Even Keel Thinning

Environmental Assessment and Finding of No Significant Impact

EA # DOI-BLM-OR-S040-2010-0005-EA

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

T. 12 S., R. 1 E. sections 11, 13, 23 & 25; W.M.

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BLM
Salem District

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

BLM/OR/WA/AE-11/017+1792

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FINDING OF NO SIGNIFICANT IMPACT

The Bureau of Land Management (BLM) has conducted an environmental analysis for a proposal to thin approximately 445 acres of 48 to 75 year old forest stands. The project is located on BLM lands in T. 12S., R. 1 E., sections 11,13, 23 & 25; Willamette Meridian in Linn County, Oregon. The Even Keel Thinning Environmental Assessment (EA) (DOI-BLM-OR-S040-2010-0005-EA) documents the environmental analysis of the proposed commercial thinning activity. The EA is attached to and incorporated by reference in this Finding of No Significant Impact (FONSI) determination. The EA and FONSI will be made available for public review from June 19 to July 11, 2012 (EA section 5.2).

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 proposed thinning activities have been designed 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 BLM lands within the Salem District (EA Section 1.3). Approximately 337 of these acres are in the Matrix land use allocation (LUA), and 108 acres are in the Riparian Reserve LUA as described in the RMP.

Draft Finding of No Significant Impact[1]

Based upon review of the Even Keel Thinning EA and supporting documents, I have determined that the proposed action is not a major federal action and would not significantly affect the quality of the human environment, individually or cumulatively with other actions in the general area. No environmental effects meet the definition of significance in context or intensity as defined in 40 CFR 1508.27. Therefore, supplemental or additional information to the analysis in the RMP/FEIS in the form of a new environmental impact statement is not needed. This finding is based on the following discussion:

Context [40 CFR 1508.27(a)]***:*** Potential effects resulting from the implementation of the proposed action have been analyzed within the context of the project area 7th-field watershed boundaries: Scott Creek, South Fork Scott Creek, Green Mountain Creek and the Upper Hamilton Creek. This project would affect approximately 3 percent of the 13,330 acre combined four 7th field watersheds 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/FEIS.

[1] This section of the Even Keel 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 3.2.1): Effects to this resource are not significant because: 1/ the proposed action would retain a forested environment with at least 40 percent canopy cover (see wildlife); 2/ The proposed action would not adversely affect BLM Special Status or Survey & Manage Species because no suitable habitat for any species requiring protection would be lost or altered to a degree that may impact these species. Therefore, the project would not contribute to the need to list a species as Threatened or Endangered; and 3/ Noxious Weeds – Increases in the number of invasive/non-native plants are not expected with the application of Project Design Features. (EA section 2.2.3), and native species would naturally revegetate after thinning activities reducing the suitable habitat for invasive species.
- Hydrology*; Fisheries and Aquatic Habitat; and Soils* (EA sections 3.2.2-3.2.4): Effects to these resources are not significant because: 1/ The proposed action would abide by and meet State of Oregon water quality standards; 2/ Road construction would occur on gentle slopes with stable, vegetated surfaces; 3/ Stream protection zones (minimum of 70 feet on perennial streams, 30 feet on intermittent streams) would maintain current stream temperatures by retaining the current vegetation in the primary shade zone and most of the current levels of shading in the secondary shade zone. Stream protection zones are also expected to prevent sediment as a result of overland flow or surface erosion in logging units from reaching streams during storms of less than a 10 year return interval (EA section 3.2.2); and 4/ Timber haul and road maintenance project design features would prevent sediment delivery to streams in quantities that would exceed Oregon Department of Environmental Quality (ODEQ) requirements.
- *Soil Productivity* (EA section 3.2.4): Effects to this resource are not significant for the following reasons. No measurable reduction in overall growth and yield in the thinning area would be expected because 1/ Soil compaction is limited to no more than 10 percent of each unit's acreage; 2/ Analysis and decades of BLM experience with similar projects demonstrate that soil compaction and road construction would cause little difference in the average tree spacing, site utilization or overall stand stocking.
- *Wildlife* (EA section 3.2.5): 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 ($\geq$ 15 inches diameter and $\geq$ 15 feet tall) snags that would be felled for safety or knocked over by falling and yarding operations would be retained as CWD; 3/ No suitable habitat for 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 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; 5/ See # 9, for effects to northern spotted owl.
- *Air Quality, Fire Risk and Fuels Management* (EA section 3.2.6): Effects to this resource are not significant because the 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 proposed action would comply with the Clean Air Act and State of Oregon Air Quality Standards by adhering to Oregon Smoke Management guidelines.

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 proposed action would not affect a municipal water source, and there is no danger to the public from logging operations due to the project's location behind a locked gate (EA section 3.2.7).

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 no significant historical or cultural resources were found in the project vicinity. 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 3.2.7).

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.

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 effects associated as a result of the project do not have not uncertain, unique or unknown risks because the BLM has experience implementing similar actions in similar areas without these risks and project design features would minimize the risks associated with the project (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 documented in the RMP/FEIS. 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. See # 4, 5, above.

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 there is a potential for cumulative effects on water quality and fisheries. The proposed action would be expected to temporarily increase stream sediment and turbidity as a result of road renovation, road maintenance, and culvert replacement (EA Sections 3.2.2.2).

   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 for the following reasons: 1/ Any sediment increase resulting from thinning would be too small to be discernible relative to background sediment yields, would not be expected to exceed ODEQ water quality standards and would decrease quickly over time, returning to current levels within three to five years as vegetation increases (Dissmeyer, 2000).

2/ the limited magnitude (less than 0.2 percent of the 6th field Hamilton Creek watershed sediment supply, an undetectable change) and duration (primarily major storm events during the first year following disturbance) of this effect would likely be insignificant for water quality on the watershed scale.

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 there are no properties eligible or listed on the National Register in the project area (EA sections 3.2.7, 5.1.3).

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 3.2.5): Effects to the species are not significant because: The project maintains dispersal habitat, and does not affect suitable owl habitat; habitat conditions are expected to improve as thinned stands mature (>20 years); residual trees would increase in size and be available for recruitment or creation of snags, culls and CWD for prey species and nesting opportunities, particularly in Riparian Reserves. ESA Consultation is described in EA section 5.1.1.
   - *ESA Fish – Upper Willamette River (UWR) Chinook salmon and UWR steelhead trout* (EA Section 3.2.3). Effects to ESA fish are not significant because thinning is not expected to affect these species because: The project is more than 2.8 miles from salmon and steelhead habitat; design features would minimize impacts on stream channels, water quality, and fish habitat; and new road construction would be located in stable locations so it 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, 3.2.7).

Approved by: Cindy Enstrom

Cindy Enstrom, Cascades Resource Area Field Manager Date: 6/13/2012

1.0 INTRODUCTION

1.1 Proposed Action

The Cascades Resource Area, Salem District Bureau of Land Management (BLM), proposes to thin approximately 445 acres within 48-75 year old forest stands. Connected actions include road work (construction, renovation, maintenance, blocking and stabilizing); and fuels treatments (EA Sections 2.0 and 3.0).

1.1.1 Project Area Location and Vicinity

The Even Keel Thinning project area is within the Hamilton Creek and Crabtree Creek Watersheds east of the City of Lebanon in Linn County, Oregon. The BLM ownership pattern is intermixed with privately-owned Weyerhaeuser Company. Access is obtained from the south by the Scott Creek Main Line from Upper Berlin Road. A Weyerhaeuser gate restricts access to the general public and is the only haul route facilitating logging operations. The proposed project is two to four miles behind this locked gate. The project is located within Township 12 South, Range 1 East, sections 11, 13, 23 & 25; Willamette Meridian. See EA Section 7.0 for project maps.

1.2 Purpose of and Need for Action

1.2.1 Need for the Action

BLM staff members have 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). These 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 lower timber productivity and delays development of complex stand structure for habitat.

1.2.2 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 BLM lands within the Salem District (EA Section 1.3). 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). Objectives for these LUA include:

- **GFMA (Matrix) LUA:** For this project, all Matrix land is within the General Forest Management Area (GFMA), so the terms “Matrix” and “GFMA” may be used interchangeably in this document.

Lands within the Matrix LUA are designated for the sustained production of timber. Overstocked stands within this LUA have declining growth rates which results in reduced volume yield and value over the planned timber rotation. The proposed forest management activities are needed in these stands to reverse these trends so the stands will persist and contribute to future forest production and other goals of the RMP (EA section 1.2.2 and RMP pp. 46-48.

- **Riparian Reserve LUA:** The Riparian Reserve LUA (RR) includes the stream and the area extending one site-potential tree height (slope distance) from the edges of the stream channel (each side) for non-fish bearing streams and two site-potential tree heights for fish bearing streams. For this project the width of the Riparian Reserve LUA is between 440 – 480 feet on each side of fish bearing streams and between 220 – 240 feet on each side of non-fish bearing streams.

  Lands within the Riparian Reserves 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 in this LUA are overstocked, resulting in simple stand structure and declining growth rates that result in delayed development of large diameter snags and other habitat characteristics associated with late-successional forests.

  The NWFP (p. C-32) and the RMP (p.11) direct the BLM to apply silvicultural practices in the Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy (ACS) objectives. The RMP (p. D-6) states that merchantable logs may be removed "where such action would not be detrimental to the purposes for which the Riparian Reserves were established". EA section 3.2.8 describes the project's compliance with the Aquatic Conservation Strategy, including the nine ACS objectives.

  The NWFP (p. B-31) states that "active silvicultural programs will be necessary to restore large conifers in Riparian Reserves".

Project Objectives within the Matrix (GFMA) LUA

1. Manage developing stands on available lands to promote tree survival and growth to: 1/ achieve a balance between wood volume production, quality of wood, and timber value at harvest (RMP p. 46); 2/ increase the proportion of merchantable volume in the stand; 3/ produce larger, more valuable logs; 4/ anticipate mortality of small trees as the stand develops; and to 5/ maintain good crown ratios and stable, wind-firm trees (RMP p. D-2) by applying commercial thinning treatments.

2. Supply a sustainable source of forest commodities from the Matrix/GFMA LUA to provide jobs and contribute to community stability (RMP pp. 1, 46-48). Select logging systems based on the suitability and economic efficiency of each system for the successful implementation of the silvicultural prescription, for protection of soil and water quality, and for meeting other land use objectives (RMP p. 47) by developing timber sales that can be successfully offered to the market place.

3. Maintain and develop a safe, efficient and environmentally sound road system (RMP p. 62) and reduce environmental effects associated with identified existing roads within the project area (RMP p. 11) by:

   - Providing appropriate access for timber harvest, silvicultural practices, and fire protection vehicles needed to meet the objectives above;
   - Performing road work to prevent road deterioration or failure and to prevent road generated sedimentation that exceeds ODEQ standards.

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 functions such as dispersal of organisms, carryover of some species from one stand to the next, by maintaining ecologically valuable structural components such as large down logs and snags, and large trees (RMP p. 20).

Project Objectives within the Riparian Reserve LUA

6. Maintain water quality standards (RMP p.2) and improve stream conditions by:
   - Maintaining effective shade for streams pursuant to BLM's Total Maximum Daily Load (TMDL) agreement with the State of Oregon (EA Section 2.2.3);
   - Designing new roads and using existing roads to avoid increasing the quantity of water and sediment transported to streams (EA Section 2.2.3); and
   - Performing road work to prevent road deterioration or failure and to prevent road generated sedimentation that exceeds ODEQ standards.

7. Maintain and develop or accelerate development of:
   - Large conifers with deep crowns and large limbs; future source material (large green trees) for coarse woody debris (CWD) meeting RMP standards; future source material (large green trees) for large (>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; and
   - Habitat for Special Status, SEIS special attention and other terrestrial species (RMP p. 9)

   By applying commercial thinning treatments within the Riparian Reserve LUA concurrent with treatments in the adjacent Matrix/GFMA LUA (RMP pp. 7, 9-15, D-6; NWFP p. B-31, C-32).

8. 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

9. Protect, manage, and conserve federal listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act and Bureau Special Status Species policies (RMP p. 28).

10. Increase protection for the public and high-value resources from large, intense wildfires in the rural/urban interface (RMP, pp. 39, 43) in accordance with the National Fire Plan's Healthy Forest Initiative and Restoration Act by:
    - Reducing natural and activity-based fuel hazards on BLM-administered lands in mixed ownership areas,
    - Protecting resources on BLM-administered land from potential wildfires originating on adjacent private land by reducing fuel hazards.

1.2.3 Decision to be Made

The Decision Maker will decide whether to implement the proposed project, what additional project design features would be incorporated into the project, and which alternative best meets the purpose of and need for the project.

1.2.4 Decision Factors

In choosing the alternative that best meets the purpose and need, the Cascades Resource Area Field Manager will consider the extent to which each alternative would:

1. Provide timber resources to the market and revenue to the government from the sale of those resources (objectives 1 and 2);
2. Provide for economically efficient short-term and long-term management of public lands in the project area (objectives 2 and 3);
3. Provide for safe, economically efficient and environmentally sound access for logging operations, fire suppression and administration on public lands (objectives 2, 3, and 10)
4. Provide for increased survival and growth of conifer species while retaining structural and habitat components, such as large trees, snags, and coarse woody debris (objectives 1, 5, 7, 8, and 9);
5. Provide habitat for special status, SEIS special attention and other terrestrial species associated with a variety of seral stages and forest stand characteristics in the vicinity of the project area (objectives 4, 5, 7, 8, and 9);
6. Provide for aquatic habitat and water quality/quantity by designing new roads and using all roads to avoid increasing the quantity of water and sediment delivered to streams (objectives 3 and 6);
7. Minimize the potential for human sources of wildfire ignition and prevent large scale, intense wildfires in the project area (objectives 3 and10).

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

This project has been designed under 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 BLM lands within the Salem District. In summary, the Even Keel 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 plan terms and conditions. Implementing the RMP is the reason for doing these activities (RMP p.1-3).
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 Even Keel Thinning EA is site-specific, and 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 RMP/FEIS is amended by the *Final Supplemental Environmental Impact Statement for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, November 2000.

Watershed Analysis: Information from the *Hamilton Creek Watershed Analysis*, 1995 and the *Crabtree Creek Watershed Analysis*, 2001 has been incorporated into the development of the proposed thinning activities and into the description of the Even Keel Thinning EA's affected environment and environmental effects (*EA section 3.0*) and is incorporated by reference.

The above documents are available for review in the Salem District Office. Additional information about the proposed activities is available in the Even Keel Thinning EA Analysis File, also available at the Salem District Office.

1.3.1 Land Use Plan Update

A final judgment was issued on 5/16/2012 concerning the Pacific Rivers Council V. Shepard litigation. The court vacated the Western Oregon Plan Revision (WOPR) Record of Decision, returning the management of the federal lands to the Northwest Forest plan, i.e. 1995 Resource Management Plans that were in place prior to December 30, 2008, as modified (i.e. Salem District RMP). The Northwest Forest Plan was incorporated into the 1995 Salem District RMP.

1.3.2 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 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 streamflow, provide for recreational facilities, and contribute to the economic stability of local communities and industries.

Additional authorities and management direction are described in EA section 3.2.7, Table 19.

1.4 Scoping and Identification of Relevant Issues

1.4.1 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 by IDT members, 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 56 recipients, including federal, state and municipal government agencies, nearby landowners, tribal authorities, and interested parties on the Cascades Resource Area mailing list on June 4, 2010. The BLM received five comment letters/emails during the scoping period. The scoping comment letters/emails are available for review at the Salem District BLM Office.

1.4.2 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 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. Response to scoping comments received, including these issues can be found in EA section 9.0.

1.4.2.1 Issue 1: The Effects of Management Actions on Water Quality, Fisheries, Riparian Reserves and Aquatic Conservation Strategy

Elements of the issue: the need to build new roads; effects of road work on connectivity to the stream network and hydrological processes; effects of thinning within Riparian Reserves on water quality and other Aquatic Conservation Strategy objectives.

1.4.2.2 Issue 2: The Effects of Management Actions on Forest Structure and Site Productivity

Elements of the issue: effects of thinning on snag, large woody debris (LWD) and coarse woody debris (CWD) recruitment and retention; minor tree species retention; effects to wildlife habitat; creation of early seral vegetation and forage for big game and other species of wildlife whose populations are at risk of decline; vegetation trends in the short and long term; and forest site productivity.

1.4.2.3 Issue 3: The Effects of Management Actions on Special Status Species (includes ESA threatened/endangered species)

Elements of the issue: impacts to Special Status Species, including plant, bird, fish, and animal species. See Issues 1 and 2.

1.4.2.4 Issue 5: The Effects of Management Actions On Air Quality, Fire Risk, And Fuels Management

Elements include: Impacts to air quality from harvest operations and prescribed burning. The risk of a fire start in high hazard areas and the impacts of fire on other resources.

1.4.3 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, and 10 (EA section 1.2). Specific concerns about harvest operations are addressed in EA section 9.0 (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[2] 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[3]:

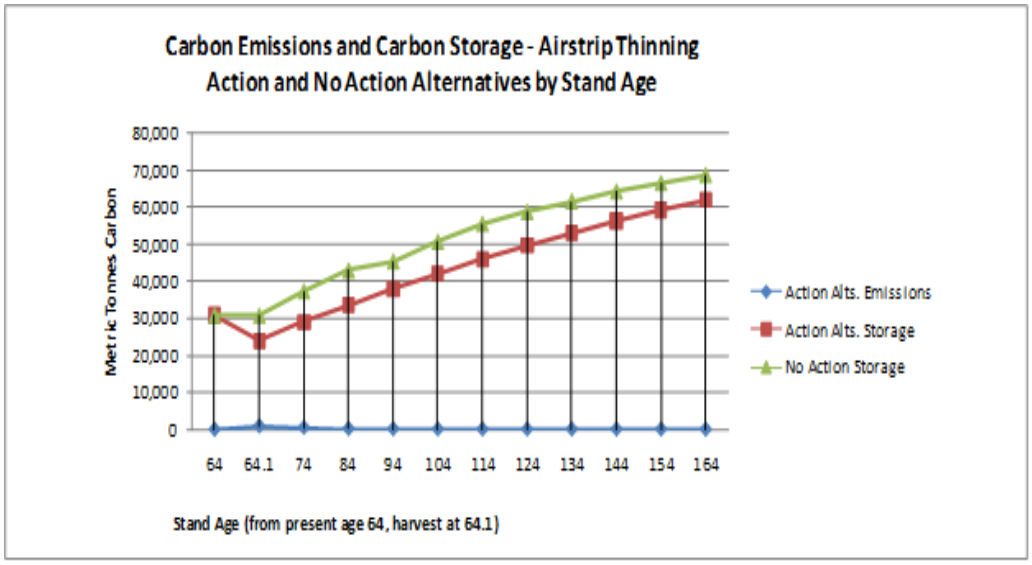
   - Range analyzed for treated acres in the projects: 290 to 1,724 acres.
   - Range analyzed for carbon in harvested wood: 7,000 to 107,000 tonnes.
   - Range analyzed for total carbon emissions in the 30 year period following harvest: 1,850 - 17,080 tonnes.
   - Range of carbon storage in untreated project 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:

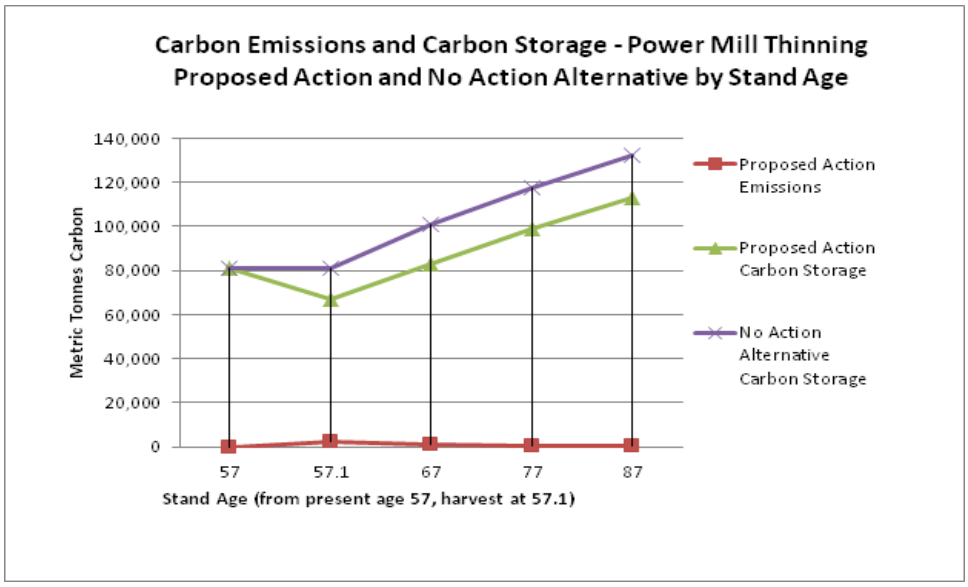
   - The carbon emissions attributable to the projects, both individually and cumulatively, are of such small magnitude that it is unlikely to be detectable at any scale (global, continental or regional) and thus would not affect the results of any models now being used to predict climate change.
   - Total 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.

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

[3] 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 Even Keel Thinning project falls within the range covered by the projects analyzed and is expected to have similar results.

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 "Proposed Action" and "No Action Alternative" (which provides the baseline to evaluate effects).

2.2 Proposed Action

The BLM proposes to thin approximately 445 acres of 48 to 75 year-old forest stands, using ground-based yarding on approximately 297 acres and skyline yarding on approximately 148 acres. BLM requires the logging operators to submit an operating plan to BLM and receive BLM approval of this plan prior to implementing harvest treatments. Table 1 shows the proposed action by watershed. (EA Section 7.0 for map of the Proposed Action and Table 7 for Stand Characteristics).

2.2.1 Proposed Treatments

The proposed commercial thinning would reduce stand density by implementing a "thin from below" prescription in all units. The prescription generally designates trees to be retained based on a combination of tree size, crown position, spacing, species mix, vigor and potential future log quality (Silvicultural Prescription p. 2). Table 1 shows the proposed action by land use allocation (LUA) and harvest method.

Table 1: Acres by Land Use Allocation (LUA) and Harvest Method

EA Unit No.		Stand Age	Thinning Acres				
			EA Total	Matrix		Riparian Reserve	
				Ground based	Skyline	Ground based	Skyline
T.12S. R. 1E.	11A	71	70	16	38	4	12
	11B	67	5	0	5	0	0
	13A	65	21	10	2	1	8
	13B	57	159	129	7	16	7
	23A	75	85	56	7	21	1
	23B	48	88	26	31	5	26
	25A	60	17	8	2	5	2
Total Acres			445	245	92	52	56
Land Use Allocations	**Matrix**		337	245	92		
	Riparian Reserve		108			52	56
Harvest Method	**Ground-based**		297	245		52	
	Skyline		148		92		56

Implement half to one acre low density thinning (LDT) patches (10 to 12 green trees per acre) in 12S-1E-13A, 13B, 23B and 25A units for a total of up to six LDT patches. Remove or pile and burn slash in the gap openings for recruitment of grasses, forbs, deciduous shrub, understory vegetation and ground cover. This treatment addresses the request for early seral habitat in these stands, to provide habitat for big game, migratory birds, and other early seral dependent species.

Matrix LUA

The BLM proposes to thin 337 acres within the Matrix. For Matrix LUA objectives, refer to EA section 1.2.2. To achieve these objectives, the proposed prescription would:

- Retain the largest, healthiest and best formed dominant and co-dominant trees;
- Remove some dominant and co-dominant trees to achieve desired stocking levels and spacing, and to facilitate safe and economical logging;
- Maintain spacing to provide adequate growing room for retained trees based on target stocking (number of trees per acre to be retained in each stand);
- Reduce current tree densities from 106-208 trees per acre to 60-150 trees per acre;
- Maintain sufficient growing stock to insure the site is fully utilized and total net yield throughout the rotation is not substantially reduced;
- Maintain a mix of tree species, including hardwoods that are currently present in the stand.
- Retain and protect 90 percent of existing large (>15 inches diameter and 15 feet tall) snags from damage during timber harvest activities;
- Retain and protect 90 percent of existing CWD (down logs ≥20 inches diameter and ≥20 feet long) from damage during timber harvest activities;
- Maintain spotted owl dispersal habitat after harvest maintaining an average canopy closure of 40+ percent over the project area; and
- Retain and protect all remnant old-growth trees.

