Gunners Lakes Project

Environmental Assessment and
Finding of No Significant Impact

Environmental Assessment Number DOI-BLM-OR-S060-2010-05-EA
May 2010

Salem District
Columbia County, Oregon

T. 4 N., R. 3 W. sections 7, 9, 21, 29, W.M.

Responsible Agency:	USDI - Bureau of Land Management
Responsible Official:	Stephen M. Small, Field Manager Tillamook Resource Area 4610 Third Street Tillamook, OR 97141 (503) 815-1100
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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-10/033+1792

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FINDING OF NO ADDITIONAL SIGNIFICANT IMPACT

Introduction

The Bureau of Land Management (BLM) has conducted an environmental analysis (Environmental Assessment Number DOI-BLM-OR-S060-2010-0005-EA) for a proposal to thin approximately 500 acres located on BLM lands within the Tillamook Resource Area in Columbia County, Oregon. The *Gunners Lakes Project Environmental Assessment* 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 determination (FONSI). 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 (ROD/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 project is located on BLM lands in T.4N, R.3W, sections 7, 9, 21 and 29, in Columbia County, Oregon. The proposed action is to thin approximately 508 acres of 70 year-old timber stands. Approximately 291 of these acres are in the Matrix land use allocation (LUA), and 217 are in the Riparian Reserve LUA.

The EA and FONSI will be made available for public review from ***May 17, 2010*** **to June 18,** ***2010***. The notice for public comment will be published legal notices by the **Hillsboro Argus** and **Scappoose South County Spotlight** newspapers. Comments received by the Tillamook Resource Area of the Salem District Office, 4610 Third Street, Tillamook, Oregon, 97141, on or before ***June 18, 2010*** will be considered in making the final decision for this project.

Finding of No Significant Impact

Based upon review of the Gunners Lakes Project EA and supporting project record, I have determined that this project 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. There are no site specific impacts that would require supplemental/additional information to the analysis done in the *Salem District Proposed Resource Management Plan/Final Environmental Impact Statement,* September 1994 (RMP/FEIS). Therefore, an environmental impact statement is not needed. This finding is based on the following discussion:

Context. The proposed projects are site-specific actions directly involving a total of approximately 508 acres of BLM administered land, along with actions occurring on various haul routes in and near the project area. These actions by themselves do not have international, national, region-wide, or state-wide importance.

The discussion of the significance criteria that follows applies to the intended actions and is within the context of local importance. The EA details the effects of the action alternatives; none of the

effects identified, including direct, indirect and cumulative effects, are considered to be significant and do not exceed those effects described in the RMP/FEIS.

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

1. **Impacts may be both beneficial and adverse.** Due to the proposed projects' design features, the most noteworthy predicted effects include: (1) increased growth rates of residual trees in thinning areas; (2) increased tree species diversity in the project area; (3) consistency with the ACS (Aquatic Conservation Strategy) objectives; (4) no loss in population viability of special status or special attention species (also see significance criteria #9 below); (5) slight, short-term increases in sediment are anticipated from road construction, road improvement, culvert replacement and removal, timber harvest, and log haul; (6) no impacts to water temperature, or streamflow; (7) slight, short-term impacts to stream channel stability are expected at the two sites that will have culverts removed; and (8) social and economic benefits to the local communities through the supply of timber to local mills.

None of the environmental effects disclosed above and discussed in detail in *EA Section 3* are considered significant, nor do the effects exceed those described in the RMP/FEIS.

2. **The degree to which the selected alternative will affect public health or safety.** Public health and safety was not identified as an issue. The proposed project is comparable to other commercial timber sales and road projects which have occurred within the Salem District with no unusual health or safety concerns.

