant because soil compaction is limited to no more than 10 percent of each unit's acreage. In addition, the actions would maintain sufficient mycorrhizae to support healthy tree growth in residual stands.
- *Wildlife (EA section 3.1.5):* Effects to this resource are not significant because: 1/ Stands proposed for thinning are not presently functioning as old growth habitat; 2/ Existing snags, remnant old growth trees and coarse woody debris (CWD) would be reserved. The small number (≤ 10 percent) of large (≥ 15 inches diameter and ≥ 15 feet tall) snags expected to be felled for safety or knocked over by falling and yarding operations would be retained as CWD; 3/ No suitable habitat for the BLM Special Status Species known or likely to be present would be lost. Therefore, the project would not contribute to the need to list any of the BLM Special Status species; 4/ Thinning would not significantly change species richness (a combination of species diversity and abundance) of the Migratory and Resident Bird community. No species would be extirpated in stands as a result of thinning; and 5/ The amount of dispersal and suitable spotted owl habitat within the provincial home range of known spotted owls would not change as a result of thinning.
- *Air Quality, Fire Risk, and Fuels Management (EA sections 3.1.6):* Effects to this resource are not significant because the selected action will comply with the Clean Air Act and State of Oregon Air Quality Standards by adhering to Oregon Smoke Management guidelines. Within one year fire risk will diminish as needles drop and ground cover/understory vegetation "greens up". Other fine fuels generated by thinning would decay in the project areas within 3 to 5 years reducing the risk of a surface fire to near current levels. The thinning would decrease the risk of a canopy fire by removing ladder fuels. Prescribed burning would lessen the fuel load, and the potential for human caused ignition adjacent to roads that are open to public access.
- Recreation, Visual Resources, and Rural Interface (EA section 3.1.7): Effects to this resource are not significant because changes to the landscape character would be low and would comply with Visual Resource Management guidelines because the project would maintain a forested setting. Some disturbance to vegetation would be observable after thinning activities and would be expected to develop an undisturbed appearance within five years.

2. *[40 CFR 1508.27(b) (2)]* - **The degree to which the proposed action affects public health or safety:** The proposed project would not adversely affect public health or safety because the public would be restricted from the project area during operations and the project would not create hazards lasting beyond project operations (EA section 3.1.7).

3. *[40 CFR 1508.27(b) (3)]* - **Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas:** The proposed project would not affect historical or cultural resources because all known cultural resources that require protection are outside of the unit boundaries and would not be affected by operations. Any cultural resources discovered in the future would be protected as determined by the BLM Archaeologist. The Proposed project would not affect parklands, prime farmlands, wild and scenic rivers, wilderness, or ecologically critical areas because these resources are not located within the project area (EA Section 1.4.3, 5.1.3).

4. *[40 CFR 1508.27(b) (4)]* - **The degree to which the effects on the quality of the human environment are likely to be highly controversial:** The proposed project is not unique or unusual. The BLM has experience implementing similar actions in similar areas without highly controversial effects over the course of many decades of timber resource management.

5. *[40 CFR 1508.27(b) (5)]* - **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks:** The BLM has experience implementing similar actions in similar locations and has designed the project, including project design features, to avoid highly uncertain, unique and unknown risks (EA section 2.2.3). See # 4, above.

6. *[40 CFR 1508.27(b) (6)]* - **The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration:** The proposed action would not establish a precedent for future actions nor would it represent a decision in principle about a further consideration for the following reasons: 1/ The project is in the scope of proposed activities document in the RMP EIS; and 2/ the BLM has experience implementing similar actions in similar areas without setting a precedent for future actions or representing a decision about a further consideration.

7. *[40 CFR 1508.27(b) (7)]* - **Whether the action is related to other actions with individually insignificant but cumulatively significant impacts:** The Interdisciplinary Team (IDT) evaluated the project area in context of past, present and reasonably foreseeable actions and determined that the proposed action would be expected to temporarily increase stream turbidity as a result of culvert replacement, road renovation, road maintenance, road use and log fill removal (EA Sections 3.1.2 - 3.1.4). These effects are not expected to be significant because any turbidity increase resulting from thinning would be too small to be discernible relative to background turbidity, would not exceed ODEQ water quality standards, would dissipate within 800 meters downstream, and would decrease quickly over time, returning to current levels within minutes or hours. Cumulatively, the proposed action and connected actions would be unlikely to result in any detectable change for water quality on a sixth or seventh field watershed scale and would be unlikely to have any effect on any designated beneficial uses, including fisheries (EA Section 3.1.3). All other analyses determined that there would be little to no indirect or direct effects; therefore, there would be no cumulative effects.

8. *[40 CFR 1508.27(b) (8)]* - **The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources:**

The project would not affect these resources because cultural resource inventories of the affected area have occur and no resources found (EA section 3.1.8).

9. *[40 CFR 1508.27(b) (9)]* - **The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act (ESA) of 1973:** The proposed project is not expected to adversely affect ESA listed species or critical habitat for the following reasons:

- *ESA Wildlife - Northern spotted owl (EA Section 3.1.5):* Effects to the species are not significant because: 1/The project is not located in Late Successional Reserve, Critical Habitat, or stands which meet the criteria for Recovery Action 32 for the northern spotted owl; 2/ The project maintains dispersal habitat and suitable habitat; 3/ Habitat conditions are expected to improve as thinned stands mature (>20 years); and 4/ Residual trees would increase in size and be available for recruitment or creation of large diameter (>15 inches) snags, culls and coarse woody debris (CWD) for prey species and nesting opportunities, particularly in Riparian Reserves, sooner than would be expected without treatment. ESA Consultation is described in EA section 5.1.1.
- *ESA Fish – UWR Chinook salmon and UWR steelhead trout (EA Section 3.1.3).* Effects to ESA fish are not significant because thinning is not expected to affect these species. Considerations include: 1/ Distance – almost all Project Units are >1 mile upstream of salmon and steelhead habitat; 2/ implementation of stream protection zones 200 feet in width on streams within 1 mile of steelhead habitat; and 3/ Project design features minimize impacts from tree thinning and road renovation and maintenance on stream channels, water quality, and fish habitat as described in the Hydrology; Fisheries and Aquatic Habitat; and Soils section, above. Additionally, new road construction would be located in stable locations and would not contribute to degradation of aquatic habitat. ESA Consultation is described in EA section 5.1.2.

10. *[40 CFR 1508.27(b) (10)]* - **Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment:** The proposed thinning activities have been designed to follow Federal, State, and local laws (EA sections 1.3, 3.1.10).

Approved by: _____ _____

John Huston, Date
Field Manager,
Cascades Resource Area