Riparian Reserve LUA

The BLM proposes to enhance Riparian Reserve characteristics by thinning 108 acres to accelerate development of a large tree component, good snag distribution and density management. The prescription contributes to developing a complex, variable stand structure across the landscape in the Riparian Reserve to meet Aquatic Conservation Strategy (ACS) (see EA section 1.2.2).

Unless otherwise noted, the prescription for the Matrix LUA would apply to the Riparian thinning. In addition, the proposed action within the Riparian Reserve LUA would:

- Create a variable density thinning effect where structural and horizontal diversity could be enhanced in selected Riparian Reserve areas;
- Retain a canopy closure of at least 50% in the secondary shade zone.
- Maintain stream protection zones (SPZ) on all perennial and intermittent streams. No harvest or direct disturbance would take place within the SPZ, except road renovation/maintenance at stream crossings within the road right-of-way. The SPZ would have a minimum width of 70 feet each side of perennial streams and 30 feet each side on intermittent streams.

- Retain the remaining forest stands within the Riparian Reserve LUA (1175 acres) on BLM managed lands within T.12S., R.1E. sections 11, 13, 23, and 25. These untreated areas include:
  - Areas with steep, unstable slopes;
  - Areas where 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

1. **Road Work (**EA Section 2.3.4; EA Section 7.2-Maps**):**

Table 2: Road Work

EA Unit		(Miles)			
		New Road construction			Road Renovation
		BLM	Private	Total	
T. 12S. R.1E.	11A	0.24	0.02	0.26	0.27
	11B				0.24
	13A	0.31	0.05	0.36	
	13B	0.07	0	0.07	1.71
	23A				0.28
	23B	0.39	0	0.39	0.28
	25A		0.17	0.17	0.37
Total		1.01	0.24	1.25	3.15

New Road Construction: The BLM would design and construct approximately 1.01 mile of new road on BLM land and approximately 0.24 mile of new road on private land to provide access to the proposed thinning project area for logging and hauling where none existed before. New construction includes clearing vegetation within the road Right-of-Way (R-o-W) using ground based logging equipment. Clearing would average less than 30 feet wide. The BLM may rock new roads on Matrix land depending on conditions and needs during operations. Up to one new culvert would be installed on private land for ditch relief. New roads would be blocked and stabilized after operations.

Road Renovation: The BLM would maintain and renovate approximately 3.15 miles of existing road on BLM managed 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. Up to 2 culverts are proposed for replacement on roads to be renovated to meet current standards. Both culverts are in small live streams and would be replaced during the in water work period of June 1st through September 30th.

Road Maintenance: The BLM would perform routine maintenance on approximately 9.85 miles of existing roads along the timber haul route. Road maintenance is the normal, periodic work done to maintain existing, open roads in a useable, safe and environmentally sound condition.

Up to 31 culverts are proposed for installation or replacement to meet current standards. Of these 31 culverts, 3 are new installations and 13 are live stream culverts that would be replaced during the in water work period of June 1st through September 30th. The remaining 15 culverts proposed for replacement are ditch relief cross drains to route runoff to stable vegetated slopes.

2. **Fuels Treatments** (EA Section 3.2.6)

   Post-harvest fuels hazard surveys would be conducted and site-specific 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).

Table 3: Fuels Treatment Methods

Section	Proposed Treatments
11, 13, 23, 25	Machine pile, cover and burn landing piles
13, 25	Machine pile or handpile, cover and burn approximately 5 acres within the low density thinning areas).
13, 23, 25	Fuel reduction corridor (50') along property lines (approximately 10 acres)

Treatments may include:

- Landing pile construction, covering, and burning.
- Machine pile/handpile construction, covering, and burning.
- Fuel reduction corridor construction including:
  - Slash pullback
  - Slashing
  - Lopping and scattering
  - Firewood cutting
  - Biomass removal

In lieu of burning, slash at landing areas may be removed to be used as mulch to cover roadbeds during stabilization (see EA section 2.2.2, Item 1, above), slash may be offered for firewood, or slash may be removed as biomass for energy production . The total amount of debris expected to be machine piled or handpiled in the low density thinning areas is estimated to be between 30 and 50 tons.

3. **Landings:** The BLM would require the timber sale operator to construct ground-based and skyline landings according to the approved logging plan. No landings would be placed in the Stream Protection Zones.

4. **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.

5. **False Brome Pre-Treatments** (PDF # 39, EA section 2.2.3): The BLM would pre-treat existing false brome with the application of herbicides prior to Even Keel ground disturbing activities. The objective of these pre-treatments is to reduce the risk of false brome spread as a result of Even Keel ground disturbing activities. In 2012, two treatments would occur where false brome has been found within EA Units 13A &B and 25A &B and within T12S-R01E-sec12, 25 & 27. The initial treatment is to occur during the first half of June to try and kill all the current bunches and to kill all plants before they set seed. A second treatment would occur in late summer to try and kill any additional sprouts that come up after the initial spray during the summer.

   Previous pre-treatments occurred during 2011, described in EA section 3.2.1. The effects of the previous 2011 and the current 2012 treatments are covered under the programmatic *2009 Cascades Resource Area Invasive Non-Native Plant Management EA* (#DOI-BLM-OR-S040- 2009-0002-EA). Finally, these treatments follow the direction in BLM Manual 9015 - Integrated Weed Management.

2.2.3 Project Design Features (PDF)

This section summarizes the project design features that would further reduce the project's effects on the affected resources described in EA section 3.1-3.2. Project design features described in this section would be implemented in the selected alternative. These design features are based on the management guidance described in the RMP/FEIS (pp. 2-35 – 2-37, 4-11 – 4-14, G-1 – G-2, S-1 – S2) and RMP (pp. 23-24, C-1 – C-2). BLM contracting officer would ensure PDF's are implemented during operations by incorporating them in contract requirements and by monitoring the operator's performance in the field. A performance bond associated with the contract holds the purchaser financially liable for implementing the PDFs.

The following project design features, shown in Table 4, 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); 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 4: Project Design Features

Applicable Resources / Objectives Project Design Features (PDF) (RMP/FEIS references for key points)	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire / Air	Public	Cultural	Economic
In All Logging Operations: **RMP/FEIS (pp. 2-34 -- 2-37; 4-11 -- 4-13; G-1,2)**										
1. Limit the area compacted by logging operations (skidding, yarding and landings) to less than ten percent (10%) 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 more than a few (generally less than 10) feet.	♦	♦	♦	♦						
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 landing size to the minimum area needed for safe and efficient operations.	♦	♦	♦		♦	♦	♦			♦
5. Retain organic material including duff, litter and logging slash on the forest floor to return nutrients to the soil.	♦	♦	♦	♦	♦	♦	♦			
6. Implement erosion control measures to prevent rill or gully erosion including shaping to modify drainage (water bars, sloping, etc.); tilling; placing logging slash and debris on exposed soil; and seeding with native species.	♦	♦	♦	♦	♦	♦				
7. Directionally fall trees in the harvest units so that they generally do 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)**										
8. 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.	♦	♦	♦	♦		♦				♦
9. Re-use existing skid trails whenever feasible for logging operations according to the approved logging plan.	♦	♦	♦	♦	♦	♦				♦
10. Locate new skid trails generally on slopes not greater than 35 percent to avoid gouging, soil displacement and erosion.	♦	♦	♦	♦		♦				♦
11. Generally limit uphill skidding to slopes where skidders would not break traction to avoid soil displacement.		♦	♦	♦						♦
12. Allow use of mechanized falling/processing and log handling machinery on slopes up to 45 percent where the machinery design and operating techniques 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:[4] RMP/FEIS (pp. 2-34 through 2-37; 4-11 through 4-13; G-1,2)										

[4] 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.

Project Design Features (PDF) (RMP/FEIS references for key points)	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire / Air	Public	Cultural	Economic
13. 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 -- 2-37; 4-8 -- 4-13; G-1,2)**										
14. A Prescribed Fire Burn Plan would be initiated and signed by the Authorized Officer prior to any prescribed burning activity.	♦	♦	♦	♦	♦	♦	♦			
15. 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. It would be conducted under good atmospheric mixing conditions to lessen the impact on air quality in Smoke Sensitive Receptor Areas.	♦	♦	♦	♦	♦	♦	♦			
16. 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.	♦	♦	♦	♦	♦	♦	♦			
17. Woody debris greater than six (6) inches in diameter would not be piled.	♦	♦	♦	♦	♦	♦	♦			
18. Hand, machine, and landing piles would be located as far as possible from green trees and reserved trees to minimize damage.	♦	♦	♦	♦	♦	♦	♦			
19. Machine and landing piles would only be constructed within twenty-five (25) feet of designated roads and landings. Equipment used in the construction of machine piles or landings would remain on the roads or landings during the construction.	♦	♦	♦	♦	♦	♦	♦			
20. Hand, machine, and landing piles would be covered with .004 mil thick black polyethylene plastic. The plastic shall not exceed one hundred (100) square feet in size and would be placed and anchored to help facilitate the consumption of fuels during the high moisture fall/winter burning periods.	♦	♦	♦	♦	♦	♦	♦			
21. Lopping and scattering of fuels would be incorporated where fuel loading is relatively heavy but not heavy enough to warrant burning.	♦	♦	♦	♦	♦	♦	♦			
22. 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.	♦		♦		♦	♦	♦			
23. 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. Restrict or suspend ground disturbing activities immediately if prehistoric cultural resources are encountered during project implementation and develop appropriate management practices to protect the site/cultural values.									♦	
Road Construction, Renovation, Maintenance, Stabilization and Closure: **RMP/FEIS (pp. 2-22,68,69; 2-75,76; 4-11 -- 4-19; G-2 -- G-7)**										

Project Design Features (PDF) (RMP/FEIS references for key points)	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire / Air	Public	Cultural	Economic
25. 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 could be channeled directly to streams (Wemple et al. 1996).	♦	♦				♦	♦	♦		♦
26. 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.	♦	♦				♦	♦	♦		♦
27. Haul logs on forest roads during times and road conditions that would not generate sediment that would enter streams and cause a visible increase in stream turbidity.			♦	♦						♦
28. During yarding and 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. Allow operations to resume when ODEQ turbidity standards are met.			♦	♦						♦
29. Close and stabilize all new roads after use to reduce changes to natural drainage patterns and prevent erosion.	♦	♦	♦	♦	♦	♦	♦	♦		♦
30. Eliminate fine sediment delivery to streams by using sediment control measures. Methods include but are not limited to: adding rock to the road and re-grading of the road surface to improve drainage, placement of bark bags or other material in the ditch to filter sediment out of the water, restricting haul until conditions improve.	♦	♦	♦	♦	♦	♦				
31. Culverts and subgrades of closed and stabilized roads would be left intact so that the road can be renovated for future use or fire control with minimal disturbance and expense.	♦						♦	♦		♦
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)**										
32. Retain remnant old growth trees and protect them from logging damage that would impact tree health or function.	♦				♦					♦
33. Retain 90 percent of snags larger than 15 inches diameter and 15' tall (IDT best management practice based on wildlife report) intact and standing during logging activities.	♦				♦					♦
34. 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 operating techniques that require minimal movement of CWD to protect its physical integrity. (RMP p. 21)	♦	♦			♦					♦
35. In the Riparian Reserve LUA, where feasible with safe and efficient logging operations, maintain minor conifer tree species and retain some (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).	♦				♦					
36. Retain hardwood species. Reserve any existing minor hardwood species (black cottonwood, golden chinquapin), and retain bigleaf maples greater than 20 inches in diameter.	♦				♦					♦

Applicable Resources / Objectives Project Design Features (PDF) (RMP/FEIS references for key points)	Vegetation	Soil	Water	Fish	Wildlife	Invasives	Fire / Air	Public	Cultural	Economic
37. 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.	♦	♦	♦	♦	♦	♦				
38. Clean all ground-disturbing logging and road construction equipment to be free 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.						♦				
39. False brome pre-treatments would only occur during calm, dry weather conditions; using low pressure spot spray of direct wicking applications; no herbicides would be applied to open water or to plants in standing water. (2010-2013 Pesticide Use Proposal (#10-OR080-002)	♦					♦				
40. 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 5.

Table 5: Summary of Seasonal Restrictions and Operational Periods

Seasonal Restriction	Reason	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Most logging, road work and site preparation All units in section 12S-1E-11 and Unit 13A	Spotted Owl critical nesting time March 1st through July 15th			■	■	■	■	■					
Most logging, road work and site preparation operations. Unit23A (8 acres) off road 12-1-23	Red Tailed Hawk Critical Nesting Season March 1st through July 31st			■	■	■	■	■					
Hand falling and yarding	Bark slippage			▒	▒	▒	▒	▒					
Hauling	Water quality and sedimentation	▒	▒	▒	▒	▒						▒	▒
Skidding and mechanized falling	Soil compaction	▒	▒	▒	▒	▒				▒	▒	▒	▒
Road Construction / Road Closure	Soil damage/erosion control	■	■	■	■	▒				▒	▒	▒	■
In-water work: stream culvert maintenance	Protect fish and aquatic habitat	■	■	■	■	■					■	■	■
Logging operations	Fire season, ODF 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 6: Acres of BLM Land, Matrix, and Riparian Reserve

T.S. R.E. section	Total Acres by Section			Even Keel Proposed Action			No Thinning		
	BLM Land	Matrix LUA	Riparian LUA	Total Acres	Matrix Thinning	Riparian Thinning	BLM Land	Matrix LUA	Riparian LUA
12-1-11	471	254	217	75	59	16	396	195	201
12-1-13	613	274	339	180	148	32	433	126	307
12-1-23	536	234	302	173	120	53	363	114	249
12-1-25	671	354	317	17	10	7	654	344	310
Totals	2291	1116	1175	445	337	108	1846	779	1067

The proposed action would thin:

- 445 acres out of a total of the 2291 acres (20 percent) of BLM land within the project area.
- 108 acres out of a total of the 1175 acres (9 percent) of BLM land within the Riparian Reserve LUA within the project area.

2.4 No Action Alternative

The No Action alternative describes the baseline against which the effects of the proposed action can be compared, i.e. the existing conditions in the project area and the continuing trends in those conditions if the BLM does not implement any of the proposed actions. The "No Action Alternative" means that no timber management actions, fuel reduction treatments, or connected actions would occur. 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.

2.5 Alternatives Considered, Not Analyzed In Detail

1. 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 ACS objectives for habitat. Two general criteria were used in this screening process: 1) If the stand has a simple structure that would benefit from thinning to accelerate development of elements of complex structure for habitat enhancement; and 2) If the stand can be treated in conjunction with the adjacent Matrix unit.. Riparian Reserve stands that did not meet both of the above conditions were dropped from further consideration for treatment.

2. Other stands proposed for treatment:

   The IDT had initially considered thinning 50 acres (approximately 30 acres of Matrix and 20 acres of riparian reserve) on road 12-1-15.1 in Unit 11A. After evaluating impacts of renovating Hamilton Creek road to access the additional acres in 11A, the team recommended dropping these acres from the proposed action.

3. Units dropped from the Proposed Action:

   The IDT had initially considered thinning an additional 115 acres within the project area. After further field work, the team recommended dropping these acres from the proposed action.

4. Reserve the stands in the project area for carbon storage:

   This alternative was not analyzed 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
   - Is substantially similar in design to the "No Action alternative" which is analyzed in the EA, in that this alternative would leave the stands unaltered and unmanaged just as under the "No Action alternative".

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

Analysis 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 such as water quality and aquatic habitat 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 forest condition information was compiled 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 pp. 12-13, Wildlife Report pp. 1, 29-34).
- Geographic Information System (GIS) data, aerial photographs and satellite imagery, BLM's Forest Operations Inventory (FOI) records, resource specific field surveys (see the following EA sections for specific surveys conducted) and field reconnaissance by BLM resource specialists were used to describe vegetation, habitat and plant and animal species present on BLM lands.

3.1 General Setting

Incorporated by reference: Hamilton Creek Watershed Analysis (HCWA), 1995; Crabtree Creek Watershed Analysis (CCWA 2001).

The Hamilton Creek Watershed (HCW) is approximately 17,500 acres in size and the analysis was completed in March 1995. The BLM manages approximately 26 percent of the watershed, and the remainder is managed primarily by Private Industry (HCWA pp. 14-15). The predominate age class on BLM lands in the HCW is mid seral closed sapling pole stands from 35 to 75 years of age (HWCA pp. 30-31).

A shortage of late successional forests in the HCW over 80 years of age was identified (HCWA pp. 33-34), and density management was recommended to accelerate late successional conditions, especially in Riparian Reserve (HCWA pp. 72-73).

Virtually all private and federal forest lands have been logged since the 1920's. Management objectives for industrial forest landowners within the HCW have been sustained yield forest management. Industrial forest lands will continue to be managed for timber commodities on a sustained yield basis in compliance with the Oregon Forest Protection Act, with a regeneration harvest rotation age averaging 50 to 60 years.

The Even Keel Thinning proposes to treat 80 acres in Crabtree Creek. The Crabtree Creek 5th field watershed is 100,022 acres in size and is also located in Linn County. The Crabtree Creek Watershed Analysis (CCWA 2001) was completed in July 2001. The BLM manages about 18 percent of the Crabtree Creek Watershed.

One of the key findings of the Crabtree Watershed Analyses was that there is a lack of older forests and the watershed is dominated by younger stands, which lack structure and characteristics of late successional stands (CCWA 2001, Chp. 7 p. 1).

3.2 Resource Specific 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, to determine if they would be affected by the proposed action (BLM Handbook H-1790-1: p. 137), [40 CFR 1508.27(b)(3)], [40 CFR 1508.27(b)(8)] (EA section 3.2.7), as well as the issues raised in scoping (EA section 1.4.2). The elements of the environment affected by this project are described the following sections: Vegetation; Hydrology; Fisheries and Aquatic Habitat; Soils; Wildlife; and Air Quality and Fire Risk and Fuels Management.

3.2.1 Vegetation

Sources Incorporated by Reference: *Vegetation Description – Even Keel Thinning and Silvicultural Prescriptions, Thompson, (Silviculture Report); Cascade Resource Area Botanical Report Proposed Even Keel Thinning Timber Sale, Fennell (Botany Report); Cascade Resource Area Wildlife Report for the Even Keel Thinning Project, England (Wildlife Report); Even Keel Thinning Project Air Quality, Fire Risk, and Fuels Management Specialist Report, Mortensen (Fuels Report). Additional sources: Stand Exam data and analysis, botanical surveys, field reconnaissance by BLM personnel, Salem District Forest Operations Inventory (FOI) data, Salem District Timber Production Capability Class (TPCC), Salem District Geographic Information System (GIS) data, Salem District archival records.*

Affected Environment

Stand Structure and Development - Proposed Thinning Unit Characteristics

Matrix (GFMA) LUA

The forest stands on BLM lands throughout the Even Keel Thinning project area are currently second-growth, managed conifer forest. Most of the BLM land in the project area was clearcut in the 1920s, 30s and 40s. Table 7 presents key information from collected stand data.

The stands range from 48 to 75 years old and, except as described in the following paragraphs, are dense, single storied stands of Douglas-fir, western hemlock, hardwood trees and other conifers. None of the stands in the Even Keel Thinning project area have reached culmination of mean annual increment (CMAI), so they are not considered to be ready for regeneration harvest (RMP, p. 48). The tree density levels throughout the project area range from 106 to 208 trees per acre. These densities 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 windthrow.

Riparian Reserve LUA

The Riparian Reserve stands proposed for thinning are similar to and contiguous with the Matrix stands proposed for thinning. When BLM lands in the Even Keel 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.

Specialists evaluated Riparian Reserve stands in the project area and determined that selected portions of those stands are lacking structural diversity 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 severely hindered by the shade of the dense overstory canopy. The wildlife biologists determined that in these selected stands thinning would accelerate key elements of habitat development in these areas.

Table 7: Even Keel Stand Characteristics

T-R-Sec Unit	Stand Acres	Seral Stage#	CWD** (Linear feet/acre)	Snags per 100 acres >15"Diameter & >15'Tall	Stand Age*	Current Condition			Average Diameter, Year 20 No Thin	After Proposed Treatment		
			Hard/Soft	Hard/Soft		Trees per Acre	Average Diameter	Curtis RD		Trees per Acre	Average Diameter Year 20	Curtis RD
12-1-11A	70	Late-Middle	<60/240	50/100	71	142	20	63	23	80	27	37
12-1-11B	5	Late-Middle	0/0+	0+/160	67	131	16	44	19	60	23	34
12-1-13A	21	Late-Middle	120/480	0+/250	65	208	16	70	20	80	25	39
12-1-13B	159	Middle	<30/210	70/0+	57	173	16	61	20	100	24	37
12-1-23A	85	Late-Middle	<30/480+	50/60	75	106	23	62	26	60	30	35
12-1-23B	80	Middle	0+/360	125/0+	48	202	13	53	16	150	20	39
	8	Late-Middle	120/120	0+/50	75	106	23	62	26	60	30	35
12-1-25	17	Middle	60/480	50/50	60	196	15	60	18	80	22	38
Total	445											

***** Total stand age as of 6/2012

Seral stage age categories: Early = 0-30 years, Early-Middle = 31-40, Middle = 41-60, Late-Middle = 61-80, Early mature = 81-120, Mature = 121-200, & Old growth = 200+ years

** RMP requirements for CWD are minimum 20 inches diameter large end x 20 feet long.

*2006 Stand Exams. Ages, T/A, Diameter and RD separated by a comma (##, ##) denote two forest stand types within the treatment unit.

No thinning would take place in the Riparian Reserve LUA stands that provide greater variety than is found in the adjacent uniform conifer stands because they are:

- naturally developing structural complexity;
- associated with ecological riparian zones where the water table largely defines site conditions;
- structurally diverse with hardwood trees, brush species and western red-cedar.

Survey Results

Threatened or Endangered /Special Status Plants/Survey and Manage Species

No Threatened & Endangered species or habitat was found to exist within or adjacent to the proposed harvest areas. Suitable habitat for some Special Status or Survey and Manage vascular plant, lichen, or bryophytes species was found to exist within the boundaries of the proposed harvest areas. No Survey and Manage plant species or habitat requiring protection under the 2011 Survey and Manage Settlement Agreement were found within the project area.

Invasive / Non-native Plant Species

BLM field surveys found the following BLM Manual 9015 Class B & C and Oregon Department of Agriculture (ODA) List B &T invasive non-native species within and adjacent to the proposed harvest areas, within road corridors and previously thinned stands:

Table 8: Invasive Non-Native Plan Species Within and Adjacent to Proposed Thinning Units

Common Name	Scientific Name	Type	
		BLM 9015 Class	ODA List
false brome	*Brachypodium sylvaticum*	B	B/T
tansy ragwort	*Senecio jacobaea*	C	B
Canadian thistle	*Cirsium arvense*	C	B
bull thistle	*Cirsium vulagre*	C	B
St. John's wort	*Hypericum perforatum*	C	B
scotch broom	*Cytisus scoparius*	C	B

BLM Manual 9015 Class B Listed species receive the second highest priority within a three tiered rating system. Management emphasis is to control the spread, decrease population size, and eventually eliminate the weed population.

ODA List T species represent a threat to the state of Oregon and are targeted for eradication. These species are of both economic and ecological importance due to their potential impacts on the environment. BLM Manual 9015 Class C and ODA List B species identified during field surveys are species of both economic and ecological importance due to their potential impacts on the environment.

As shown on Table 8, false brome is a 9015 Class B and ODA List B/T species. The BLM treated false brome where it was found within T12S-R01E-sec11, 15 & 23 twice during 2011 (7/1/11 and 10/8/11). The treatments were successful in the control of false brome within the project area.