3. **Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farm lands, wetlands, wild and scenic rivers, or ecologically critical areas**. There are no prime farm lands, or wildernesses located within the project area (EA section 3.13). No cultural resource sites have been identified within the project area. Scaponia Park, which is a BLM campground managed by Columbia County under the authority of a Recreation and Public Purposes Act lease, is located adjacent to the project area. None of the proposed actions will occur in the park, and it will not be affected by this project. There are no federally designated Wild and Scenic Rivers within the project area. Under the design features for the commercial treatment, all identified wetland and riparian areas would be buffered to protect resource values. There are no Areas of Critical Environmental Concern or other known ecologically critical areas within or adjacent to the project area.

4. **The degree to which the effects on the quality of the human environment are likely to be highly controversial.** Extensive scoping of the proposed project resulted in only three project specific comment emails. The disposition of public comments is contained in EA section 1.4.1.

The effects of the proposed project on the quality of the human environment were adequately understood by the interdisciplinary team to provide an environmental analysis. A complete disclosure of the predicted effects of the proposed project is contained within EA section 3.

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

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

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

8. **The degree to which the action may adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.** The proposed projects will not adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places, nor will the proposed projects cause loss or destruction of significant scientific, cultural, or historical resources (EA section 3.13).

9. **The degree to which the action may adversely affect an endangered or threatened species or its designated critical habitat under the Endangered Species Act of 1973.** The spotted owl would be affected by this project only through the modification of dispersal habitat. Due to the minor impact to a component of spotted owl habitat, informal consultation with the U.S. Fish and Wildlife Service is warranted and would be completed programmatically within the appropriate years (year of sale if the proposed action is selected) Habitat Modification Biological Assessment in the "Light to Moderate Thinning" category.

Consultation with the National Marine Fisheries Service on the potential effects of the proposed action on Oregon Coast coho salmon will be completed with project specific consultation (Section 7 Streamlined Consultation) or one of the programmatic consultation processes available at the time of implementation for actions that require consultation. Required consultation for Magnuson-Stevens Fisheries Conservation and Management Act Essential Fish Habitat for the proposed action is included in EA section 3.4.3. Section 7 Endangered Species Act Consultation will be completed prior to the Field Manager authorizing an action.

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

Approved by: _____ _____

Stephen M. Small Date

Tillamook Resource Area Field Manager

GUNNERS LAKES PROJECT ENVIRONMENTAL ASSESSMENT

1.0 INTRODUCTION

This EA will analyze the impacts of proposed commercial thinning operations and connected actions on the human environment. The EA will provide the decision maker, the Tillamook Resource Area Field Manager, with current information to aid in the decision-making process. It will also determine if there are significant impacts not already analyzed in the Environmental Impact Statement for the Salem District's Resource Management Plan (RMP) (1995) and whether a supplement to that Environmental Impact Statement is needed or if a Finding of No Significant Impact is appropriate. Section 1 of this EA for the proposed Gunners Lakes Project provides a context for what will be analyzed in the EA, describes the kinds of actions we will be considering, defines the project area, describes what the proposed action needs to accomplish, and identifies the criteria that we will use for choosing the alternative that will best meet the purpose and need for this proposal.

1.1 Proposed Action

The Tillamook Resource Area, Salem District Bureau of Land Management (BLM), proposes to implement forest management activities within the East Fork Nehalem River (EFNR) 6th-Field Watershed. The proposed forest management activity is commercial thinning to maintain the health and growth of existing dense stands. Connected actions include such activities as removal of undersized and failing culverts, and building, renovating and decommissioning roads (*EA sections 2.0 and 3.0)*.

1.1.1 Project Area[1] Location and Vicinity

The Gunners Lakes Project area is approximately 6 miles southeast of the town of Vernonia, Oregon, in the East Fork Nehalem subwatershed of the Nehalem River watershed (Table 1). The project area includes BLM-managed lands within sections 7, 9, 21 and 29 of Township 4 North, Range 3 West, Willamette Meridian (Figure 1).

The proposed project area is located on Oregon and California Railroad Lands (O & C Lands) within the Matrix and Riparian Reserve (RR) land-use allocations. The Matrix is further divided into General Forest Management Area (GFMA) which encompasses sections 7 and 9, and Connectivity/Diversity Blocks (CON) in sections 21 and 29. BLM-administered land is intermixed with privately owned industrial timberland, creating an assortment of ownership patterns.