With the exception of false brome, 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 present population size or decrease population to a manageable size.

The BLM botanist conducted a Noxious Weed Risk Assessment of the project area and determined that the area has a risk rating of "moderate" (Botany Report, p. 9). A moderate rating indicates the proposed project could proceed as planned with measures in place to control and/or prevent the establishment of invasive/non-native plant species in areas of ground disturbance (EA section 2.2.3).

Environmental Effects

3.2.1.1 Proposed Action

Stand Structure and Development

Within the Matrix (GFMA) LUA

Direct Effects Immediately after Thinning:

Immediately following thinning the stands would appear healthy with minimal logging damage to the residual trees. Most of the stand should appear more uniform in spacing and tree size than it currently does. The average stand diameter would increase, since the bulk of the harvested trees would be in the smaller diameter classes.

Fewer trees and lower relative density would result in less competition for site resources (light, nutrients and water). The canopy would be more open than it is currently so that the crowns of retained trees would receive sunlight from the sides as well as above, and lower limbs would be less shaded. Enough light would reach the forest floor to allow establishment of native ground cover species, and brush understory with some conifer regeneration.

Long Term Trends:

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 is slowing down by the end of the second decade after thinning.

The understory vegetation should become less vigorous as the site resources become concentrated in the trees and less light reaches the forest floor. The effect of the thinning on total net yield in the GFMA should be positive since available site resources would be redistributed and utilized by fewer stems. For subsequent rotations the productivity of this site should be maintained. These stands should produce a sustainable supply of timber and still meet all of the other resource objectives outlined in the RMP.

Indirect Effects:

As site resources are concentrated on fewer trees, the growth rates of the retained trees increases and the trees are more vigorous and healthy compared to what they would be in a crowded stand.

With faster growth rates, more trees would get larger faster, with proportionate increases in average log volume and timber value for the remainder of the rotation (the planned cycle of a forest stand from establishment to regeneration harvest).

The faster growth rates after thinning would also provide trees of suitable size for snags (15+ inches diameter) and CWD (20+ inches diameter) as needed for management plans sooner than would be available without thinning.

Trees damaged by logging would either survive to be logged in future timber harvest, develop decay pockets that could be used by cavity excavating/nesting wildlife species, or die and become snags or CWD. 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.

Within the Riparian Reserve LUA:

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 are essentially the same as described above for thinning on Matrix lands and only differences in effects or emphasis will be described below. (The focus of the description of environmental effects to vegetation and stand structure on Matrix ground emphasized the effects important to timber production.)

Enough light would reach the forest floor to allow establishment of native ground cover species, and brush understory with some conifer tree regeneration within three to five years. The small clumps and gaps created by spacing variation would also introduce variation in the density, distribution and species mix of ground cover plants and brush and conifer understory.

Hardwood trees and conifer species having low local abundance to be retained in the stand would have less competition for site resources and should have higher survival and growth rates than would be expected if the stands were not thinned.

Long Term Trends:

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 (Table 7). The crowns would expand and fill the spaces created by the thinning and the site should be fully occupied so that growth is slowing down by the end of the second decade after thinning. As the crowns grow into the open space the retained trees would grow deeper crowns with larger limbs that provide better habitat than small crowns with small limbs and long, limbless boles.

The understory vegetation in the thinned area should be well established and vigorous by year five, but start to become less vigorous after about 15 years as the site resources become concentrated in the trees and less light reaches the forest floor.

Indirect Effects:

As site resources are concentrated on fewer trees, the growth rates of the retained trees increases and the trees are more vigorous and healthy compared to what they would be in a crowded stand. With faster growth rates, more trees would get larger faster. The faster growth rates after thinning would provide trees of suitable size for snags (15+ inches diameter) and CWD (20+ inches diameter) sooner than would be available without thinning. Thus, accelerated growth would help meet IDT goals for Riparian Reserve in the Even Keel Thinning project area to develop and maintain later seral forest stand characteristics. Desirable stand characteristics include larger trees for a large green tree component and recruitment of large standing dead and down coarse woody debris in future stand.

Retaining minor conifer species and hardwoods and the development of understory vegetation would also help meet IDT objectives for multi-layered stands with well developed understories, and multiple species that include hardwoods and other minor species.

Trees damaged by logging would either survive and perhaps develop decay pockets that could be used by cavity excavating/nesting wildlife species, or die and become snags or woody debris.

Threatened, Endangered, Special Status and Survey & Manage Species

Since no Threatened, Endangered, Special Status or S&M Species (SSS) requiring protection or special management were found within proposed project area boundaries, no impacts to these species are anticipated. Suitable habitat would remain in both the thinned and reserves areas, and no adverse impact to suitable habitat or any undiscovered SSS is anticipated. The proposed project would not contribute to the need to list any SSS as Threatened or Endangered.

Invasive/Non-native Plant Species

With the use of Project Design Features (Botany Report pg. 6, EA section 2.2.3, PDF #37 - #39), a decrease in the overall number and population size of the identified invasive non-native species within and adjacent to the project areas is anticipated. Based on observations of the location and abundance of invasive species made during field surveys, invasive species would likely maintain a small presence along roads in and adjacent to the proposed Even Keel Thinning area. Although still present these species are not expected to be strong competitors with native vegetation because:

- If populations of invasive species that are not known from the project area are identified in or adjacent to the proposed harvest areas, appropriate measures to reduce the risk of spreading those species would occur.
- Seeding with native species would be used to abate the establishment of invasive/non-native species in areas of disturbed soil that are a result of the proposed project.

Variable Density and Horizontal Complexity

Immediately after thinning the Even Keel Thinning project area would have a higher degree of complexity on a landscape level than it currently has due to the 50 percent spacing variation within thinned stands, treatments that vary between stands and the untreated areas adjacent to the thinned stands.

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. Future silvicultural treatments may be done in about 20 years to further develop this variation and complexity. The following photos (Figures 2 -4[5]) indicate the visual differences in stand characteristics that typically result from thinning prescriptions proposed in the Matrix LUA.

Figure 1: Proposed Unit 12-1-23A - Prior to Thinning Treatment (T.12S. R1E. Section 23)

[5] File photos by L. Schofield, 2011.

Figure 2:Adjacent Keel Mountain Density Thinning - Post Treatment (T.12S. R1E. Section 13)

Figure 3:Adjacent Keel Flats Density Thinning - Canopy view post treatment (T.12S. R1E. Section 23)

3.2.1.2 Cumulative Effects

No 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.

No cumulative effects to Threatened, Endangered (T/E), Special Status (SSS) or Survey & manage Species (S&M) are expected because no suitable habitat to support any T/E species was identified within the proposed project boundaries, and although modified, suitable habitat for SSS and S&M Species would remain both within and adjacent to the project area. The proposed project would not contribute to the need to list any species as Threatened or Endangered.

Following the application of Project Design Features and over time, existing populations of invasive/non-native species would decline in number of plants and vigor as native vegetation displaces non-native species. These species would likely maintain small populations along roads and in natural openings although populations may increase in areas where soil disturbance occurs. Management activities on land not managed by the BLM and public access into the area (as described in section 3.3.7 of this EA) may result in introducing additional species, or increasing populations of species that are currently in the area. If areas of the forest are heavily impacted by natural disturbance, higher infestations of invasive/non-native species would be anticipated in those disturbed areas.

3.2.1.3 No Action Alternative

Stand Structure and Development (all land use allocations)

The stands would continue to grow but at a reduced rate. Crowns would close and there would be more suppression mortality resulting in more snags and down wood, especially in the smaller (less than 15" DBH) size classes. Understory vegetation would be reduced in quantity and diversity because of the ever-reduced light reaching the forest floor. In the Matrix LUA, at rotation age there would be smaller trees of lower quality to harvest and total net yield would be reduced below the potential for the site.

Within the Riparian Reserve LUA especially, there would be slower development of the 15+ inch DBH trees desirable for future snag and 20+ inch diameter trees desirable for future coarse woody debris recruitment. Fewer of them would reach these sizes within the next 20 years. The trees which would reach these larger sizes would tend to be dominant and co-dominant trees which are the most vigorous trees in the stand, and the least likely to die.

The dense stands would not increase in vigor and may decline in vigor, making them more susceptible to disease, insects, windthrow and fire. This condition would not meet RMP objectives and would not fulfill the Purpose and Need for this project. The live crown ratio (live crown height/total height of the tree, expressed as percent) would continue to decline as lower limbs die from shading.

Threatened/Endangered/Special Status/Special Attention/Former 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, and Special Attention 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 both increase and decrease during different stages of succession as suitable environmental conditions and substrates become available.

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

Under the No Action Alternative and if natural succession were to occur, the proposed harvest area(s) would not remain static in their composition. Natural disturbances such as wind, insects and disease would create openings and cause soil disturbance. The lack of timber harvest would not necessarily prevent the introduction and spread of invasive/non-native species. Small openings and areas of soil disturbance would in most cases reestablish with native vegetation from the immediate area. On occasion some areas would become populated with invasive/non-native species from seed brought in by animals, wind or recreational users.

Areas within the proposed project that have seen similar past disturbances are currently free of invasive/non-native species due to competition from native vegetation and this trend would be expected to continue with the absence of management actions. In time however, as the stand matures, larger openings due to insect, disease and wind damage are likely to occur as a result of the current over-stocking of the forest overstory.

If areas of the forest are heavily impacted by natural disturbance, higher infestations of invasive/non-native species would be anticipated. Areas not impacted by natural disturbance would have complete canopy closure and the current forest understory (i.e. small trees, shrubs and herbs) would die back to only the most shade tolerant species (e.g. ferns).

3.2.2 Hydrology

Sources Incorporated by Reference: *Hydrology/Channels/Water Quality: Specialist Report for the Proposed Even Keel Thinning Project, (Hawe) (Hydro Report), WEPP (Water Erosion Prediction Project) Report for Even Keel Thinning (Hawe) (WEPP Report)*

Affected Environment

Project Area Setting

The project area is located in four separate 7th field watersheds (Upper Hamilton Creek and Scott Creek, South Fork Scott Creek and Green Mountain Creek) with approximately 13,330 acres (20.8 miles^2) in combined drainage area. All proposed units ultimately drain to the South Santiam fourth field. The City of Lebanon withdraws drinking water from the South Santiam downstream from the confluence with Hamilton Creek. None of the project area streams are designated as Wild and Scenic and there are no key watersheds in the project area.

Project Area Hydrology (ACS Objective 6)

Base Flow

Hamilton Creek is similar to other Western Cascades streams where highest discharge takes place during winter storm events. Summer base-flow (when mean stream discharge drops below 20% of the mean winter flow) normally begins in perennial channels sometime in July and continues from August-October. Many small headwater channels (intermittent or ephemeral) dry up completely during this period.

Peak Flow

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 (OWEB, 1997 located at http://www.oregon.gov/OWEB/docs/pubs/OR_wsassess_manuals.shtml).

Table 9 displays statistics by seventh field watershed used for determining the current risk of peak flow augmentation in project watersheds. Rain on Snow (ROS) zones constitute from 46%-85% of the four project 7th field watersheds and the risk of peak flow enhancement would vary with the proportion of this area that has been recently harvested from the Oregon Watershed Assessment Manual. GIS review of 2006 satellite data indicated that 23-32 percent of the ROS zone of the four watersheds had <35 percent crown closure.

The proportion of ROS area with current crown closure <35 percent is not extensive enough in any project seventh field watersheds to result in an increased risk for peak flows. This analysis indicates that there is currently a low risk for peak-flow enhancement due to forest openings in the project area.

Table 9: Risk of Peak Flow Enhancement by 7th Field Watershed in Even Keel

7th Field Watershed	**Watershed Area (acres)**	**Percent of Watershed in ROS Areas** (horizontal axis of Figure 4)	**Percent of ROS area with <35% Current Crown Closure** (vertical axis of figure 4)	**Peak-Flow Enhancement Risk**
Scott Creek	2289	60% (1380 acres)	29% (401of the 1380 acres)	Low
South Fork Scott Creek	2891	56% (1624 acres)	28% (458of the 1624 acres)	Low
Green Mountain Creek	3137	85% (2668 acres)	23% (625of the 2668 acres)	Low
Upper Hamilton Creek	5015	46% (2325 acres)	32% (750of the 2325 acres)	Low

Figure 4: (OWEB, 1997 - Figure 3) Graph for Determining Risk of Peak Flow Augmentation

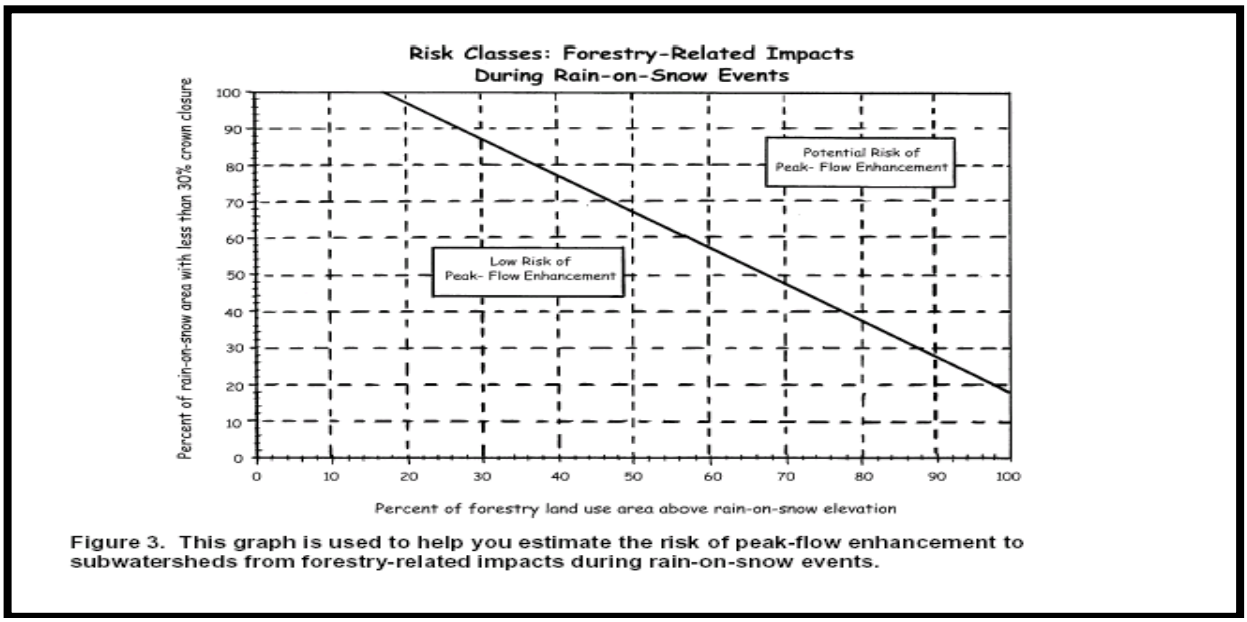


Figure 3. This graph is used to help you estimate the risk of peak-flow enhancement to subwatersheds from forestry-related impacts during rain-on-snow events.

Table 10: Estimated channel network expansion at road-stream intersections for project watersheds. Data was estimated utilizing the Salem ARC-GIS

7th field Watershed Name	Watershed Area Acres/mi2	Stream Length (Miles)	Drainage Density	Number of Stream/Road intersections	Extended Drainage Density	Increase in Drainage Density
Upper Hamilton Creek	5015 / 7.8	43.2	5.5	69	6.3	15%
Scott Creek	2,289 / 3.6	19.0	5.3	26	5.9	11%

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

Wemple et al. (Wemple 1996) concluded that an increase in drainage density, due to road stream intersections, of approximately 20% or greater has the capacity to alter both the timing and quantity of peak flows.

Project watersheds are not currently at risk for augmentation of peak flows as a result of the existing road network because increases in drainage densities range from 11% in Scott Creek to15% in Upper Hamilton Creek (Table 10), below the 20% threshold described above.

Project Area Ground Water

The Oregon Water Resources Department (OWRD), together with the Oregon Department of Environmental Quality (ODEQ), is responsible for the regulation and protection of ground water quality and quantity. The ODEQ has not identified groundwater pollution problems within project watersheds.

Project Area Stream Channels (ACS Objective 3)

Perennial stream channels that drain to the northern tributary to Upper Hamilton and the southern tributary to Scott Creek pass through or are located adjacent to the proposed units. All of these channels have ample supplies of large wood from nearby riparian forest and are well shaded. There is also a large supply of cobble, and gravel sized material being actively transported in these Rosgen "A3" channel types (Rosgen, 1996).

The Cascades Area Hydrologist determined that channel reaches observed in the project area on BLM are currently in proper functioning condition (PFC) because there is 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.

The remaining channels adjacent to the proposed treatment units are small with intermittent or ephemeral flow. Ground water and intricate patterns of subsurface flow, as opposed to surface run-off, is the primary system of water delivery to these small channels. Most are lower gradient (<10%) with small substrates (sands, silts and gravels) reflecting the adjacent soils. All of the intermittent channels on BLM viewed in the field are currently in "proper functioning condition" (U.S.D.I., 1998).

The culverts at 15 stream crossings are too small to meet current standards. Some of these are actively failing because they are beginning to collapse or because flows at the inlet are eroding the road.

Project Area Wetlands

No wetland\pond complexes are identified on National Wetlands Inventory maps and\or in the Linn County Soil Survey in the project area. All areas considered fragile, including high water tables, would be excluded from treatment during layout of the unit boundaries.

Project Area Water Quality (ACS Objective 4)

Stream Temperature

The BLM collected stream temperature data in the Scott Creek watershed in the summer of 2000. Two sites, one on lower South Fork of Scott Creek (section 21 T.12S R.1E) and one higher in the watershed in section 23, were monitored during development of the South Santiam Total Maximum Daily Load assessment. Seven day average stream temperature's at the upper site was at no time over the standard of 18 degrees Celsius (^{o} C). The lower site was slightly over standard one day during the monitoring period. Solar pathfinder measurements of potential shade at the monitoring sites were 90% (upper site) and 79% (lower site).

Most of the tributaries adjacent to the proposed thinning units are intermittent and only flow during the wet season when exposure to solar heating is of little concern. In addition, full forest cover on the public lands adjacent to these streams maintains temperatures below the state threshold and within the range of natural variation.

Dissolved Oxygen, Inter-gravel Dissolved Oxygen, pH, and Conductivity

Most of the channels in the project area on BLM are currently well shaded and in proper functioning condition; therefore it is likely that these water quality variables are well within the range of natural variability at these locations.

Turbidity and Sediment

During winter field reviews of area streams, the Resource Area Hydrologist observed high water clarity. Turbidity levels were low.

Designated Beneficial Uses and Water Rights

The State of Oregon designates the beneficial uses for which all waters of the state are utilized. Water quality standards are ultimately meant to protect these uses. Some of the site specific uses of surface water from the project area are displayed in Table 11.

Table 11: Beneficial uses associated with streams in the project area.

Stream (Watershed)	Project Action	Beneficial Use	Distance from Project Action	Information Source
Hamilton Creek and Scott Creek (South Santiam Basin)	Timber harvest: density management, thinning Road construction and renovation	Anadromous fish rearing and spawning	See Table 13 – EA section 3.2.3.	BLM
		Resident fish & Aquatic Life	See Table 13 – EA section 3.2.3.	BLM
		Irrigation & Domestic Drinking Water	>3 miles downstream from project area along Hamilton Creek.	WRIS*
		Municipal Drinking Water	Intake downstream several miles near Lebanon, OR	City of Lebanon

* *WRIS = Water Rights Information System of the Oregon Department of Water Resources* (http://map.wrd.state.or.us/apps/wr/wr_mapping/)

The City of Lebanon withdraws water from the South Santiam river several miles downstream from the project area. The ODEQ has completed a Source Water Assessment available on-line at: http://www.deq.state.or.us/wq/dwp/SWAReports/PWS00359_Lebanon.pdf. Both resident and anadromous fish are downstream from several of the proposed units. There are water withdrawals along the main Hamilton Creek channel to the southwest of the project area for domestic use, irrigation and livestock watering (maps available online at: http://map.wrd.state.or.us/apps/wr/wr_mapping/). Additional beneficial uses include: industrial water supply, wildlife & hunting, fishing, boating, anadromous fish passage, water contact recreation, and aesthetic quality. Designated beneficial uses for the Willamette may be viewed on-line. See web site: http://www.deq.state.or.us/wq/standards/GenBenUseTablesFinal/FTable340A_Willamette.pdf

Water Quality Limited Streams

The ODEQ, under the Clean Water Act, has been delegated authority to protect the quality of all waters in the State of Oregon. The ODEQ's 2006 303d List of Water Quality Limited Streams is a compilation of streams which do not meet the state's water quality standards (http://www.deq.state.or.us/wq/WQLData).

The South Santiam River and Hamilton Creek were listed for exceeding summer stream temperature. In response, the ODEQ completed the Willamette Basin Total Maximum Daily Load assessment (TMDL) in 2005 (http://www.deq.state.or.us/wq/TMDLs/docs). The TMDL requires the recovery or maintenance of full potential shade along all 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 ODEQ on July 18, 2008. The recommended design features of this plan have been incorporated into the Even Keel project.

Environmental Effects

3.2.2.1 Proposed Action

Watershed Hydrology (ACS Objective 6)

Direct and Indirect Effects

Mean Annual Water Yield

Increases in mean annual water yield (the total yield of water from a watershed in one year averaged across the period of record) following the removal of watershed vegetation have been documented in numerous studies around the world (Bosch et al., 1982). Forest vegetation intercepts precipitation and through the processes of sublimation (the direct conversion of snow from a solid to a gas w/o entering a liquid phase) and/or evapo-transpiration, the forest returns to the atmosphere over 50% of the annual precipitation that might otherwise become runoff. Therefore, this proposal would likely result in some incremental increase in annual water yield correlated to the partial removal of the conifer over-story (Troendle et al., 2006).

Other than the augmentation of peak and/or base flows (discussed below) the "increase in fall and winter discharge from forest activities is likely to have little biological or physical significance" (US EPA. 1991).

Base Flow And Fog Drip

No studies have been located for this analysis to indicate that fog drip is a large contributor to stream flow in the project area (Hydrology Report p. 13). In addition, no studies have documented reductions in fog drip where less than 20% of the watershed is in an open condition, as in this case. Based on these two factors, it is unlikely the proposed action would have a detectable effect on fog drip or a detectable effect on the base flow in the project area.

Peak Flow

All of the proposed treatment units lay in a zone subject to transient snow accumulations (TSZ) in the winter. It can be assumed that the reduction in stand density would result in some increase in snow accumulation on the ground in these areas because there would be less canopy interception and sublimation.

However, even with all acres thinned under this proposal, it would not increase areas with <35% canopy closure within the TSZ in any of the project watersheds because in all cases thinning would retain at least 50% in the secondary shade zone, on average, of the existing crown closure.

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. In addition, openings would affect tributary channels in these watersheds, not the Hamilton Creek main-stem. These tributary channels are a small proportion of the Hamilton Creek watershed so that a slight increase in peak flows would be below the detection level relative to the discharge in the main channel.

Peak Flow Effects from Existing Roads

The seventh field watersheds in the project area are currently at low risk for augmentation of peak flows due to the road network in the watershed

Since this proposal would not increase stream crossings or road /stream intersections in project watersheds, there is no mechanism of change from current conditions (i.e., current conditions would be maintained).

New Road Construction

All the proposed new road construction is located on slopes generally under 35% and would not require extensive full bench construction. Roads constructed on these surfaces result in little or no sub-surface disturbance. These roads would have no discernible 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 would quickly infiltrate into the ground. Under these circumstances, road construction has a low risk of altering watershed hydrology or peak flows because intercepted water does not reach stream channels any faster than precipitation which falls on the forest floor.

Groundwater

The proposed action is unlikely to affect peak or base flow, so by extension it has little capacity to affect groundwater patterns which are linked to the surface. Compacted surfaces would be limited to less than 10% of the affected area and would mostly coincide with existing compacted surfaces. New road construction is unlikely to intersect ground water flow. These surfaces are located on topography with low to moderate slope so water that does not infiltrate here would either be evapo-transpired or would infiltrate quickly into adjacent soils that are not compacted.

Stream Channel and Wetland Morphology (ACS Objective 3)

Direct and Indirect Effects:

In general, there would be no direct alteration of the physical features of project area stream channels or wetlands under this proposal: stream banks, channel beds and wetlands are protected with no entry buffers (i.e. stream protection zones or SPZ) from direct physical alteration or disturbance by harvesting equipment. With the exception of the proposed restoration of fifteen stream crossings (discussed below), direct disturbances by equipment or yarding are kept a minimum of 70 feet from all fish bearing stream channels and 30 feet on non-fish bearing.

In addition, the proposed action is unlikely to affect stream flow (see the previousdiscussion under watershed hydrology) and therefore any *indirect effects* to stream channels as a result of flow alteration or timing is unlikely.

Thus, the proposed action would be unlikely to result in 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.

New road construction would not cross stream channels or wetlands; however, road renovation and road maintenance work would take place at fifteen stream crossings on roads that have not been maintained. Replacing the failing and undersized culverts at these locations would stabilize the fill material and provide adequate passage for water and material. This 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 culvert replacement 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 fifteen 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.

Water Quality (ACS Objective 4) - Direct and Indirect Effects

Summer Stream Temperature Maximums in Streams

Field reviews of the perennial stream channels in the project area by the area personnel found that they are well shaded and functioning properly on BLM land. This proposal would maintain effective shade above the range required under the Willamette TMDL. Essentially, the TMDL requires the recovery or maintenance of full potential shade along all perennial streams in the watershed.

To ensure that any harvesting adjacent to perennial streams would not increase summer temperature maximums, the BLM has agreed to follow the *Northwest Forest Plan Temperature TMDL Implementation Strategies* (U.S. Forest Service and Bureau of Land Management. 2005). No shade producing vegetation within the "primary shade zone" (approximately 70 feet from the active stream channel) of perennial streams would be cut or removed as a result of the proposed action.

Where riparian thinning is proposed beyond the stream protection zone, which includes the primary shade zone, an average canopy closure of at least 50% would be maintained in the secondary shade zone (the area beyond the primary shade zone that contributes to effective shade). Retaining 50% of the secondary shade zone canopy closure was determined by the *Northwest Forest Plan Temperature TMDL Implementation Strategies* to provide adequate shade for the prevention of any increase in stream temperature because it does not allow enough light to strike the water surface to increase the heat load.

A recent article (Wilkerson et al, 2005) provides additional evidence in support of this conclusion. Wilkerson found no temperature effect on streams with a reduction in basal area to 60% of current conditions in the *primary shade zone*. Therefore, since this proposal retains all primary shade, it is unlikely to result in any detectable change in stream temperature; would maintain stream temperatures in their current range; and would protect beneficial uses because there is no harvest in the primary shade zone and 50% of the shade in the secondary shade zone would be retained.

Summer Stream Temperature Maximums in Intermittent Streams

Most channels in the project area have an intermittent flow regime and do not flow on the surface during most summers. Water temperature in these channels is influenced directly by soil temperature which is a function of elevation, aspect and soil type. Therefore, these channels have little potential to be heated by exposure to direct solar radiation. A reduction in stand density in the riparian forest near these streams is unlikely to result in any measurable alteration of temperature regime because the proposed action would retain vegetation in the primary shade zone of perennial, intermittent and ephemeral streams

Dissolved Oxygen, pH and Conductivity

Heavy inputs of fine, fresh organic materials, particularly when combined with increases in stream temperature, sedimentation and reduced re-aeration, can severely reduce the concentration of dissolved oxygen (DO) in small forested streams (Hall and Lantz, 1969). The proposed action is unlikely to alter stream temperatures or sedimentation, would not place large amounts of fine organic material in the stream and would not alter re-aeration. Therefore, it is unlikely that this proposal would have any measurable effect on DO levels in project area streams. Available data indicates that most forest management activities have little effect on pH or conductivity (US EPA, 1991).

Sediment Supply, Transport and Turbidity

The proposed action is unlikely to have a detectable effect on sediment supply, routing or long term turbidity as demonstrated by the following review of the processes that control both the supply and transport of sediment in forested watersheds and potential effects of management practices.

Mass wasting

The proposed action is unlikely to affect mass wasting because treatment is not proposed on slopes that are steep (>60 percent) or unstable, and continuous forest cover and its root structure would maintained after thinning. Additional discussion of mass wasting is presented in the section titled Tree Harvest and Yarding.

Surface Erosion, Stream Bank and Channel Erosion

The proposed action is unlikely to increase surface erosion because water would continue to infiltrate the native soil rather than concentrating runoff that would erode soil and transport it to streams (see the discussion of Project Area Hydrology, above).

The proposed action is unlikely to increase stream bank and channel erosion because it would not contribute to increasing stream flows outside of normal ranges. The proposed action is unlikely to increase sediment production at stream crossings to a degree that would measurably affect the sediment regime of the project area streams.

It is unlikely that the proposed action would lead to a measurable long-term alteration in sediment delivered to streams, stream turbidity, stream substrate composition, or sediment transport regime because BMPs and project design features are proposed to eliminate and/or limit acceleration of sediment delivery to streams in the project area beyond background levels. For example, stream protection zones would be placed on all stream channels, including intermittent headwater channels that only flow during the winter. The effectiveness of these 'stream protection zones" (SPZ) for protecting water quality in forestry operations has been demonstrated in research studies around the world (Norris, 1993).

In most cases, management practices with the potential to accelerate erosion fall into the following categories: road construction and maintenance; hauling; and timber harvest and yarding:

Road Construction and Maintenance

The proposed action would maintain water quality and protect beneficial uses for the following reasons. New roads would not be connected to the stream system and therefore no pathway would exist for delivery of any sediment to streams generated by their construction or use.

All new road construction would occur on low to moderate slopes emanating from the existing road network, on stable surfaces (i.e., surfaces that are not contributing to landsliding or mass wasting) and therefore road related landslides in these locations are also unlikely. All road construction would utilize the BMPs required by the Federal Clean Water Act (as amended by the Water Quality Act of 1987) to reduce non-point source pollution to the maximum extent practicable[6]. Since new road construction would occur on stable surfaces outside stream protection zones and incorporate appropriate BMPs, there would be no opportunity for these roads to deliver sediment to the stream system.

[6] See http://www.epa.gov/owow/nps/forestrymgmt/ for a review of applicable BMPs.

Maintenance and renovation of existing roads (i.e., added rock and blading of road surfaces), replacement of stream crossing culverts and removal of the blocked and eroding culverts would occur during the driest period of the year (the "in-water work period ") to avoid increasing turbidity of local streams during periods of higher (See Table 4)).

Nevertheless, there may be increased turbidity (i.e., a visible reduction in water clarity) relative to background or upstream water clarity during this activity. Turbidity may also increase slightly in the first winter following the project, if storm events wash some of the fines off disturbed surfaces and deliver them to the stream.

Based on research (see 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).

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), would not likely exceed the standards set by the State of Oregon. Since the projects are greater than 800 meters (approximately 0.5 mile) upstream of Hamilton Creek, it is highly unlikely increased turbidity would reach the main channel.

To further reduce potential increases in turbidity, flow in perennial channels would be captured and piped around the worksite. 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. The BLM would require the contractor to take appropriate steps to reduce turbidity to acceptable levels (EA Table 4, #28).

Hauling

Some of the harvest would be conducted with ground based equipment and hauling here would be primarily in the dry season. However, cable yarding units would normally be available for work during winter months and thus, winter haul may occur on some roads in the project area. Increased turbidity as a result of hauling is unlikely to be visible or detectable beyond 800 meters below the site of the disturbance (see Foltz and Yanosek, 2005), would not exceed the State of Oregon's Water Quality standards and would therefore protect beneficial uses.

To ensure haul is not contributing to increased turbidity in local streams, the authorized officer would visually monitor the road network and turbidity levels at road/stream intersections during haul (EA Table 4, #27 & #28). If water clarity is visibly altered, the authorized officer would require the BLM contractor to reduce fine sediment run-off into the stream (EA Table 4, #30). Methods include (but are not limited to): adding rock to the road and re-grading of the road surface to improve drainage, placement of bark bags or other material in the ditch to filter sediment out of the water, restricting haul until conditions improve.

Based on BLM's previous field experience with haul on forest roads, these methods would effectively eliminate fine sediment delivery to streams during or after haul. Therefore, any increases in turbidity attributable to hauling would be unlikely to exceed the State of Oregon

Water Quality standards (>10% increase relative to background levels) and would decrease as soon as hauling was discontinued and road surface drainage improved.

Tree Harvest and Yarding

It is unlikely that this proposal would increase bank erosion or channel cutting by altering channel roughness, redirecting flows or altering bank-stabilizing vegetation for the following reasons. The potential for increases in stream energy due to alterations of peak flows is low. Tree falling and yarding into or through streams is not proposed under this proposal and the stream protection zones around all streams would eliminate most disturbance of stream-side vegetation.

Increases in sediment delivery to streams due to mass wasting induced by loss of root strength and increases in soil pore pressure are unlikely to result for the following reasons. Areas with potential for slope instability and mass wasting were identified and verified by BLM personnel during work for the project proposal. All proposed treatment units are outside of any areas mapped as unstable or prone to mass wasting. Tree removal is not proposed on steep, unstable slopes where the potential for mass wasting adjacent to stream reaches is high.

Surface Erosion Potential: WEPP (Water Erosion Prediction Project)

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.

The "Disturbed WEPP" module was utilized to predict runoff, surface erosion and sediment yield due to timber harvest and ground-based yarding for the proposed action, at a "representative" location adjacent to the headwaters of Scott Creek channel in Section 23. Sediment yields from road work (construction, renovation, maintenance, use, and stabilization) and from mass wasting were discussed earlier in this document and were not evaluated by the model.

Cable yarding unit 23B adjacent to Scott Creek was analyzed for potential sediment delivery to the stream (Hydrology report, p. 19). This unit is considered to be a "representative" riparian logging unit. However, it likely overestimates the "average" potential for sediment delivery to the perennial stream network in the project area due to the steepness of the slope in this section and the close proximity of a perennial channel.

Therefore, estimates of surface erosion and sediment delivery from this unit are likely the highest of any of the units proposed for treatment in this sale (i.e., worst case scenario).

The table below displays the results of Disturbed WEPP analysis for a portion of unit 23B. Initially, WEPP was used to predict sediment delivery under current conditions (i.e., No Action). There is currently a 43% "probability" of sediment delivery to Scott Creek in any given year with an "average" quantity of delivered sediment estimated at 0.062 tons/acre/year t/ac/yr) averaged across a 30 year simulation period. No erosion or sediment delivery is predicted with less than a fifteen year storm event following several days of precipitation.

WEPP was then used to predict sediment delivery with a reduction in canopy cover by 50% and the retention of current conditions within 100 feet of the main channel. It was assumed that this would estimate logging disturbance at this location. This alternative would leave unchanged the probability of sediment delivery in the first year following treatment at 43% and no erosion or sediment delivery is predicted with less than a fifteen year storm event following several days of precipitation. However, when storm events are large enough to saturate soils and cause overland flow, the quantity of sediment eroded and delivered to the main channel would likely increase. The annual average (for a 30 year period) would increase to 0.138 t/ac/yr.

Table 12: WEPP

Treatment	Sediment Rate[1] tons/acre/year (t/ac/yr)	Acres treated[2] acre	Total Sediment [3] tons/year (t/yr)	Probability[4] %
No Action[A]	0.062	18	1.12	43
Cable Yarding[B]	0.138	18	2.48	43

Sediment Rate[1] The disturbed WEPP estimate of mean annual average (30 year period) concentration of sediment leaving the profile and entering the stream in Unit 23B.

Acres treated[2] A GIS estimate of total cable yarded acres in Unit 23B.

Total Sediment[3] The average quantity of sediment leaving the profile (derived product of columns 1 and 2).

Probability[4] The disturbed WEPP estimate of probability there is sediment delivery in the first year.

No Action[A] The No Action alternative (equivalent to current condition).

Cable Yarding[B] The proposed action.

Total sediment yields from all sources (i.e., mass wasting, surface erosion, bank erosion, etc.) for small, forested watersheds in the Pacific Northwest range from 0.02-19.43 with a mean of 1.752 t/ac/yr (Patric, 1984).

The proposed action would likely maintain sediment yield from the treatment unit at the lower end of this range and the predicted sediment yield under the worst case scenario in Unit 23B (0.138 t/ac/yr) is less than 10% of the average background yield of 1.752 t/ac/yr.

Typically, sediment yields from forest harvest decrease over time as a negative exponential (Dissmeyer, 2000). The quantity of surface erosion with delivery of sediment during large storm events would likely drop back to current levels (0.062 t/ac/yr) within three to five years as the remaining forest stand fills out.

Indirect effects from sediment delivery to stream systems include risk to water quality and aquatic organisms due to turbidity. Sediment transport normally increases during large storm events thus increasing turbidity and reducing the clarity of the water so that sediment supplied by this proposal would be unlikely to be discernible by the average observer.

As stream flows recede sediment would deposit and turbidity would return to background levels at low flow. Therefore, it is unlikely that the proposed alternative would result in a discernible effect to the levels of turbidity or water clarity in Scott Creek. Similarly, turbidity levels would be unlikely to reach levels that would cause additional treatment expense or technical difficulties for the downstream water providers.

Yarding corridors, if sufficiently compacted and disturbed, may route surface water and sediment into streams. WEPP analysis predicts a small increase in sediment delivery to streams as a result of harvest and yarding disturbance. However, this was a "worst case scenario" analysis and the WEPP model does not account for Best Management Practices Several factors that WEPP cannot model mitigate the potential sediment effect:

1) even when compacted, large quantities of residual slash (i.e., brush, limbs and branches) on yarding corridors (both machine and cable) would contribute to reducing the accumulation of runoff by deflecting and redistributing overland flow laterally to areas where it would infiltrate into the soil,

2) gentle to moderate slopes in much of the project area provide little opportunity for surface water to flow,

3) the no-treatment zones in riparian areas have high surface roughness which functions to trap any overland flow and sediment before reaching streams,

4) the small size of trees being yarded would limit surface disturbance to minimal levels and

5) most skid road surfaces would be much farther away from stream channels than 70 foot minimum and therefore unlikely to deliver any sediment at all to streams.

Recent research casts doubt on the reliability of WEPP for predicting sediment yields on a watershed basis in Western Oregon. From the abstract of Barbara Geren: "Results indicated that WEPP tended to over-estimate suspended sediment outputs across the treated basin scenarios relative to long-term ground data" (Geren, 2006). This is likely a result of an over prediction by the WEPP model of overland flow and sediment yield on the heavily vegetated slopes of the Western Cascades. Field reviews (Hawe, 2007) of cable logged units on BLM land during intense rainstorm events in 2007 found no evidence of overland flow or sediment transport on cable yarding corridors where WEPP had predicted sediment transport under similar conditions.

Effects of False Brome Pre-Treatments on Water Quality, Fisheries and Aquatic Resources

For effects of pre-treatment of false brome on water resources, the *Cascades Resource Area Invasive Non-Native Plant Management EA* (Weed EA, February 2009) is incorporated here by reference. Pages 27- 28 of Weed EA determined that these treatments would have little effect on fish, water and aquatic habitats for the following reasons. Treatment methods are selected due to their low potential for adversely affecting aquatic species and facilitation of riparian restoration through invasive plant control. The isolated use and application procedures (i.e. spraying individual plants and/or wicking) and timing of the treatments would help to limit effects to soils, and prevent herbicides from reaching streams and affecting fisheries and water quality. All treatments would follow manufacturer's label requirements and project design features described on pp. 16-17 of the Weed EA. (also summarized in Even Keel EA section 2.2.3, PDF 39).

3.2.2.2 Cumulative Effects

Watershed Hydrology (ACS Objective 6)

The proposal is not likely to result in a direct effect to peak or base flow, the proposal is therefore unlikely to contribute to any cumulative effects to peak or base flows in these watersheds. Current condition of the watersheds in the project area indicates low risk for augmentation of peak flows due to forest openings.

Since there is unlikely to be any direct or indirect effect to the watershed's ground water, the proposed action carries no risk for contributing to any existing cumulative effects to this resource. This proposal would result in no net increase, except for new roads 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 construction is unlikely to alter surface or subsurface hydrology in a manner that would alter stream-flow patterns or timing or contribute cumulatively to any change from current conditions in the watershed.

Project Area Stream Channels and Wetlands (ACS Objective 3)

With the exception of disturbance at fifteen stream crossings, this proposal would not result in any direct effects to channel or wetland morphology and therefore would have no cumulative effect.

At the fifteen locations of direct channel disturbance, 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 at the site of disturbance, if they occur at all, would be of relatively low magnitude and short duration (channel adjustment within one year).

Water Quality (ACS Objective 4)

Overall, this proposal is unlikely to have any measurable direct or indirect effect on stream temperatures, pH, or dissolved oxygen. Current conditions and trends in water quality would likely 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.

Sediment Yield Cumulative Effects

The risk of 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. This effect would be non-detectable on the scale of the seventh field watershed and would be unlikely to have any effect on any designated beneficial uses because:

- Magnitude of Effect (affected area): Increased turbidity produced by this project would not be visible or detectable beyond 800 meters below the site of the disturbance (see Foltz and Yanosek, 2005);

- Duration of Effect: Turbidity would be visible primarily in the first winter following road repairs;

- Turbidity levels would be maintained below the limits required by the Oregon State DEQ. Cumulatively the limited magnitude and duration of this effect would be non-detectable on the scale of the seventh field watershed and would be unlikely to contribute cumulatively to turbidity levels in the watershed.

Cumulative Actions that have effects that overlap in space and time with the proposed action are:

- future harvest on private lands, and

- road repair and timber haul associated with harvest on private lands using the same haul route at the same time as the proposed action within the 800 meter affected area.

According to watershed analysis, past harvest activities and road building have likely increased sediment yields in the South Santiam relative to an undisturbed condition. Future harvesting on private lands is likely to occur and this could also contribute to an increase in sediment yields. However, given the high variability in logging methods and their effects on different parts of the landscape, it is not feasible to predict how much additional sediment *hypothetical* logging on private lands would produce. Therefore, it is assumed that quantities of sediment reported in the scientific literature represent a meaningful "average" that provides a basis for comparison.

Average annual suspended sediment yield was estimated at 1.752 t/ac/yr. Assuming this "average yield" in the project area watersheds (13,330 acres), total sediment yield would be approximately 23,354 tons/year.

As indicated earlier, this average is assumed to be a result of all activities in the watershed, including harvest on private lands, and is therefore an estimate of the "cumulative" sediment yield in the watershed.

The estimated average increase to 0.138 t/ac/yr directly attributable to the proposed action (cable yarding of 148 acres) is an increase of 20 tons/year total across the watershed. According to the WEPP model, 10-30 tons/year would be contributed to the watershed from this action which represents between 0.04 and 0.1% of mean annual yield in the combined seventh field watersheds.

Given the inherent variability and error in sediment yield measurements[7], an increase of such small magnitude is not detectable with current technology. Typically, sediment yields from forest harvest decrease over time as a negative exponential (Dissmeyer, 2000). The quantity of surface erosion with delivery of sediment during large storm events would likely drop back to current levels (0.062 t/ac/yr) within three to five years as the remaining forest stand fills out.

[7] Accurate estimates of sediment yield are difficult to measure and may vary by two or more orders of magnitude (Gregory L. Morris, Jiahua Fan, 1998).

3.2.2.3 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, above. Any existing effects in the watershed would continue to occur from the development and use of private and other agency lands (primarily agriculture, timber harvesting and road building).

3.2.3 Fisheries and Aquatic Habitat

Sources Incorporated by Reference: *Even Keel Fisheries Specialist Report, Zoellick (Fisheries Report) , Hydrology Report,* ***Additional Sources Referenced:*** *Logging Systems Report*

Affected Environment

Fish and Aquatic Habitat

Coastal cutthroat trout (*Oncorhynchus clarki clarki*; Behnke 1992) are common in the Hamilton and Scott Creek watersheds, and inhabit South Fork Scott Creek, and five unnamed 3rd order tributary streams to Hamilton, Scott, and South Fork Scott creeks in Units 11, 13, 23, and 25.

No 1st and 2nd order headwater tributaries in the project area support fish populations with the exception of the lower 100 meters of an unnamed 2nd order tributary of South Fork Scott Creek in Unit 23. These headwater streams are too small and or steep to support fish populations.

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).

Hamilton Creek is a tributary to the South Fork Santiam River in the upper Willamette River basin. Scott Creek is a major tributary to Hamilton Creek. Winter steelhead trout are distributed in Hamilton Creek from its confluence with the South Santiam River to 11 miles upstream, to a barrier falls located about 1 mile upstream of the confluence of Scott Creek (Section 9, T.11S, R.1E; Streamnet 2006, USBLM 1995). Spring Chinook salmon inhabit the lower 5 miles of Hamilton Creek. Thinning units are located 2.8 to 4.4 miles upstream of the nearest winter steelhead trout habitat, and 8 to 10 miles upstream of spring Chinook salmon habitat (Table 13). All steelhead trout and salmon habitat in the Hamilton Creek basin is located on private land downstream of BLM-administered lands (Hamilton Creek Watershed 1995).

Aquatic Habitats

Stream channels in the project area are stable (generally gravel or cobble dominated; BLM Fish Inventories 2010) and well-shaded (>90% effective shading; Hydrology Specialist Report), and streambanks are stable (>90% of banks vegetated with riparian and streamside vegetation; BLM Fish Inventories 2010).

Bedrock dominated channels comprise about 10% of the channel of an unnamed Hamilton Creek tributary in unit 11. Most 3rd order streams in the project area flow through confined valleys (gradients of 2-4%) with narrow floodplains (Rosgen B-channel type; Rosgen 1994). First and second order headwater tributary streams in and adjacent to units drop steeply towards larger streams with channel gradients of >10percent.

Large woody debris (LW) levels were visually estimated to be low in the unnamed Hamilton Creek tributary in Unit 11 and in an unnamed tributary to South Fork Scott Creek in Unit 23 (BLM Fish Inventories 2010).

Fish habitat on private land in lower Hamilton Creek is thought to be impacted by elevated water temperatures, loss of riparian vegetation, and streambank erosion (HCWA 1995). LW levels in Hamilton Creek are thought to be low because of past timber harvest practices and the relatively young age of streamside forest stands (HCWA 1995). Only 20% of riparian forest stands in the Hamilton Creek watershed were >80 years of age in 1995 (HCWA 1995).

Table 13: Distances From Proposed Project Units To Resident Cutthroat Trout And ESA Listed Fish Habitat[a]

Unit Number	Stream	Distance (miles) to Cutthroat trout habitat	Distance (miles) to ESA Listed Fish Species Habitat	
			Steelhead trout	Chinook salmon
11A	Hamilton Creek and unnamed tributary	≥70 feet	2.8	9.2
13	Scott Creek; unnamed tributary to Hamilton Creek	650 feet; ≥70 feet	3.7	10.1
23	South Fork Scott Creek and tributaries	≥70 feet	3.2	8.4
25	South Fork Scott Creek	≥70 feet	4.4	9.6

[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. Stream distances were measured using ArcGIS software.

Environmental Effects

3.2.3.1 Proposed Action

Stream Channels (ACS Objective 3)

Proposed forest stand thinning in Riparian Reserves (RR) would not impact channel conditions and fish habitat due to minimum no-disturbance buffers (Stream Protection Zones [SPZ])of ≥70 feet on perennial streams, and 30 feet on intermittent 1st and 2nd order tributaries. These SPZ 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).

Stream Shading and Temperature

Perennial tributaries to Hamilton Creek would have ≥70 foot wide SPZ's. Thus, with no disturbance to the primary shade zone and retaining >50% canopy closure in the secondary shade zone, no change in solar radiation input and stream temperature would occur in these streams (BLM TMDL Implementation Strategy).

Large Wood (LW)

Thinning in RR of tributary streams to Hamilton Creek, would result in faster tree growth rates and an increase in LW availability to the tributary streams over the long term.

Sediment and Roads

New and renovated roads would not increase the size of the stream network (Wemple et al. 1996). New roads would be located on gentle to moderate slopes. 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, little if any sediment produced by road surfaces would reach stream channels and would not impact aquatic habitats or fish populations.

Timber Haul Roads

Fifteen stream culverts would be replaced or repaired on haul roads (roads 12-1E-15.1, 12-1E-15.2, 12-1E-17.2 and 12-1E-25.00). Sediment transport and turbidity would increase for about a day during culvert installations on perennial streams and for up to 1-2 days after flows increase in the fall. Sediment impacts from culvert installations would extend <0.5 mile downstream of crossings (Foltz and Yanosek 2005).

Cutthroat trout in 0.6 mile of an unnamed tributary to Hamilton Creek, 0.5 mile of Scott Creek, and 0.25 mile of South Fork Scott Creek could be temporarily displaced (and have to compete with greater numbers of fish for food) or their feeding disrupted (unable to see prey items; Bjornn and Reiser 1991) by short term increases in turbidity associated with culvert repairs or replacements on haul roads that cross these creeks or their tributaries with 0.5 mile of cutthroat trout habitat.

The haul route (Upper Berlin Drive) crosses listed fish habitat in Hamilton Creek four times on paved bridges. All other stream crossings are greater than 1 mile upstream of listed fish habitat with no potential to deliver sediment to listed fish habitat (Foltz and Yanosek 2005).

Threatened and Endangered Species

Thinning and associated road activities would not affect listed fish or their habitat in Hamilton Creek, both because of the distance from the project areas to listed fish habitat (>2.8 miles to steelhead trout habitat, and >8 miles to Chinook salmon habitat), and because of minimum no-disturbance buffers (SPZ of ≥70 feet on perennial streams, and 30 feet on intermittent 1st and 2nd order tributaries). 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, and retaining >50% canopy closure in the secondary shade zone, would result in no change in stream temperatures of perennial headwater tributaries to Hamilton Creek, which would have ≥70 feet wide SPZ.

Thinning in RR would increase the availability of LW over the long term (>20 year period) by increasing tree growth rates. However, LW is unlikely to move from thinning units on tributary streams to listed fish habitat in Hamilton Creek because of both the distance to listed fish habitat (>2.8 miles) and small size (capability) of tributary channels to move LW.

All project sites are located >8 miles upstream of Chinook salmon habitat and Essential Fish Habitat (EFH) as designated under Magnuson-Stevens Fishery Management Act with no potential to affect these habitats.

Approximately 1.25 miles of new road would be constructed more than 2 miles from listed fish habitat. New roads would be located on gentle to moderate slopes. 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. Approximately 3.15 miles of road renovation would primarily involve blading the ripped surface of the road flat and to remove small-statured alder, Douglas-fir and other vegetation that has grown in on the road surface. New and renovated roads would not increase the size of the stream network (Wemple et al. 1996).

Additionally, renovated 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 and renovated roads and would not reach stream channels and impact listed fish habitat. All new roads would be stabilized and closed to vehicles following the project.

Culvert replacements or repairs on the haul routes adjacent to the harvest units would not deliver sediment/turbidity to listed fish habitat in Hamilton Creek because of the distance from the culverts (>2 miles) to listed fish habitat and presence of low gradient stream reaches (0.5 to 1 mile long) downstream of the culvert sites. Sediment impacts from culvert installation would likely extend <0.5 mile downstream of crossings (Foltz and Yanosek 2005).

Steelhead trout and salmon habitat in Hamilton Creek would not be impacted by log hauling as the haul route is a paved road where it crosses listed fish habitat in Hamilton Creek. Because the road is paved, no sediment would move to streams as the result of log hauling.

Special Status Species Presence in the Project Area

No aquatic BLM Sensitive, Bureau Strategic or Former Bureau Assessment Species have been documented in the Even Keel Thinning project area.

3.2.3.2 Cumulative Effects

The proposed action would have no direct impacts (other than that associated with culvert installations) 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 <0.5 mile downstream of culvert installations. Short-term increases in sediment delivery and turbidity could occur with the culvert installations.

No direct or cumulative impacts to peak flows are expected (EA section 3.1.2.2).

Over the long term, culvert repairs should help reduce risks to water quality and watershed hydrology associated with the current undersized culverts. 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.

3.2.4 Soils

Source Incorporated by Reference: *Soils Specialist Report for the Proposed Even Keel Project (Soils Report)*

Affected Environment

Soils series mapped in the project area are primarily Harrington-Klickitat complex, which consists of clay loams with high course fragment content in the surface horizon and low erosion hazard on slopes under 30 percent. In the steeper forested slopes near the ridgeline, soils tend toward stony clay loams on 30-50% slopes with slightly higher hazard of erosion. Project soils are well-drained to moderately well-drained and moderately deep to very deep, with some local areas of shallow/stony soils on ridge tops. Soil maps and descriptions of project soil characteristics are available at the Natural Resource Conservation Service web site: http://www.or.nrcs.usda.gov/pnw_soil/or_data.html.

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 areas from previous logging. Moderately compacted soils are primarily located along former 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 on-the-ground observations, it is estimated that approximately 2% of the soils in the project area are slightly to moderately compacted (bulk density increase of 10-20%). This estimate assumes similar conditions of compacted surfaces on private forest lands in these watersheds (which have not been field examined by BLM specialists) as on public lands. Therefore, an estimate of total compacted surfaces is 5% (or less) of the surface area of the four seventh field watersheds as a whole (Soils Report p. 2).

Environmental Effects

3.2.4.1 Proposed Action

Direct / Indirect Effects of Proposed Action

Harvest

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.

The expected amounts of surface soil displacement and soil compaction from harvest operations would not exceed 10% of each project area, consistent with RMP standards and guidelines (p.C-1-2) because less than 10% of surface soils would be subject to operations that could result in compaction or soil displacement. The estimated rate of surface erosion, under the worst case scenario, is discussed below (see WEPP). 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.

Compaction And Disturbance/Displacement Of Soil

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. Yarding by skidders is restricted to a system of yarding trails. The percentage of total treatment unit area impacted by surface disturbance and soil compaction as a result of skid roads would be approximately 6%-8% (between 18 to 24 acres).

On the soil surfaces disturbed by skidding operations, a moderate amount of top soil displacement and moderate to heavy soil compaction would be expected to occur within the skid trails.

On the soil surfaces disturbed by skidding operations, a moderate amount of top soil displacement and moderate to heavy soil compaction would be expected to occur within the skid trails, which are limited to no more than 12 feet wide and (together with landings) no more than ten percent of the harvest area.

Yarding by a harvester/forwarder system for the proposed ground-based area, 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 6 to 15 acres).

With mechanized harvester systems operating between skid trails, soil displacement would be minor and soil compaction would be light to moderate (not likely to measurably affect the reestablishment or growth of vegetation).

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. 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 (148 acres) or approximately 4-10 acres.

Road Work

Total construction of new roads would displace topsoil and compact subsoil on 4.5 acres (6,600 feet, average 30 foot "footprint"). The road to be constructed would be on moderate topography (grades of approximately 3% to 35%), so the total width of the clearing would be expected to be around 30 feet. This clearing would have a minimal effect on overall tree spacing and stocking.

All of the new construction would be stabilized and blocked following harvest, so some recovery back to a forested condition would occur in this area over time. Water bars, seeding with native grass seed would decrease surface erosion and runoff (EA Section 2.2.4, Table 2, #21). This also provides a source of organic material to the disturbed soil.

Road maintenance 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 (ditches, catch basins, culverts) 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 road maintenance 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 cleaning, reshaping, or culvert installment operations.

Litter-fall accumulations and the growth of vegetation generally re-establish within one-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 landing area is estimated to be approximately 1% of the total project area (4.5 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 alternative, the total area of disturbed surfaces would range from a low of 18 acres to a high of 31 acres representing 4-7% of the 445 treatment acres. Therefore, the proposal would be expected to maintain surface disturbance/compaction at or below the district guidelines to not compact more than 10% of ground-based logging units in the Salem District RMP.

Indirect Effects on Site Productivity Due To Disturbance of Soils

No research was identified that has documented a reduction in tree growth following stand thinning that was attributable to compacted surfaces or soil disturbance. In fact, accelerated tree growth is part of the purpose of stand thinning. Therefore, it is reasonable to assume that this proposal would have no negative effect on tree growth in the residual stand that is a result of compacted surfaces on adjacent skid roads.

New road surfaces and heavily compacted log landing areas would remain far below potential site productivity levels for many decades unless they are actively recovered and restored. This proposal would result in the loss of 4.5 acres of productive land converted to road surfaces.

Surface Erosion Potential: Water Erosion Prediction Project (WEPP)

Surface soil erosion under this proposal is unlikely to have any long term deleterious effect on soil productivity. The WEPP soil erosion model was used to predict potential changes in erosion and sediment yield from actions proposed in this EA (EA Hydrology Section 3.1.2). Predicted "upland erosion rate" for the proposal are: Current condition- 0.062 tons per acre[1.] Tree harvest and yarding- 0.138 tons per acre. 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 below the assumed rate of soil formation.

Harvest with cable yarding of the stand is estimated to increase surface erosion, the predicted erosion rate under the "worst case scenario," to 0.138 t/ac/yr which remains in the range of soil renewal rates.

These WEPP predicted erosion rates could theoretically 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 (0.062 t/ac/yr) within three to five years as the forest vegetation provides 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).

Direct/Indirect Effects of 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, and 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, grass seeding or placing yarding slash would promote out-slope drainage and prevent water from accumulating in large quantities, running down the road surface, and causing erosion. After several seasons, the accumulated litter fall on the road surfaces would further reduce surface erosion potential.

3.2.4.2 Cumulative Effects

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 7th field watersheds. The 1.25 miles of new road surfaces are primarily located in the separate 7th field catchments (Upper Hamilton Creek and Scott Creek, South Fork Scott Creek and Green Mountain Creek) and would be closed and stabilized following use therefore resulting in no increase in compacted surfaces due to roads.

There is an overall maximum increase of 31 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 <5% (excluding urban areas) or approximately 660 acres (assumed 13,330 total watershed acres). Increasing compacted surfaces by 31 acres would result in approximately a 0.05% increase in the percentage of compacted surfaces for the project watersheds. At the conclusion of the project the quantity of compacted/disturbed soils would begin to decrease over time from the maximum and would 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.).

There is a 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 overall site productivity is not expected to be affected because the increase in compacted surfaces is less than one (0.3) percent and of surface erosion during large storm events, for example, would likely drop back to current levels of 0.062 t/ac/yr within three to five years.

3.2.4.3 No Action Alternative

Existing, maintained rocked roads would continue to be part of the transportation system and be maintained according to the Salem District transportation management plan, and would remain as non-forest land and provide access for management activities.

Historic unmaintained roads and landings would be left in their current condition, which range from virtually no evidence of recovery to advanced recovery where understory vegetation is similar to adjacent areas. Vegetation and other natural processes would continue to slowly break up existing compaction and continue the process of recovering productive capability over time.

3.2.5 Wildlife

Sources incorporated by reference: *USDI Bureau of Land Management, Salem District, Cascades Resource Area. March 1995 Hamilton Creek Watershed Analysis (HCWA); USDI, Bureau of Land Management, Salem District, Cascades Resource Area. 2001. Crabtree Creek Watershed Analysis (CCWA 2001); USDA, Forest Service; USDI, Bureau of Land Management; Fish and Wildlife Service. 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); 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.*

Methodology:

Descriptions of stand conditions as they relate to wildlife habitat are based on stand exam data, aerial photo interpretation and field review by BLM resource specialists in wildlife biology (wildlife biologist) and silviculture (silviculturist).

Affected Environment

General Stand Condition

The stands proposed for thinning in the Even Keel area originated between the mid-1930s 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 (see Table 7).

Forest management during the period when these stands were established was designed and intended to maximize timber production. Wildlife habitat conditions were given secondary consideration during stand initiation and management.

Forestry practices that were applied to these stands included clearcutting, 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).

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. There are few residual old-growth trees present in the proposed Even Keel units. There are fewer than 5 each in units 12S-1E-23A, 23B and 25A; and up to 10 in unit 13A.

Large CWD that would meet RMP management direction (240+ linear feet per acre of material in decay classes 1 or 2, at least 20" 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 is 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 bulk so they have wider and more rapid seasonal swings in moisture content, and they 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 harvest, and are often in larger diameter classes. These logs provide valuable habitat for a whole host of CWD associated wildlife species (e.g. Oregon slender salamander) (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 units 12S-1E-11A, 13A, 23A, 25A and to a lesser extent 13B and 23B. This material is lacking in unit 11B.

Table 14: Summary of Remnant Old Growth, and Coarse Woody Debris (CWD) Present By Project Unit

Unit#	Location	Seral Stage	Remnant Old Growth	CWD***
				Hard / soft
11A	12S-1E-11	Late-Mid	No	<60/240
11B	12S-1E-11	Late-Mid	No	0/0+
13A	12S-1E-13	Late-Mid	Yes	120/480
13B	12S-1E-13	Mid	No	<30/210
23A	12S-1E-23	Late-Mid	Yes	<30/480+
23B(part)	12S-1E-23	Mid	No	0+/360
23B(part)	12S-1E-23	Late-Mid	Yes	120/120
25A	12S-1E-25	Mid	Yes	60/480

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+
*** Linear feet/acre >=20" diameter large end & >=20' 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.

Special Habitats

There are no special habitat areas within or adjacent to the proposed units.

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 hairy woodpecker, red-breasted sapsucker and pileated woodpecker are species associated with conifer stands in the western Cascade Mountains, and are present in the Even Keel 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" diameter) and/or highly decayed. Trees that could have developed into large snags were removed by past timber management treatments. 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

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

Diameter class	Snag Decay Stage		Total by diameter class
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' tall/100 acres						
Township, Range and Section Unit #	**Hard snags 15-25"**	**Soft snags 15-25"**	**Hard snags 25"+**	**Soft snags 25"+**	**Total hard snags 15"+**	**Total soft snags 15"+**
12S-1E-11A	50	50	0	50	50	100
12S-1E-11B	0+	0	0	160	0+	160
12S-1E-13A	0+	0	0+	250	0+	250
12S-1E-13B	70	0	0	0+	70	0+
12S-1E-23A	50	0+	0+	60	50+	60+
12S-1E-23B	125	0+	0	0	125	0+
12S-1E-23B	0+	0+	0	50	0+	50
12S-1E-25A	50	0	0	50	50	50

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 445 acres of dispersal habitat in the Hamilton and Crabtree Creek Watersheds. There is one known spotted owl site in the vicinity of the proposed units. This owl site was occupied by a pair in 2006. The site was surveyed to protocol from 2007 to 2011 and there have been no responses. This site is considered to be unoccupied and historic. The male from this site was confirmed to be nesting at another known owl site that is at least 1.5 miles from the Even Keel project area. The site near the proposed project units is considered to be non-viable due to the lack of suitable habitat within the provincial home range. However the male from the 2006 nesting pair has been observed in the vicinity of the project area in the recent past. Units 12S-1E-11A, 11B, and 13A; and portions of 13B, 23A, and 23B are located within the provincial home range of this site. Portions of 12S-1E-11A, 11B, and 13A are within 0.5 miles of the site center.

There has been a fairly consistent presence of barred owls in the Hamilton Creek Watershed since about the mid 1990s, including the known sites within and near the project area.

No suitable nesting, foraging and roosting habitat is proposed for thinning inside or outside the provincial home range of any known spotted owl sites. 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. None of the proposed units meet the criteria for Recovery Action 32 due to their young age and lack of structure.

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

Bureau Sensitive – Johnson's Hairsteak

Johnson's hairstreak *(Callophrys johnsoni)* is a small butterfly which is found in older coniferous forests that contain mistletoes (*Arceuthobium* species), primarily of western hemlock and true firs. It is a forest canopy species and late successional and old-growth forests are important to the survival of Johnson's hairstreak. It has been called the only old-growth obligate butterfly (Pyle 2002).

However, younger forests that contain dwarf mistletoe may have the potential to support populations of the Johnson's hairstreak (Hoffman and Lauvray 2005). There are no old-growth or late successional stands in the proposed Even Keel units, however, western hemlock dwarf mistletoe is present in the Even Keel area, particularly in units12S-1E-13B and 25A. Most of the Johnson's hairstreak records in Oregon are from elevations over 2,000 feet. BLM lands in Even Keel vary in elevation from about 1,400 to 2,700 feet, with most of sections 13 and 25 above 2,000 feet. All of 12S-1E-11 and most of 23 are below 2,000 feet.

Oregon Slender Salamander

Oregon slender salamander, a former Bureau Sensitive Species, is expected to occur in all units of the project area where larger CWD in advanced stages of decay is present. 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

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 (ROD) eliminating the Survey and Manage mitigation measure. In response, parties entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. Projects that are within the range of the northern spotted owl are subject to the survey and management standards and guidelines in the 2001 ROD, as modified by the 2011 Settlement Agreement (IM-OR-2011-063, July 2011). The Even Keel Thinning project complies with the 2001 ROD as modified by the 2011 Settlement Agreement.

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 for the species, and red tree voles could occur. None of the stands currently proposed for thinning meet the stand-level criteria as described in the Red Tree Vole Protocol (Biswell et al 2002) due to a lack of predominant overstory trees and mature (80+ year old) stand conditions. Since these stands don't meet these criteria, habitat for red tree vole is marginal at best. Most of unit 23A and portions of 23B were surveyed for red tree voles during 1999. No red tree voles were confirmed to be present.

Bats

Four bat species of concern are suspected to occur in the Even Keel Area (silver-haired bat; long-eared, long-legged, 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 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 area, and these species are likely to be present in low numbers.

Migratory and Resident Bird Species

The wildlife report shows that there are approximately 125 bird species are known or suspected to breed in the Cascades Resource Area (Altman and Hagar 2007, Adamus et. al 2001, Altman 2008, Marshall et.al. 2003). Of these species, there are 54 species identified as priority, and 33 of these species have at least a low probability of breeding in the Even Keel project area.

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 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. 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 stands which provide hiding and thermal cover. The lower elevation stands are located on warm southerly aspects and show signs of moderate use, especially during the colder winter months. These include units in 12S-1E-23A and 23B, where elevations range from 1,400 to 2,000 feet. Stands in units12S-1E-13 and 25 are colder higher elevation sites where big game use is low to moderate. Stands in 12S-1E-11 are cold northerly aspects where big game use is low. Early seral communities and mid seral stands are abundant on adjacent private lands surrounding the project areas. The Salem District RMP identifies no critical winter or summer range in the project areas (RMP p.26).

Environmental Effects

3.2.5.1 Proposed Action

General Stand Condition

Overall, short term (less than 5 years) canopy cover reduction, disturbance, and reduction of understories and ground vegetation would occur due to thinning. In the long term (more than 5 years), the proposed action is expected to result in increased structural complexity and improved habitat quality for wildlife for the following reasons.

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. Several one acre low density thinning patches are proposed. These openings would result in more vertical understory layering and ground cover, adding complexity to stands.

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.

Riparian Reserves and associated Wildlife Species

The age classes proposed for thinning provide the greatest opportunities for acceleration of tree diameter growth and understory development through thinning and density management. 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.

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 low density thinning patches in the Riparian Reserve are ruffed grouse, Wilson's warbler, warbling vireo, song sparrow and big game species.

Old-growth Remnants, Snags and Coarse Woody Debris (CWD)

Existing old-growth trees in the vicinity of the units would be protected by posting these structures out of the unit where possible, falling trees away from old-growth, and avoiding road construction, skid roads and skyline corridors where old-growth remnants are located. Based on the locations of known old-growth remnant trees in the Even Keel Area, it appears to be feasible to protect these structures, and no loss of standing old-growth is anticipated.

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") (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, it is anticipated that 90+ percent of existing snags in all sizes over 15 inches diameter would remain standing after treatment. This would effectively reserve the best existing habitat features for primary excavators (woodpeckers), and secondary cavity users, such as songbirds, bats 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 dead-wood associated species, including the Oregon slender salamander. All dead wood that is on-site when timber marking takes place would remain on-site, either in the form or standing snags or as down logs, after thinning.

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 areas are expected to remain in a snag deficit condition (RMP, p. 21) for one to three decades, until live trees become large enough (at least 20" diameter) to provide for recruitment of large snags and CWD. 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" in diameter at the large end, and 20 feet in length), could be met in one to three 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. Prior BLM approval of skid trail locations would ensure that skid trails were located to avoid impact to high value CWD whenever feasible. The same principles generally apply to snag retention.

Federally Listed Species: Northern Spotted Owl

Refer to Table 17 for a summary of the Even Keel project and its effects on spotted owl habitat and definition of terms. In the short term, 445 acres of dispersal habitat in the Hamilton Creek and Crabtree Creek Watersheds would be altered 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 (Forsman et al. 1984, USFWS 2007c). These silvicultural activities include the light to moderate thinning and individual tree removal proposed in this project.

Table 17: Spotted Owl Habitat Modification and Effect Determination[5] for the Even Keel project

5th. Field Watershed	Township-Range-Section#	Proposed Treatment [1]	Acres	Land Use Allocation [2]	Pre/Post Treatment Habitat Type [3]	Habitat Modification [4]	Effect [5]
Hamilton Creek	12S-1E-11	Light to moderate thin	75	GFMA (Matrix) and Riparian Reserve	Dispersal to Dispersal	Maintain Habitat	NLAA
Crabtree Creek	12S-1E-13	Light to moderate thin	80				
Hamilton Creek	12S-1E-13	Light to moderate thin	100				
	12S-1E-23	Light to moderate thin	173				
	12S-1E-25	Light to moderate thin	17				
		Total Acres	**445**				

Notes and definitions for Table 13 (BA, pp. 3, 5; LOC, pp. 11, 12, 13):

[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: GFMA**=General Forest Management Area Matrix; **RR**=Riparian Reserve.
[3] **Habitat Types: No Suitable (nesting, roosting and foraging) habitat** is proposed for thinning.
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). For spotted owl dispersal-only habitat a canopy cover of >40 percent along with other habitat elements (e.g. including snags, down wood, tree-height class-diversity, and older hardwoods) would be maintained post treatment to adequately provide for spotted owl dispersal.
[5] **Effect: NE**=No effect; **NLAA**=May affect, but not likely to adversely affect; **LAA**=May affect and likely to adversely affect.

Based on recent surveys, the presence of spotted owls in the project area is unlikely. In the short-term, seasonal restrictions on habitat modification activities (felling, yarding, burning, and road building) in 12S-1E-11 and 13A 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. However, thinning would maintain dispersal habitat, therefore maintaining the ability of the habitat to accommodate movement of birds after thinning is completed.

In the long term, thinning could accelerate the development of suitable habitat characteristics, especially in Riparian Reserves. As thinned stands mature, habitat conditions are expected to improve. Canopy closures would increase and these stands would attain suitable habitat conditions within 10 to 40 years. These stands would develop foraging and nesting structure and residual trees would 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 altered as a result of thinning. No suitable habitat would be altered or downgraded within the provincial home range radius of any known spotted owl sites. Overall habitat conditions with the provincial home range of the known spotted owl site would not change as a result of thinning. None of the proposed units are located in LSR or Critical Habitat for the Northern spotted owl.

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. For spotted owl dispersal-only habitat a canopy cover of >40 percent along with other habitat elements (e.g. including snags, down wood, tree-height class-diversity, and older hardwoods) would be maintained post treatment to adequately provide for spotted owl dispersal. Such treatments can have long-term benefits to spotted owls by encouraging late-successional characteristics to occur more rapidly (BA p. 10, LOC p. 17).

Special Status and Survey and Manage Species

Bureau Sensitive – Johnson's Hairsteak

Peak conditions for the Johnson's hairstreak's are old growth and late successional second growth forests which contain hemlock dwarf mistletoe (Lasen et. al., 1995). No old-growth or late successional habitat is proposed for thinning.

Younger stands with hemlock dwarf mistletoe are thought to have the potential to support populations of Johnson's hairstreak (Hoffman and Lauvray 2005). There is hemlock dwarf mistletoe within the stands proposed for thinning, especially in T.12S., R.1E., sections 13 and 25.

This thinning proposal would adversely affect hemlock dwarf mistletoe hemlock and therefore may have effects on Johnson's hairstreak, but the impacts would be limited to individual trees in sub-optimal habitat mostly below 2,000 feet. Hemlock dwarf mistletoe is known to be very persistent and virtually impossible to eliminate without aggressive clearcutting (Hawksworth pp. 135-139), and would persist after this treatment.

Oregon Slender Salamander

Thinning these stands are not expected to adversely affect Oregon slender salamander populations or their habitat. Post-thinning treatment surveys in the Keel Mountain Density Management Study Area verifies that Oregon slender salamander populations 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" diameter at the large end, >20' in length) currently exists. The CWD currently on-site prior to thinning would continue to provide refuge for terrestrial salamanders many years after treatment (Table 10). 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).

In the short term, direct effects (disruption or mortality) to individual 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 (EA Tables # 4, #5), activity would occur during the drier seasons when amphibians are less active.

Design features common to all projects 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 (Table 4, #1), and therefore, no more than ten percent of potential Oregon slender salamander habitat within any unit.

Survey and Manage – Red Tree Vole

In the short-term, undetected red tree vole nests within marginal habitat (habitat less than 80 years of age) could be destroyed or disturbed during thinning. After thinning is completed, habitat conditions for red tree voles would gradually become more suitable 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 older forests are proposed for thinning. 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 Even Keel area.

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 is expected to have a 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.

The majority of the logging activity would occur outside the period when big-game would be using these stands for thermal cover during the colder months. 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 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.

3.2.5.2 Cumulative Effects

Snags and CWD: Regardless of the scale for assessing cumulative effects, 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), including the Oregon slender salamander.

Beneficial cumulative effects to CWD, snag habitat and associated species may occur as a result of implementing the project, 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; LOC, p. 12), 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.

The proposed project would not contribute to cumulative effects to spotted owls because dispersal habitat within and between known owl sites would be maintained, and no suitable habitat would be removed or downgraded within known owl sites. Overall habitat conditions within the provincial home range of the spotted owl site 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 (LOC p. 25).

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 would not contribute to cumulative effects to the Oregon slender salamander and other 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.

No adverse cumulative effects to red tree vole habitat is expected because red tree voles are considered to be a late successional associate and no late successional habitat over 80 years of age would be lost or altered. Undisturbed habitat in the same or similar age class with connectivity to the thinning units exists within the project area, elsewhere within the affected sections. In the long term, thinned 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 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 the existing road systems are gated year round.

3.2.5.3 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 50 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 in the less diverse closed mid seral condition 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 50 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 50 years) trees would 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 would 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.

3.2.6 Air Quality, Fire Risk, and Fuels Management

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

Affected Environment

Air Quality

The major source of air pollutants within the Even Keel analysis area would come from potential wildfire starts and from associated resource management activities including prescribed burning (hand, machine, and landing piles), and dust from the use of natural-surfaced roads in association with proposed project activities.

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. The combination of cold, stagnant air and restricted ventilation causes 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 Willamette Valley has been designated by the State of Oregon 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 will remain 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.

The two main causes of wildfire starts across the state are people and lightning. Dry lightning (lightning that that has no accompanying moisture) that occurs during the summer months is rare in Northwest Oregon. Within the Oregon Department of Forestry's Southern Oregon Area - South Cascades District - Sweet Home Unit over the last ten years no fire starts are attributed to lightning. (http://oregon.gov/ODF/FIRE/HLCause.pdf). The highest risk ignition source within the analysis area is people. The entire analysis area is located behind locked private gates and is signed as Private Property - No Motorized Public Access. These areas are accessible to the public by walking in during the year, and receive increased use during hunting season immediately after the close of fire season when fuels are often still ignitable.

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 located at: (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. 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.

Timber Stand and Fire History

The fire history of the Even Keel 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 is not specifically known. Fire does play a major role as a natural disturbance agent, as do people. The analysis area has experienced numerous management activities over the past 100 years. The majority of timber stands in the analysis area were established following clearcut harvesting during the mid to late 1930's to the late 1960's. Many of these harvest units had broadcast burning associated with them, both for hazard reduction and for site preparation.

It has been several decades since the most recent man-caused disturbance (logging) occurred, and 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

3.2.6.1 Proposed Action

Air Quality

Hauling 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 harvest and hauling) effects to air quality. None of these management activities would create dust above threshold (the intensity level that is just barely perceptible) levels. These effects would be localized to the immediate vicinity of the operations.

Prescribed burning would be conducted and smoke would be generated if the increased fuel load resulting from the proposed activities is determined to be a fire hazard through post-harvest surveys or by the use of the Stereo Photo Series for Quantifying Forest Residues in Coastal Forests (General Technical Report PNW-GTR-231.

Following harvest, there would be an average of 38 tons per acre or approximately 17,000 total tons of slash in the project area. Landing pile construction would remove approximately 20 tons of slash per pile or approximately 2,500 total tons from the project area. Machine/handpile construction would remove approximately .5 ton of slash per pile in the low density thinning areas or approximately 30 total tons from the project areas.

Prescribed burning treatments would remove approximately 75% of the landing and low density thinning slash or 1,900 tons leaving about 15,100tons of slash across the project area. This equals approximately 34.1 tons per acre. Landing, machine, and handpile burning would occur during the fall/winter time period.

All prescribed burning would require a project level Prescribed Fire Burn Plan that would address adherence 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, and would be conducted in accordance with the Oregon State Implementation Plan and Oregon Smoke Management Plan. These plans limit or prohibit burning during periods of stable atmospheric conditions.

Burning would be conducted when the prevailing winds are blowing away from SSRAs (Smoke Sensitive Receptor Areas) in order to minimize or eliminate the potential for smoke intrusions. The potential for 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 harvest 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

Fire is a natural disturbance process in the analysis area. Initially, 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 harvest when needles dry but remain attached to tree limbs. The additional fuel load created by the harvest of timber, and the addition of coarse woody debris for wildlife habitat within harvest units would add an estimated 11-26 tons per acre of dead fuel to the commercial thinning harvest units.

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. Previous wildfires, fuels treatments, and timber harvests, as well as proposed treatments, and suppression priorities placed on BLM land by the Oregon Department of Forestry would result in a continued low risk of a major stand replacement wildfire. All harvest projects would see a short term (1-5 year) increase in fire ignition potential because of the increase of fine dead fuels. Wildfire or prescribed fire has a major influence on vegetation in the analysis area. It affects seedbed preparation, nutrient cycling, successional pathways, fish and wildlife habitat, vegetative species composition, age, and structure, insect and disease susceptibility, and fire hazards.

The first strategy to reduce the risk of a fire is to reduce fuels in accessible areas. Newly constructed roads within the project areas would be removed or blocked following harvest. The project areas are behind locked private gates and are signed as Private Property - No Motorized Public Access. These areas are accessible to the public by walking in during the year, and especially during hunting season immediately after the close of fire season when fuels are often still ignitable.

Proposed harvest activities would remove some ladder fuels and decrease tree crown density (or crown bulk density). A relative density of 35-45 or lower has been identified as the point where crown 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 (Thompson, 2012).

Surface fuel reduction in harvest units, in strategic locations such as landing areas, and along roads and along property lines within harvest units would further reduce the risk in accessible areas. Increasing the height to the live crown base, opening canopies, and reducing surface fuels would result in lower fire intensity, and a lower probability of torching, and of an independent crown fire.

For the short term (0-5 years), the fire risk associated with the harvested stands in the analysis area would increase with the addition of tops, bark, limbs, and needles from the harvested trees. Over the long term (5-100 years), although the fuel load would slowly increase, primarily as a consequence of increased mortality, and as a result of the wildlife trees left as snags and other trees that are cut and left for CWD, the potential for a high intensity crown fire would decrease because ladder fuels have been removed and the crown density has decreased.

Fire Regime and Condition Class (FRCC)

Commercially thinning these stands would not significantly change the Condition Class in the short term, but would move the stands toward Condition Class 2 or 1. Management of the surrounding private land affects the Condition Class to such an extent that actions on BLM land alone are unlikely to change the Condition Class rating.

Fuels Management

The fuel load would increase as a result of the proposed action. The modeling predictions for fire behavior based on the National Fire Danger Rating System (NFDRS) fuel models would move the commercial thinning stands from Fuel Model 8 (Closed timber litter) to Fuel Model 10 (Timber litter and understory) or Fuel Model 11 (Light logging slash). The additional fuel load created by the harvest of timber, and the addition of coarse woody debris for wildlife habitat within harvest units would add an estimated 11-26 tons/acre to the commercial thinning harvest units. Treatment of selected, high hazard fuel concentrations would occur for hazard reduction.

Fuels treatments would reduce potential fire starts in areas with elevated risk of human-caused ignition. Fuels treatments adjacent to areas with high value resources, such as riparian habitat and private lands, would reduce potential costs associated with fire suppression.

Prescribed burning, biomass removal or other fuels management treatments would help to mitigate the additional fire risk. It is estimated that following harvest and with the addition of CWD there would be an average of approximately 38.3 tons of additional fuel loading per acre in the commercial thinning areas. The total fuel load across all harvest areas is approximately 17,064.9 tons. It is estimated that approximately 1897.5 total tons of logging debris would be consumed during landing pile burning.

Comparison of Alternatives

Table 18 below lists the estimated tons per acre and total tons of post-harvest fuels, the estimated tons per acre and total tons of post prescribed burning fuels, and the estimated tons per acre and total tons that would be consumed by the various prescribed burn treatment prescriptions.

Table 18: Comparison of Dead Fuel Loading by Action Alternative

Alternative	Harvest Type / Ac.	Average Tons per/ac. following harvest[1]	Total tons following harvest[1]	Tons per/ac. following prescribed burning [2]	Total Tons following prescribed burning [2]	Total Tons per/ac. consumed[3]	Total Tons consumed[3]
Proposed Action	Commercial Thinning /445 ac.	38.3	17,064.9	34.7	15,444.9	3.6	1,620
No Action	None	21.6	9,612	21.6	9,612	0	0

[1] Total of all current CWD and post-harvest logging debris.

[2] Total of all current CWD and post-harvest logging debris left on site following prescribed burning.

[3] Total tons of post-harvest logging debris consumed following prescribed burning (75% of piled slash).

3.2.6.2 Cumulative Effects

There would be no cumulative effects to these resources, as the effects from the project would be local and of short duration, and there would be no other uses affecting this resource. Based on past experience with landing and machine pile burning in this and other similar areas 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. In the commercial thinning harvest and right-of-way areas, the hazard and risk would be mitigated by the use of prescribed fire and slash pullback along private property lines following harvest. The localized increase in fire risk would diminish to background levels over time. 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. When looked at from a watershed scale, the thinning of approximately 445 acres of forest habitat would have very little effect overall but would reduce the long term potential of the treated stand to carry a crown fire.

3.2.6.3 No Action

Air Quality

In the short term (0-1 year) there would be no timber harvest, road construction, log hauling, or any need for prescribed burning and no localized effects to air quality. In the long term (1-100 years) as the bottom and middle layers of the timber stands continue to grow, the increase in understory trees and associated ladder fuels would cause the stands to become more susceptible to a stand replacement fire event.

Fire Risk and Fuels Management

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 fuels[1]) as well as the fine fuel load (1, 10, and 100 hour fuels[1]) in these timber stands as stress-induced mortality within the stands increases. Ladder fuel densities would increase as understory trees grow larger and new understory trees begin to grow. 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.

[1] For a description of Fuel Models and Size Classes see: http://www.fs.fed.us/rm/pubs_int/int_gtr122.pdf

3.2.7 Review of Elements of the Environment Based On Authorities and Management Direction

Table 19: Elements of the Environment Review based on Authorities and Management Direction

Element of the Environment /Authority	Remarks/Effects
Air Quality (Clean Air Act as amended (42 USC 7401 et seq.)	This project is in compliance with this direction because the proposed action would comply with the Clean Air Act and the State of Oregon Air Quality Standards by adhering to Oregon Smoke Management guidelines. Addressed in Text (EA Section 3.2.6).
Cultural Resources (National Historic Preservation Act, as amended (16 USC 470) [40 CFR 1508.27(b)(3)], [40 CFR 1508.27(b)(8)]	This project is in compliance with this direction because cultural resource surveys were conducted throughout the sale area in August and September 2011 (Report # C11-06), in accordance with *the Protocols for Managing Cultural Resources on Lands Administered by the BLM in Oregon*. Records indicate logging and road building activities in the general sale area beginning in the 1930s. Within the units, skid roads, springboard notched stumps, and logging cable were found. No artifacts or other cultural resources with historical value have been found and none are expected to occur in the project area, therefore no consultation was required.
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 is in compliance 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 is in compliance with this direction because project would have no effect on low income populations.

Element of the Environment /Authority	Remarks/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 is in compliance with this direction because the thinning sale would have no effect on essential fish habitat. Addressed in Text (EA sections 3.2.3)
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 Cascades RA.
Floodplains (E.O. 11988, as amended, Floodplain Management, 5/24/77)	This project is in compliance 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 is in compliance with this direction because the proposed treatments would decrease the risk of fire and help restore forests to healthy functioning condition (EA Section 3.1.6)
Migratory Birds (Migratory Bird Act of 1918, as amended (16 USC 703 et seq)	This project is in compliance with this direction. Addressed in text (EA Section 3.2.5).
Native American Religious Concerns (American Indian Religious Freedom Act of 1978 (42 USC 1996)	This project is in compliance with this direction because no Native American religious concerns were identified during the scoping period (EA section 1.4).
Noxious weed or non-Invasive, Species (Federal Noxious Weed Control Act and Executive Order 13112)	This project is in compliance with this invasive/non-native species policies and direction because Project Design Features would help prevent establishment of new populations and decrease existing populations of targeted invasive species in the project area. Addressed in text (EA Sections2.2.3 and 3.2.1)
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.
Recreation / Rural Interface/ Visual Resources	This project would have no effect on this element because the entire project area is behind locked private gates restricting public access. There are no developed recreation facilities on BLM-administered or private lands within the Hamilton Creek Watershed. No rural interface areas within the project area. The majority of BLM lands are classified as VRM Class 4. There are no unique visual features or areas of high sensitivity.
Threatened or Endangered Species (Endangered Species Act of 1983, as amended (16 USC 1531)	This project is in compliance with this direction. Addressed in Text. (EA Sections 3.2.1, 3.2.3, 3.2.5)
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 is in compliance with this direction because the proposed project would adhere to Oregon State water quality standards. Addressed in text (EA Section 3.2.2)
Wetlands (E.O. 11990 Protection of Wetlands 5/24/77) [40 CFR 1508.27(b)(3)]	This project is in compliance with this direction because no wetlands are within the proposed units. Addressed in Text (EA Section 3.2.2)
Wild and Scenic Rivers (Wild and Scenic Rivers Act, as amended (16 USC 1271) [40 CFR 1508.27(b)(3)]	This project is in compliance with this direction because there are no Wild and Scenic Rivers within or adjacent to the project area. The nearest is Quartzville Creek Wild and Scenic River at over nine miles to the south.

Element of the Environment /Authority	Remarks/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 project is in compliance with this direction because there are no Wilderness Areas or areas being considered for Wilderness Area status in or adjacent to the project area.

3.2.8 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, which protects stream bank stability and water temperature. Stream Protection Zones (SPZ) would protect streams from direct disturbance from logging. Road and landing locations were designed to minimize disturbance to Riparian Reserves (EA sections 3.2.2-3.2.3).

ACS Component 2 - Key Watershed: The project would comply with Component 2 by establishing that the Even Keel Thinning project is not within a Key watershed (RMP p. 7).

ACS Component 3 - Watershed Analysis: The project would comply with Component 3 by incorporating the following recommendations from the Hamilton Creek and Crabtree Creek Watershed Analyses.

***Hamilton Creek Watershed Analysis*:** A shortage of late successional forests in the HCW over 80 years of age was identified (HCWA pp. 33-34), and density management was recommended to accelerate late successional conditions, especially in Riparian Reserve (HCWA pp. 72-73). This watershed analysis also states:

- Manage stands within the GFMA (Matrix) land allocation on a rotation to CMAI in conformance with the PRMP (HCW p. 66). The proposed thinning has been designed to promote tree survival and growth; achieve a balance between wood volume production, quality of wood, and timber value at harvest (RMP p. 46); increase the proportion of merchantable volume in the stand; produce larger, more valuable logs; anticipate mortality of small trees as the stand develops; and maintain good crown ratios and stable, wind-firm trees (RMP p. D-2, EA section 3.2.1).
- Implement projects within Riparian Reserves with the objective of improving riparian habitat and accelerating late-successional conditions in young stands. (HCW p. 75), Thinning in this project is designed to develop the large tree component faster, leading to earlier potential for recruiting CWD, LWD, snag and large tree habitat and to develop understory vegetation. Maintains 50% average crown closure in Riparian Reserve. Untreated areas provide additional range of species and density mix (EA sections 3.2.1, 3.2.5).

Crabtree Creek Watershed Analysis: Recommendations from the watershed analysis include density management and thinning in the Riparian Reserve Land Use Allocation (CCWA 2001, Chapter 7 pp.4-8).

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 the Riparian Reserve LUA 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. Road renovation and road design would reduce impacts to the road system and the proposed action includes treatment of invasive weeds (EA sections 2.2.2, 3.2.1, 3.2.2).

Project Compliance with the Nine ACS Objectives

Cascades Resource Area Staff have reviewed this project against the ACS objectives at the project or site scale with the following results. The No Action alternative does not retard or prevent the attainment of any of the nine ACS objectives because this alternative would maintain current conditions. The proposed action does not retard or prevent the attainment of any of the nine ACS objectives for the following reasons.

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 3.2.1, 3.2.5). 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. 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 3.2.1, 3.2.5). 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, and drainage connectivity would be improved.

3. **ACSO 3: Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.** Addressed in Text (EA sections 2.2.3, 3.2.2, and 3.2.3). In summary:

   No Action Alternative: The current condition of the physical integrity of the aquatic system is expected to be maintained under this alternative.

   Proposed Action: Physical integrity of channels at existing stream crossings would be altered for one to several years following replacement of fifteen culverts at 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 crossings.

4. **ACSO 4: Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems.** Addressed in Text (EA sections 2.2.3, 3.2.2, and 3.2.3). In summary:

   No Action Alternative: The current condition of the water quality is expected to be maintained under this alternative.

   Proposed Action: Stream Protection Zones (SPZs) in the Riparian Reserve LUA (RR) would be maintained except for small scale disturbance at existing stream crossings where culverts are being replaced. The proposed new road construction is on ridge top or upper-slope locations with no hydrologic connections to streams or stream protection zones. Overall, the proposed action would be unlikely to have any measurable effect on stream temperatures, pH, or dissolved oxygen. Sediment transport and turbidity in the affected watersheds is likely to increase over the short term as a direct result of road repair, culvert replacement and hauling at stream crossings. Sediment 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 2.2.3, 3.2.2, and 3.2.3). In summary:

   No Action Alternative: The current condition of the sediment regime is expected to be maintained under this alternative.

   Proposed Action: Stream protection Zones (SPZs) in the Riparian Reserve LUA (minimum of 70 feet on perennial streams and 30 feet on intermittent streams in treatment areas), hauling restrictions and Best Management Practices would maintain the sediment regime under which aquatic ecosystems sediment delivery within it's 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 2.2.3, 3.2.2, and 3.2.3). In summary:

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

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 remove less than half the existing forest canopy and only a small fraction of the forest cover (roads and landings), 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 2.2.3, 3.2.2, and 3.2.7). . 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 under this alternative.

   Proposed Action: No wetland\pond complexes are identified on National Wetlands Inventory maps and\or in the Linn County Soil Survey in the project area. All areas considered fragile, including high water tables, would be excluded from treatment during layout of the unit boundaries. Thus, the current condition of floodplain inundation and water tables would be maintained under the proposed action.

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 2.2.1; 2.2.3; 3.2.1; 3.2.2; and 3.2.3). 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: SPZs would maintain the current species composition and structural diversity of plant communities in riparian areas and wetlands.

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 2.2.1; 2.2.3; 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 in these forest stands.

   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.

3.2.9 Comparison of Alternatives With Regard To The Decision Factors

This section compares the alternatives with regard to the Decision Factors described in EA section 1.2.3 and the project objectives in EA section 1.2.2.

1. Provide timber resources to the market and revenue to the government from the sale of those resources (objectives 1 and 2);
2. Provide for economically efficient short-term and long-term management of public lands in the project area (objectives 2 and 8);
3. Provide for safe, economically efficient and environmentally sound access for logging operations, fire suppression and administration on public lands (objectives 2, 3, and 10)

   The no action alternative does not meet decision factors 1-3 because no timber sale would take place. The proposed action meets these factors by providing timber resources to the market and would use commonly used silvicultural, transportation and logging practices that BLM experience with past timber sales has shown to be cost effective, providing revenue with reasonable logging costs (EA section 2.2.1; 2.2.2; 2.2.3).

4. Provide for increased survival and growth of conifer species while retaining structural and habitat components, such as large trees, snags, and coarse woody debris (objectives 1, 5, and 7, 8, and 9);
5. Provide habitat for special status, SEIS special attention and other terrestrial species associated with a variety of seral stages and forest stand characteristics in the vicinity of the project area (objectives 4, 5, 7, 8, and 9);

   The no action alternative partially meets decision factors 4 and 5. Under the no action alternative, stand health and tree growth rates would decline if stands are not thinned. Competition would result in mortality of smaller trees in the stands, resulting in numerous snags and CWD that are too small to meet resource objectives (minimum 15 inches diameter for snags, minimum 20 inches diameter for CWD).

   Trees would continue to grow slowly until reaching suitable size for large woody debris, snags and late successional habitat. (EA sections 3.2.1, 3.2.5). The no action alternative continues to provide habitat for special status, SEIS special attention and other terrestrial species.

   The proposed action would meet decision factors4 and 5. Stand health and tree growth rates would be maintained as trees are released from competition. The alternative retains the elements described under "no action" on untreated areas of the stands in the project area and encourages development of larger diameter trees and more open stand conditions in treated areas. These conditions add an element of diversity to the landscape on BLM lands which is not provided under the No Action alternative. (EA sections 3.2.1, 3.2.5). The proposed action will provide habitat for special status, SEIS special attention and other terrestrial species.

6. Provide for aquatic habitat and water quality/quantity by designing new roads and using all roads to avoid increasing the quantity of water and sediment delivered to streams (objectives 3 and 6);

Both alternatives meet Decision Factor 6. The proposed action meets decision factor 6 because roads would be maintained, road renovation at stream crossings would meet ODEQ water quality requirements, and because new road construction would not cause sedimentation (EA sections 2.2.3, 3.2.2 and 3.2.3).

7. Minimize the potential for human sources of wildfire ignition and prevent large scale, intense wildfires in the project area (objectives 3 and 10).

   Both alternatives meet Decision Factor 7. However, under the No Action alternative, dense forest stands with high crown densities are more susceptible to a high intensity, stand replacement wildfire that escapes initial attack and could threaten the public and other resources. Under the proposed action, managed, thinned forest stands are less prone to catastrophic wildfires. Fires that do start tend to be easier to control in managed stands. Maintaining logging roads provides faster access for suppression forces if a fire does start. (EA sections 2.2.3, 3.2.6).

4.0 LIST OF PREPARERS

Table 20: List of Preparers

Resource	Name	Initials
Writer/Editor	Carolyn Sands	***CDS***
NEPA Review	Keith Walton	***KW***
Botany	Terry Fennell	***TGF***
Cultural Resources	Heather Ulrich	***CS for HU***
Engineering	Steve Ditterick	***SLD***
Fire/Fuels	Kent Mortensen	***KCM***
Fisheries	Bruce Zoellick	***BWZ***
Hydrology/ Water Quality/Soils	Patrick Hawe	***WPH***
Logging Systems	Dugan Bonney	***DPB***
Recreation, Visual Resources and Rural Interface	Traci Meredith	***TMM***
Silviculture	Charley Thompson	***CT***
Wildlife	Jim England	***JE***

5.0 CONTACTS AND CONSULTATION

5.1 Consultation

5.1.1 US Fish and Wildlife Service (USFWS)

The timber sale was submitted for Informal 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 FY2011/2012 consultation process. The Biological Assessment of Not Likely to Adversely Affect (NLAA) Projects with the Potential to Modify the Habitat of Northern Spotted Owls Willamette Planning Province - FY2010/1112 (BA), was submitted in March 2010. Using effect determination guidelines, the BA concluded that the Even Keel Project may affect, but is not likely to adversely affect the northern spotted owl due to the modification of dispersal (BA, pp. 28-29).

The Letter of Concurrence Regarding the Effects of Habitat Modification Activities within the Willamette Province, FY2011/2012 (LOC) associated with the Even Keel Project was issued in June 2010 (reference # 13420-2010-I-0092). The LOC concurred that the habitat modification activities described in the BA, including the Even Keel Project, are not likely to adversely affect spotted owls and are not likely to adversely affect spotted owl Critical Habitat (LOC, p. 38). 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 including designated spotted owl critical habitat (LOC, p. 38).

The proposed thinning and connected actions described in this EA have incorporated the applicable General Standards that were described in the BA (p. 6- 8) and LOC (LOC, pp. 14-16). This includes a seasonal restriction within disturbance distance of known spotted owl sites during 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 (NMFS)

Consultation with the National Marine Fisheries Service (NMFS) on effects of the Even Keel 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. Thinning units are > 2.8 miles upstream of UWR steelhead habitat and > 8 miles from UWR Chinook salmon habitat in Hamilton Creek. No-entry buffers of ≥70feet on perennial streams, and 30feet on intermittent 1st and 2nd order tributaries are adequate to intercept and infiltrate water carrying sediment preventing its delivery to streams and aquatic habitats.

These stream buffers and retaining >50% canopy closure in the secondary shade zone, would also result in no change in stream temperatures of perennial headwater tributaries to Hamilton Creek.

Large wood (LW) levels in Hamilton Creek would not be affected by the thinning project both because of the distance to listed fish habitat (>2.8 miles) and small size (capability) of tributary channels to move LW. Steelhead trout and salmon habitat would not be impacted by log hauling as the haul route is a paved road where it crosses listed fish habitat in Hamilton Creek. Because the road is paved, no sediment would move to streams as the result of log hauling.

All project sites are located >8 miles upstream of Essential Fish Habitat (EFH) as designated under Magnuson-Stevens Fishery Management Act with no potential to affect these habitats.

Additional project design features for the Even Keel Thinning project (EA section 2.2.3) which result in no effect to listed fish, particularly relative to preventing sediment delivery to listed fish habitat, include:

a. meeting NW Forest plan standards and guidelines and BMPs for protection of water quality;
b. thinning from below, retaining the dominant/co-dominant trees;
c. meeting or exceeding minimum stream protection buffer widths (e.g. >70 feet on perennial and 30 feet on intermittent streams more than 1 mile from listed fish habitat);
d. no felling of trees within the primary shade zone on perennial streams;
e. retaining minimum 50% average canopy closure within the secondary shade zone;
f. using existing landings and skid trails to the maximum extent possible;

g. constructing new roads on stable, relatively flat topography;

h. implementing erosion control measures; and

i. no timber transport on natural surface roads during the wet season.

5.1.3 Cultural Resources: Section 106 Consultation with State Historical Preservation Office

Cultural resource surveys were conducted throughout the sale area in August and September 2011 (Report # C11-06), in accordance with the *Protocols for Managing Cultural Resources on Lands Administered by the BLM in Oregon*. Records indicate logging and road building activities in the general sale area beginning in the 1930s. Within the units, skid roads, springboard notched stumps, and logging cable were found. No artifacts or other cultural resources with historical value have been found and none are expected to occur in the project area, therefore no consultation was required.

5.2 Public Scoping and Notification - Tribal Governments, Adjacent Landowners, General Public, and State County and local government offices

For information on project scoping, see EA section 1.4. The EA and FONSI will be made available for public review from June 19 – July 11, 2012 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 *Albany Democrat Herald* newspaper. Written comments should be addressed to Cindy Enstrom, Field Manager, Cascades Resource Area, 1717 Fabry Road S., Salem, Oregon 97306. Emailed comments may be sent to BLM_OR_SA_Mail@blm.gov. Attention: Cindy Enstrom

6.0 LIST OF INTERDISCIPLINARY TEAM REPORTS INCORPORATED BY REFERENCE

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

England, J., 2012. *Cascades Resource Area Wildlife Report Even Keel Project* (Wildlife Report) Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Fennell, T., 2010. *Cascades Resource Area Botanical Report Proposed Even Keel Thinning Timber Sale* (Botany Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Greatorex F., T., 2011. *Cascades Resource Area Cultural Resource Inventory Report - Even Keel Thinning Timber Sale* (Cultural Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Hawe, W. P., 2011. *Hydrology/Channels/Water Quality: Specialist Report for the Even Keel Thinning Project*, (Hydro Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Hawe, W. P., 2010. *WEPP (Water Erosion Prediction Project) Report for Even Keel Thinning* (WEPP Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Hawe, W.P., 2011. *Soils Environmental Assessment for the Proposed Even KeelThinning Project* (Soils Report) 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. *Even Keel Thinning Project Air Quality, Fire Risk, and Fuels Management Specialist Repor*t (Fuels Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Schofield, L., 2011. *Even Keel Logging Systems Report* (Logging Report), Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

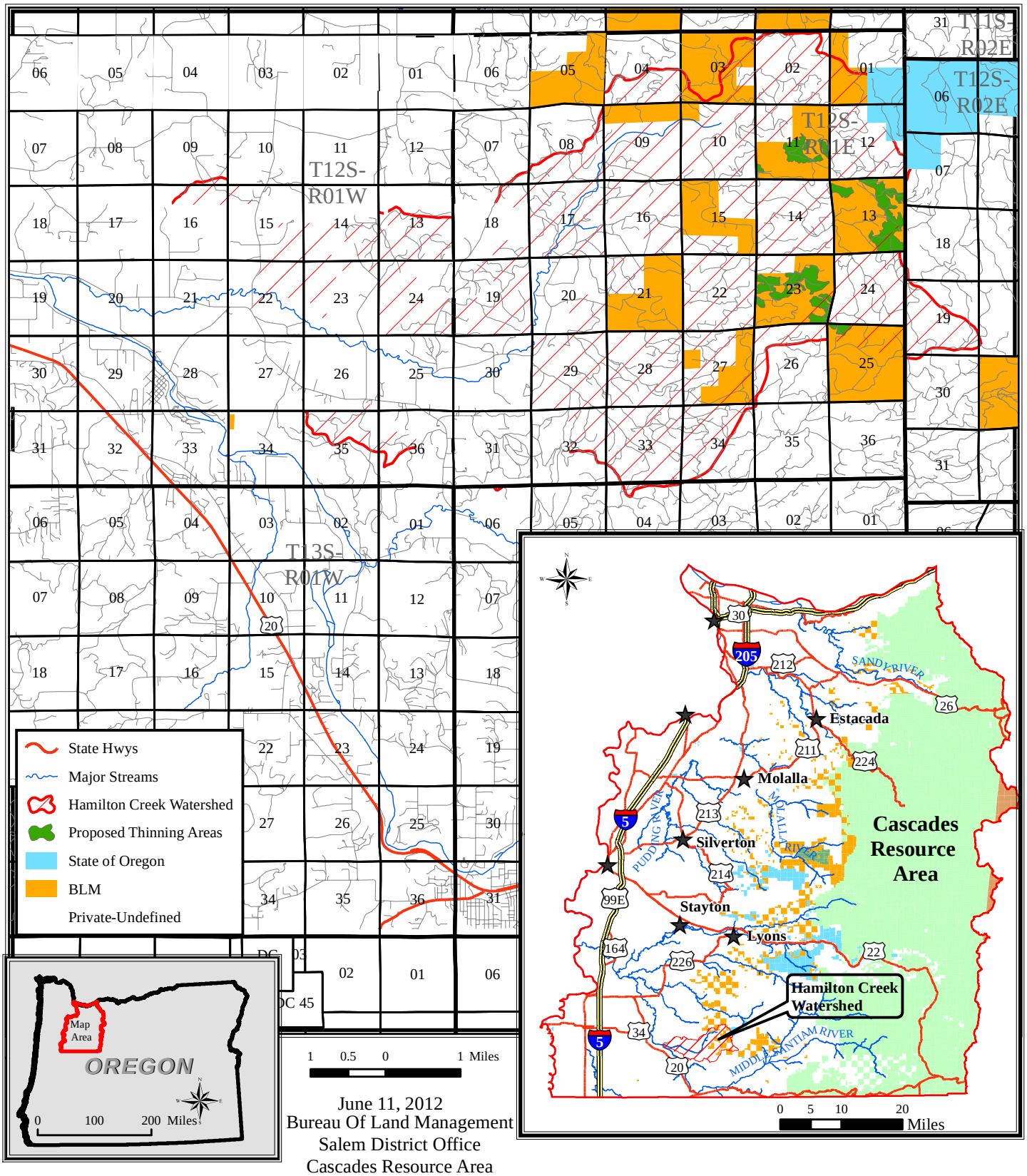
Thompson, C., 2012. *Even Keel Thinning and Silvicultural Prescriptions* (Silviculture Report). Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

Zoellick, B., 2012. *Even Keel Thinning Fisheries Specialist Report* (Fisheries Report) Cascades Resource Area, Salem District, Bureau of Land Management. Salem, OR.

7.0 PROJECT MAPS

The following pages display the Even Keel Project Maps.

Even Keel Project Vicinity Map



June 11, 2012
Bureau Of Land Management
Salem District Office
Cascades Resource Area

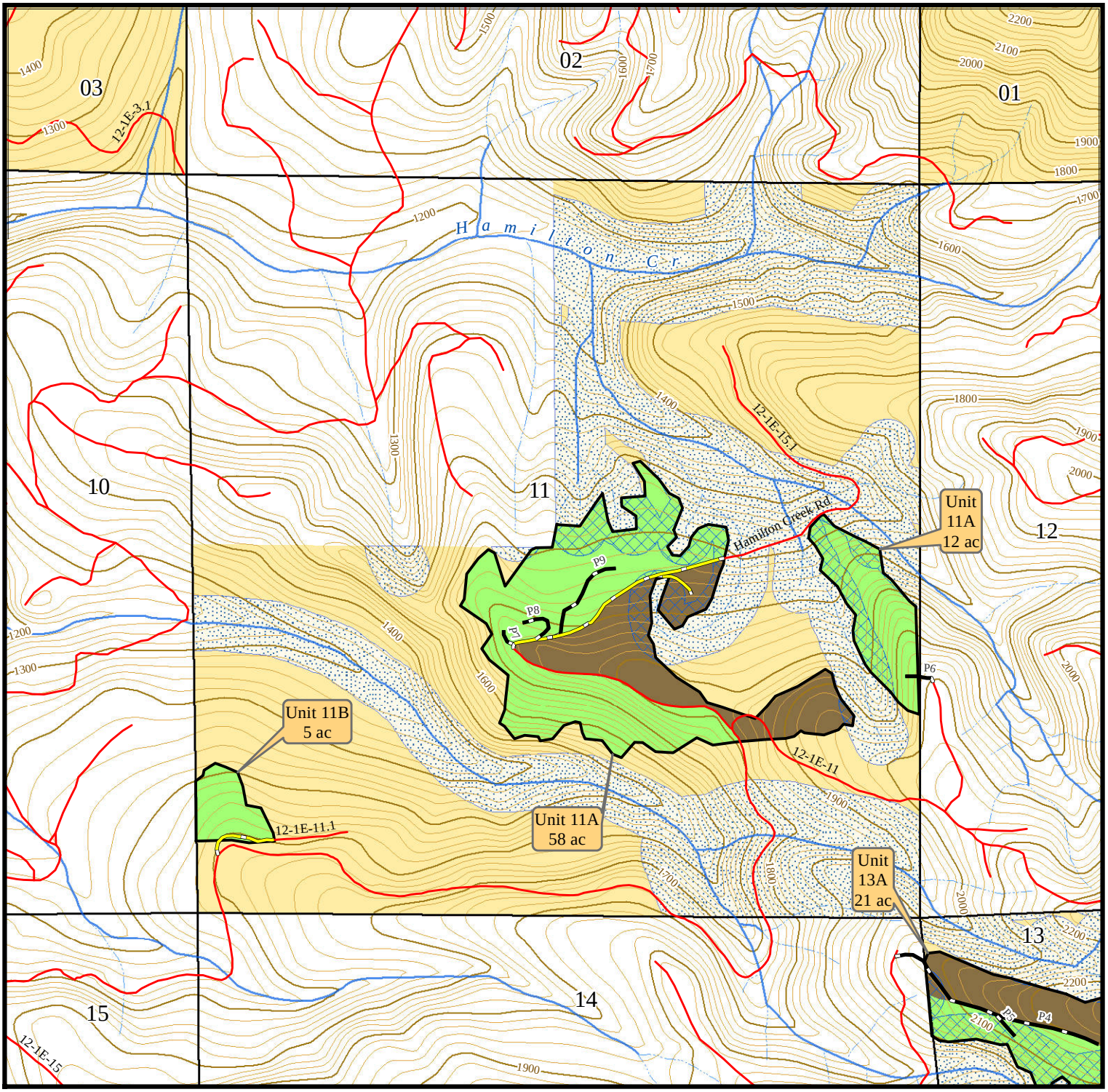
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.

★ Cities of Interest
State Hwys
Interstate Hwys
Major Streams
Cascades RA
State of Oregon
National Forest
Wilderness Areas
Warm Springs Reservation
BLM

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

Even Keel EA (# S040-2010-0005) Proposed Action Map

T12S-R01E Sec 11



1,000 500 0Feet

Contour Interval: 20'

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.

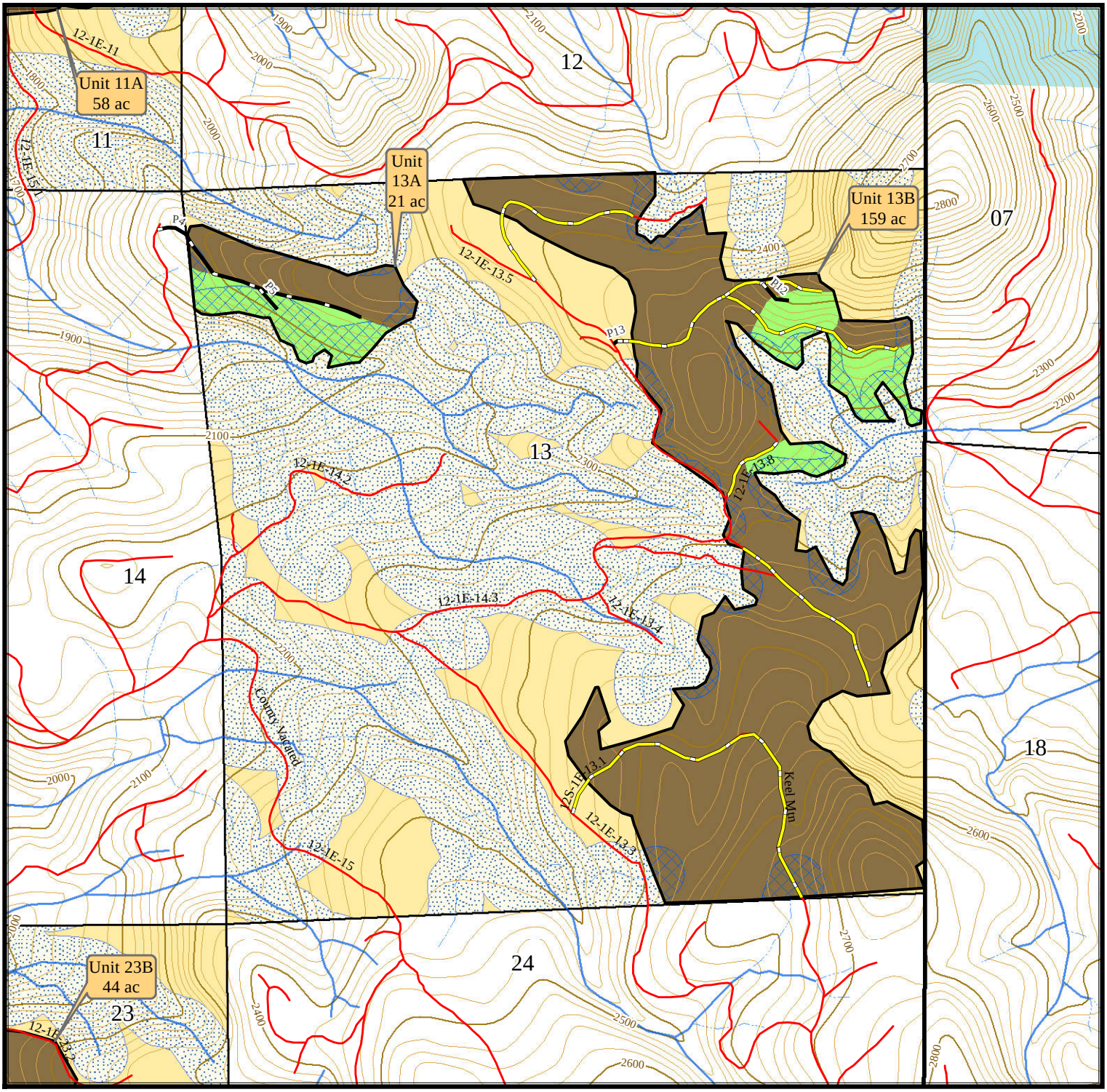
- Roads
- Intermittent
- Perennial
- New Construction
- Renovation
- Riparian Reserve (No Treatment)
- Riparian Reserve (Treated)
- Thinning Unit Boundary
- Skyline Yarding
- Ground-Based Yarding
- Bureau of Land Management
- U.S. Forest Service
- State
- Private/Unknown

Jun 11, 2012

Bureau Of Land Management
Salem District Office
Cascades Resource Area

Even Keel EA (# S040-2010-0005) Proposed Action Map

T12S-R01E Sec 13



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Contour Interval: 20'

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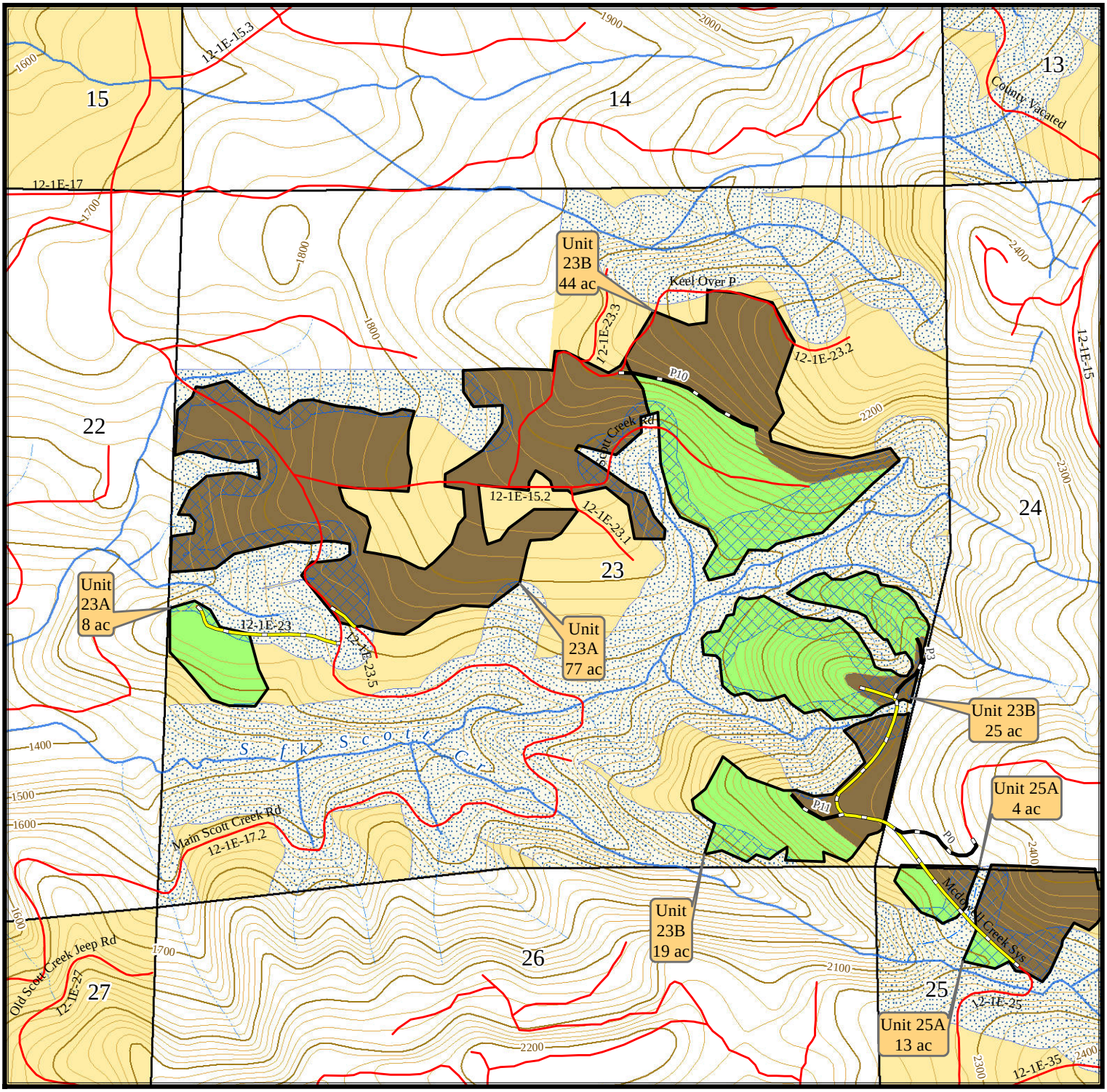
Jun 11, 2012

Bureau Of Land Management
Salem District Office
Cascades Resource Area

Even Keel EA (# S040-2010-0005) Proposed Action Map

T12S-R01E Sec 23



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Contour Interval: 20'

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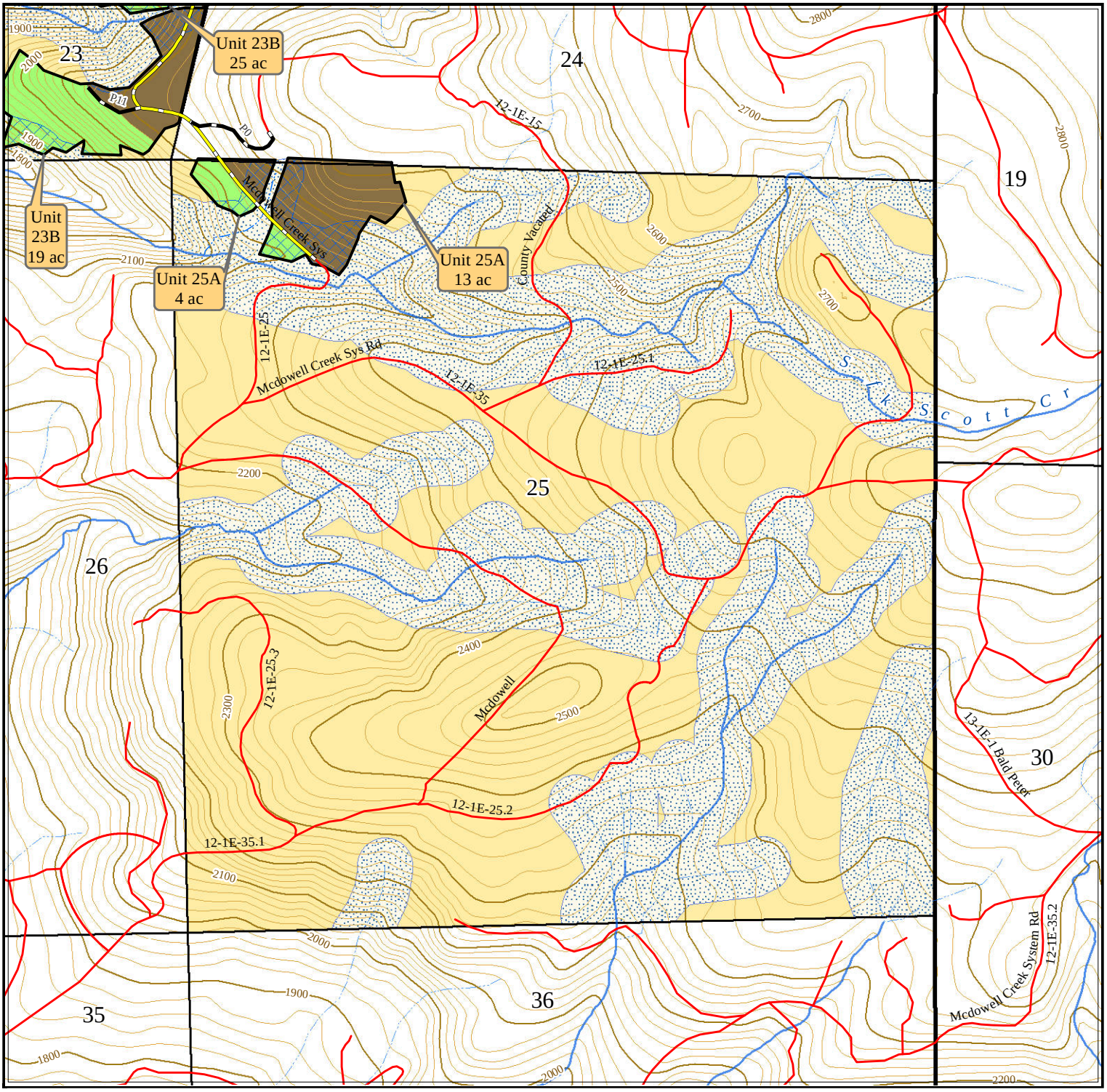
Jun 11, 2012

Bureau Of Land Management
Salem District Office
Cascades Resource Area

Even Keel EA (# S040-2010-0005) Proposed Action Map

T12S-R01E Sec 25



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Bureau Of Land Management
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NATIONAL SYSTEM OF PUBLIC LANDS
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

8.0 GLOSSARY AND COMMON ACRONYMS

8.1 Glossary

age class - A management classification using the age of a stand of trees

anadromous fish - Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Includes 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.

basal area - The cross-sectional area of a single stem, of all stems of a species in a stand, or of all plants in a stand (including the bark) that is measured at breast height (about 4.5 feet up from the ground) for larger plants (like trees) or measured at ground level for smaller plants.

baseline - The starting point for the analysis of environmental consequences, often referred to as the Affected Environment. This starting point may be the condition at a point in time (e.g., when inventory data is collected) or the average of a set of data collected over a specified number of years.

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.

canopy - The more or less continuous cover of branches and foliage formed collectively by adjacent trees and other woody species in a forest stand. Where significant height differences occur between trees within a stand, formation of a multiple canopy (multi-layered) condition can result.

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).

commercial thinning - Any type of thinning producing merchantable material at least equal to the value of the direct cost of harvesting. See *thinning*.

Consultation - A formal review between the U.S.Fish and Wildlife Service or National Marine fisheries Service and another federal agency when it is determined that an action by the agency may affect critical habitat or a species that has been listed as threatened or endangered to ensure that the agency's action does not jeopardize a listed species or destroy or adversely modify critical habitat. Critical habitat is an Endangered Species Act term denoting a specified geographic area occupied by a federally listed species, and on which the physical and biological features are found that are essential to the conservation and recovery of that species and that may require special management or protection.

crown - The upper part of a tree that has live branches and foliage.

crown fire - Fire that moves through the crowns of adjacent trees independent of any surface fire. Crown fires can often move faster and ahead of ground fires.

culmination of mean annual increment (CMAI) The age in the growth cycle of a tree or stand at which the *mean annual increment* (MAI) for volume is at its maximum.

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.

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. Also see *baseline*.

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

fuel loading - The dry weight of all accumulated live and dead woody and herbaceous material on the forest floor that is available for combustion, and which poses a fire hazard.

forest habitat - An area containing the forest vegetation with the age class, species composition, structure, sufficient area, and adequate food source to meet some or all of the life needs (such as foraging, roosting, nesting, breeding habitat for northern spotted owls) of specific species.

harvesting -The process of onsite cutting and removing of merchantable trees from a forested area.

key watershed -A Northwest Forest Plan term that denotes a watershed that contains habitat for potentially threatened species, stocks of anadromous salmonids, or other potentially threatened fish, or is an area of high-quality water and fish habitat. Also see *watershed*.

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.

mature stage - Generally begins as tree growth rates stop increasing (after culmination of mean annual increment), and as tree mortality shifts from density-dependent mortality to density-independent mortality.

merchantable - Trees or stands having the size, quality and condition suitable for marketing under a given economic condition, even if not immediately accessible for logging

modeling - A scientific method that operates by a structured set of rules and procedures to simulate current conditions and predict future conditions.

multi-layered canopy - Forest stands with two or more distinct tree layers in the *canopy*.

National Marine Fisheries Service - A federal agency under the United States Department of Commerce that is responsible for working with others to conserve, protect, and enhance anadromous fish and their habitats.

non-point source pollution - Water or air pollutants where the source of the pollutant is not readily identified and is diffuse, such as the runoff from urban areas, agricultural lands, or forest lands. Also see *point source*.

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.

point source - An origin of water or air pollutants that is readily identified, such as the discharge or runoff from an individual industrial plant or cattle feedlot. Also see *nonpoint source*.

relative density - A means of describing the level of competition among trees or site occupancy in a stand, relative to some theoretical maximum that is based on tree size and species composition. Relative density is determined mathematically by dividing the stand basal area by the square root of the quadratic mean diameter. Also see *basal area*.

road construction, new - building a road where none existed before

road renovation - restores an existing road to its original design standards. Actions include: cutting vegetation from the roadbed and ditches; blading and shaping the roadbed and ditches; repairing small slides and slumps; cutting brush adjacent to the road; maintaining, repairing, adding cross drainage culverts; replacing undersized culverts; and adding rock to replace depleted rock surfaces.

rotation - The planned number of years between establishment of a forest stand and its regeneration harvest.

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.

special forest products (SFP) - Those plant and fungi resources that are harvested, gathered, or collected by permit, and have social, economical, or spiritual value. Common examples include mushrooms, firewood, Christmas trees, tree burls, edibles and medicinals, mosses and lichens, floral and greenery, and seeds and cones, but not soil, rocks, fossils, insects, animal parts, or any timber products of commercial value.

special status species - Those species that are listed under the Endangered Species Act as threatened or endangered (including proposed and candidate species); listed by a state as threatened, endangered or candidate species; and listed by the BLM as sensitive species. Under the BLM Special Status Species policy (BLM 6840), the BLM State Director has created an additional category called Bureau Strategic Species (see glossary *Bureau strategic species*).

stand - An aggregation of trees occupying a specific area and sufficiently uniform in composition, age, arrangement, and condition so that it is distinguishable from the forest in adjoining areas.

stream, intermittent - Drainage feature with a dry period, normally for three months or more, where the action of flowing water forms a channel with well-defined bed and banks, supporting bed-forms showing annual scour or deposition, within a continuous channel network.

stream, perennial - Permanent channel drainage feature with varying but continuous year-round discharge, where the base level is at or below the water table.

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.

timber - Forest crops or stands, or wood that is harvested from forests and is of a character and quality suitable for manufacture into lumber and other wood products rather than for use as fuel.

Timber Production Capability Classification (TPCC) - An analytical tool that inventories and identifies sites as capable of sustaining intensive timber management without it degrading their productive capacity. This tool evaluates a site's soil depth, available moisture, slope, drainage, and stability to determine site capacity for timber management activity. Sites that prove incapable of sustaining intensive timber management are typically not included in the harvest land base.

understory - Portion of trees or other woody vegetation that forms the lower layer in a forest stand, and that consists of more than one distinct layer.

(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.

wildfire - Any nonstructural fire, other than prescribed burns, that occurs on wildland.

(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.

8.2 Additional Acronyms

BLM – Bureau of Land Management

BS – Bureau Sensitive, a category of species under the Oregon/Washington Special Status Species Policy

DBH – diameter at breast height

ESA – Endangered Species Act

FONSI – Finding of No Significant Impact

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

ODEQ – Oregon Department of Environmental Quality

RMP/FEIS – Salem District Proposed Resource Management Plan / Final Environmental

Impact Statement (1994)

RR – Riparian Reserve Land Use Allocation (Riparian Reserves)

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

t/ac/yr - tons/acre/year (see EA section 3.2.2 _Sediment Rate)

TMDL – total maximum daily load

USDI – United States Department of the Interior

9.0 Response to Scoping Comments

Table 21: Response to Scoping Comments

Commenter	Category	#	Comment	Response
Oregon Wild	Aquatic Conservation Strategy – Watershed Restoration	1	1/ When conducting commercial thinning projects take the opportunity to 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.	Addressed in text, EA sections 2.2.2 and 3.2.8
Individual Commenter	Aquatic	2	Project design and operational features should preserve the hydrological integrity of the South Santiam watershed, especially with respect to domestic water supplies, fisheries resources, and aquatic recreational use.	Addressed in text, EA sections 2.2.3, 3.2.2 and 3.2.3
Oregon Wild	Alternatives - Carbon	3	18/ 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. Recognize that there is a carbon cost associated with thinning.	Addressed in text, EA sections 1.4.3 and 2.5
Rocky Mountain Elk Foundation (RMEF)	Early Seral Habitat	4	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.	Addressed in text, EA section 2.2.1
RMEF	Early Seral Habitat	5	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.	Addressed in text, EA section 2.2.1
RMEF	Early Seral Habitat	6	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.	Addressed in text, EA section 2.2.3
American Forest Resource Council (AFRC)	Early Seral Habitat	7	We suggests that the Salem District BLM consider creating multiple small patch cuts (1-3 acres in size) in the thinning units to provide early successional habitat for species such as Columbian black-tailed deer (*Odocoileus hemionus columbianus*) and Roosevelt elk (*Cervus elaphus roosevelti*).	Addressed in text, EA section 2.2.1

Commenter	Category	#	Comment	Response
AFRC	Economics	8	AFRC is hopeful that the thinning units in the Even Keel Timber Sale Project harvest adequate volumes. Light thinning of 4 -8 mbf /acre makes units difficult to economically log. Purchasers need more trees to cut per acre, including some of the larger distressed dominants and co-dominants. The cutting costs for these types of units are more expensive adding to the high cost of logging.	All units in Even Keel were marked to a target Curtis Relative Density (RD) of 35-39 (EA Table 7). The Salem District RMP recommends thinning our Matrix lands to a Curtis RD of 40. Based on our current management direction, it is hard to justify thinning Matrix lands to a Curtis RD lower than 35.
AFRC	Economics	9	AFRC also would like to voice support for thinning treatments in the riparian areas of the Even Keel Timber Sale Project. By prescribing small no cut buffers (25-50 feet) to be left to maintain stream temperatures and thinning the remaining acres inside the riparian areas you can achieve the management objectives of moving them into late seral habitat faster. By reducing the no cut buffers to 25-50 feet and thinning down to that distance, the forest also harvests more volume during the sale thus reducing unit cost.	Thinning is proposed within the Riparian Reserve Land Use Allocation. Addressed in Text, EA section 2.2.1 With regard to no cut buffers, the Total Maximum Daily Load (TMDL) agreement with the State of Oregon requires the recovery or maintenance of full potential shade along all 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 would implement the TMDL on federal lands. The plan was approved by the ODEQ on July 18, 2008. The recommended design features of this plan have been incorporated into the Even Keel project. These project design features include no cut buffers are at least 30 feet on intermittent streams and 70 feet on perennial streams. Addressed in Text, EA section 3.2.2
AFRC	Economics	10	AFRC would like to see all timber sales be economically viable. Appropriate harvesting systems should be used to achieve an economically viable sale and increase the revenues to the government and O&C Counties.	Addressed in text, EA sections 1.2, 1.4.3, 2.2
AFRC	Economics	11	We would also like to encourage the BLM to take a hard look at allowing mechanical harvesting and pre-bunching of processed logs where possible (slopes less than 34% in EA)	We include only standard skyline and ground-based stipulations in the contract and the EA sets resource protection objectives and operational side-boards. The operator submits a proposal to the Authorized Officer for review. Processors have often been used very effectively on our timber sales where they have done an excellent job in preventing soil damage and minimizing damage to standing trees. They can often work an extended operating season, as long as effects stay within those effects described in the EA.
AFRC	Economics	12	AFRC cannot support the decommissioning of any permanent roads that improve access for fuels reduction treatments and early initial response to wildfires.	Addressed in text, EA section 2.2.2

Commenter	Category	#	Comment	Response
AFRC	Fuels Treatments	13	AFRC would like to see the BLM fuels treatments prescriptions have some flexibility. Rather than specifying a specific method of accomplishing your resource objectives, you should instead identify the objectives you are trying to accomplish and any limitations to resource disturbance you require.	The *Salem District Record of Decision and Resource Management Plan*, May 1995 (RMP) identifies the broad resource objectives that Fuels Managers must incorporate to meet the requirements of the Plan. The EA allows for a wide range of potential fuels treatments depending on post-harvest surveys. Addressed in Text, EA section 2.2.2
Oregon Wild	Fuels Treatments	14	12/ If using whole tree yarding or yarding with tops attached to control fuels, the agency should top a portion of the trees and leave the greens in the forest in order to retain nutrients on site.	Site specific fuel treatments have not yet been finalized. However, it is unlikely that the majority of the 445 acres would be harvested in this manner. If some small areas were whole tree yarded there should still be no lack of residue remaining on site to provide nutrients. Total fuel loading post harvest should amount to approximately 17,065 tons or 38.3 tons per acre. It is estimated that following fuels treatments there would be approximately 15,167 total tons of fuel on site or 34.1 tons per acre. (See EA Section 3.2.6).
Oregon Wild	Invasive Plants	15	14/ Take proactive steps to avoid the spread of weeds. Use canopy cover to suppress weeds. Avoid soil disturbance and road construction.	Addressed in text, EA sections 2.2.2, 2.2.3
Oregon Wild	Monitoring	16	2/ Use projects as an opportunity to learn by conducting monitoring and research on the effects of thinning. There are many information gaps that need filling. Every project should generate useful information to inform future projects.	Implementation monitoring for BMPs is conducted regularly throughout the project. Effectiveness monitoring is conducted through the Aquatic and Riparian Effectiveness Monitoring Plan (AREMP) see http://www.reo.gov/monitoring/watershed-overview.shtml
Frank	Project Objectives	17	Support for the timber sale and confidence that the project will protect natural resources	
Individual Commenter	Recreation	18	The project will occur near popular recreational hiking trails, lakes and scenic drives. Project design and operational features should take this into account.	Recreation activities within the project area are dispersed behind locked gates only. McDowell Creek County Park is approximately 3 miles to the southwest, Foster Reservoir over 5 miles to the south, and Roaring River Hatchery, County Park, and Larwood County Park are over 6 miles to the northwest of the project area. No recreation trails are on record near the project area.
Individual Commenter	Retain Habitat	19	Both commercial thinning and variable density management should preserve any minor tree species and special habitats.	Addressed in text, EA sections 2.2.3, 3.2.5
AFRC	Retain NE corner of Section 11	20	AFRC would like to see the unit in the NE corner of sec. 11 stay in this timber sale. We believe the access issue could be solved at a relatively low cost. The large stream crossing on the east side of section 11 could be crossed with a temporary bridge crossing or a spur could be extended from Weyerhaeuser's property to the east.	Addressed in text, EA section 2.5

Commenter	Category	#	Comment	Response
Individual Commenter	Road Construction	21	No new roads should be constructed in Riparian Reserves. Existing roads should be decommissioned, if possible; at the very least, the numerous stream crossings should be improved upon with better culverts or by other means.	Addressed in text, EA sections 2.2.3, 3.2.2, 3.2., 3.2.8
Oregon Wild	Road Construction	22	16/ Avoid road construction. Where road building is necessary, ensure that the realized restoration benefits far outweigh the adverse impacts of the road. Carefully consider the effects of roads on connectivity, especially at road/stream crossings, across ridge tops, and midslope hydrological processes (such as large wood delivery routes). Avoid log hauling during the wet season.	Most of the road network utilized for the sale is already in place. New road construction is already avoided due to cost and potential impacts and is developed when necessary for project implementation. Addressed in text, EA sections 2.2, 3.2.2, 3.2.3, 3.2.8
AFRC	Seasonal Restrictions	23	Seasonal and wildlife restrictions often make timber sales extremely difficult to complete within the contract timelines. Fire season restrictions on top of seasonal and wildlife restrictions can often limit workdays to 4-5 hours. All these restrictions have a cost to the purchaser and results in a lower bid for the stumpage. We strongly suggest that the BLM carefully examine sale restrictions and minimize those restrictions where possible.	Each sale, and often each harvest unit, has its own set of environmental and operational concerns and the BLM operates under various laws, policies and plans that direct us. We seek to allow the greatest possible flexibility in logging systems and seasons within those constraints.
Oregon Wild	Stream protection zones	24	15/ Buffer streams from the effects of heavy equipment and loss of bank trees and trees that shade streams. Mitigate for the loss of LWD input by retaining extra snags and wood in riparian areas	Addressed in text, EA section 2.2
Individual Commenter	Thinning	25	Variable density management in the Riparian Reserves should preserve any large trees of those which meet particular habitat needs for sensitive species. Pre-disturbance surveys should be done for former Survey and Manage Species which have been incorporated into management plans for listed species. I am particularly concerned about species with little or no mobility, such as amphibians, mollusks, and epiphytes.	Addressed in EA Sections 2.2.1; Retain largest trees, thin from below); 3.2.1, 3.2.5 (special status species); 2.2.3 3.2.5; (Retain old-growth remnants)
Oregon Wild	Thinning RX	26	4/ Focus on treating the youngest stands that are most "plastic" and amenable to restoration.	This comment is out of the scope of this project. See EA section 1.2.
Oregon Wild	Thinning RX	27	5/ Generally retain all the largest trees, then “free thin from below” retaining some smaller trees in all age-size classes.	Addressed in text, EA section 2.2, 3.2.1, 3.2.5
Oregon Wild	Thinning RX	28	6/ Retain and protect under-represented conifer and non-conifer trees and shrubs.	Addressed in text, EA section 2.2.3
Oregon Wild	Thinning RX	29	9/ Retain abundant snags and course wood both distributed and in clumps. Retention of dead wood should generally be proportional to the intensity of the thinning, Retain wildlife trees such as hollows, forked tops, broken tops, leaning trees, etc.	Addressed in EA section 2.2.3, 3.2.1- (Pre/post treatment trees per acre, retaining wildlife trees).

Commenter	Category	#	Comment	Response
Oregon Wild	Thinning RX	30	7/ Strive for a variable density outcome. Use your creativity to establish diversity and complexity both within and between stands. Use skips and gaps within units to help achieve diversity. Gaps should be small, while skips should be a little larger, but even small clumps and patches of trees are desirable. Gaps should not be clearcut but rather should retain some residual structure in the form of live or dead trees. 8/ The scale of patches in variable density thinning regimes is important. Ideally variability should be implemented at numerous scales ranging from small to large	The proposed action would have a variable density outcome by thinning to 40% canopy cover in Matrix, 50% canopy cover in Riparian, thinning 6 one-acre patches to 10-12 trees per acre, leaving unthinned stream protection zones within the unit, and leaving unthinned Riparian Reserves adjacent to the units and within the sections in the project area that contain the units.
Oregon Wild	Thinning RX	31	10/ Think not only about existing snags but more importantly about the processes the recruit snags, including: a large pool of green trees from which to recruit snags and the existence of competition and other mortality processes. Logging will significantly harm both of these snag recruitment factors. Green tree retention, including generous unthinned "skips" where density dependent mortality will play out, is necessary to support this process. Thinning both reduces and delays recruitment of snags, first by removing trees that would otherwise suffer suppression mortality, and second by increasing stand vigor and postponing overall mortality. The implications are that heavy thinning should be used sparingly and generous unthinned patches should be retained WITHIN thinned stands in order to continue the snag recruitment process and mitigate for captured mortality. To inform the decision, please conduct a stand simulation model to fully disclose the adverse effects of logging on dead wood, especially large snags >20" dbh, and then mitigate for these adverse effects by identifying areas within treated stands and across the landscape that will remain permanently untreated so they can recruit adequate large snags and dead wood to meet DecAID 50-80% tolerance levels as soon as possible and over the long-term.	Addressed in EA section 2.2.1, 2.3, 3.2.1 (untreated areas) An examination of current photos & maps reveals there are numerous unthinned skips in the project area. The Keel Mountain Density Management site in Sec. 13 has many leave islands varying in size from ¼-to1 acre. Addressed in EA sections 2.2.3, 3.2.1 and 3.2.5 The Even Keel project does not propose heavy thinning. These prescriptions meet the US Fish and Wildlife's definition of light to moderate thinning used in ESA consultation. The Field Manager disagrees that the BLM needs to run the requested stand stimulation model to make an informed decision about the effect of the project on snags and down wood for the following reasons. The proposed thinning would retain 90% of the snags larger than 15 inches. Any large snags that need to be felled for safety reasons, would be retained as CWD. Thinning would retain Green tree capital for green tree retention requirements at final harvest in the matrix, and future snag recruitment in the Riparian Reserve Land Use Allocation. These stands are currently lacking large snags and coarse woody debris so these habitat components would be protected to the greatest extent possible.
Oregon Wild	Thinning RX	32	11/ Thin heavy enough to stimulate development of understory vegetation, but don't thin too heavy. Recognize that thinning captures mortality and that plantation stands are already lacking critical [1]values from dead wood due to the unnatural stand history of all clearcut and planted stands.	Addressed in text, EA section 3.2.1, 3.2.5, 3.2.8, 3.2.9.

Commenter	Category	#	Comment	Response
Oregon Wild	Wildlife	33	3/ Consider the effects of thinning on adjacent mature & old-growth habitat which may provide habitat for spotted owls, marbled murrelets, and other species. Spotted owls may use young stands for dispersal, foraging, and security from predators. The agency should also consider adjusting both the location and timing of thinning to minimize the cumulative effects of widespread thinning on the sensitive and listed species.	Addressed in EA Section 3.2.5; (spotted owl/late successional old-growth/suitable habitat). No late successional/old-growth is proposed for thinning. There is one late successional stand adjacent to proposed thinning in 12S-1E-23. The rest of the proposed units are located adjacent to early/other mid seral stands.
Oregon Wild	Wildlife	34	13/ Avoid impacts to raptor nests and enhance habitat for diverse prey species. Train marking crews and cutting crews to look up and avoid cutting trees with nests of any sort and trees with defects.	No known raptor nests are found in the project area. Prey species-red tree vole addressed in EA Section 3.2.5. None of the other prey species have any Bureau or Survey & Manage status.
Oregon Wild	Wildlife	35	19/If the stand is younger than 80 years, the agency may rely on the Pechman exemption and not complete surveys for rare and uncommon species. However, this exemption is intended to apply to even-aged stands, and the agency should apply the survey protocol in any portion of units with two or more predominant trees per acre. See Red Tree Vole Survey Protocol Version 2.1.	Addressed in EA Section 3.2.5 (red tree vole).

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