[1] Project Area is defined as that area that is directly affected by project operations (e.g. thinning units, area cleared for landings, roads and rights-of-way). The area around the Project Area, especially BLM managed lands in the same contiguous block of ownership, is referred to as the project area vicinity or similar term.

Table 1: Watershed and Proposed Treatment Acres

Subwatershed Name	6th Field Sub-Watershed Acres	Total 5th Field Watershed Acres	Proposed Project Acres within the Watershed	Percent of Subwatershed Treated
East Fork Nehalem River	20,591	142,549	508	2.4

1.2 Purpose of and Need for Action

1.2.1 Need for the Action

Data analysis and field examinations by BLM staff have identified specific stands in which growth rates will soon decline or have already started to decline, and/or in which structural diversity is limited due to overstocking—that is, the stands contain more trees than the sites have water, nutrients, and growing space to sustain. These overstocked stands in the project area would benefit from forest management activities to reduce the number of trees per site to allow remaining trees to have sufficient water, nutrients and space for additional growth to meet RMP objectives.

On Matrix lands designated for the sustained production of timber, overstocked stands, with their declining growth rates, have resulted in reduced volume yield and value over the planned timber rotation. The proposed forest management activities are needed in the project area stands to reverse these trends so the stands will contribute to future forest production and other goals of the Northwest Forest Plan (NWFP).

On Riparian Reserve lands 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), overstocked conifer stands have resulted 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.

1.2.2 Purpose (Objectives) of the Project

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 (see EA section 1.3).
The Gunners Lakes project area is within the Matrix (GFMA and CON) and Riparian Reserve land use allocations (RMP p. 5; NWFP pp. A-4, A-5; EA section 1.3). The following RMP and NWFP objectives would be applied to achieve the purpose of this project.

Within the Matrix (General Forest Management Area (GFMA) and Connectivity/Diversity Blocks (CON)) land use allocations:

1. Manage developing stands on available lands to promote tree survival and growth and to achieve a balance between wood volume production, quality of wood, and timber value at harvest; (RMP p. 46) and increase the proportion of merchantable volume in the stand, to produce larger, more valuable logs, to anticipate mortality of small trees as the stand develops, to 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 land use allocation to provide jobs and contribute to community stability (RMP pp. 1, 46-48); and 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. In the CON LUA, manage available forest land on a 150-year rotation (RMP p. 21).

Within the Riparian Reserve land use allocation:

4. Maintain water quality standards (RMP p.2) and improve stream conditions by:
   - Maintaining effective shade for streams pursuant to BLM's TMDL agreement with the State of Oregon.
   - Removing or replacing stream crossing culverts that restrict stream flows and fish passage, or pose a threat of future failure.
   - Providing habitat for special status, SEIS special attention and other terrestrial species (ROD/RMP p. 9).
   - Meeting all Aquatic Conservation Strategy (ACS) Objectives (RMP pp. 5-6).

5. Develop large conifers and future large coarse woody debris, large snag habitat and in-stream large wood. Develop long-term structural and spatial diversity, and other elements of late-successional forest habitat, to control stocking (stand density), to acquire desired vegetation characteristics and improve diversity of species composition within the Riparian Reserve LUA. These objectives would be accomplished by applying commercial thinning treatments within the Riparian Reserve LUA concurrent with treatments in the adjacent Matrix LUA, removing merchantable material only when it is consistent with the purposes for which the Riparian Reserves were established (RMP pp. 9-15, D-6, NWFP p. B-31).

Within all land use allocations:

6. Protect, manage, and conserve federal listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, and Bureau special status species policies (RMP p. 28).
7. 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;

- Perform road maintenance to prevent road deterioration or failure and to prevent road generated sedimentation that exceeds ODEQ standards.

1.2.3 **Decision Factors**

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

1. Provide timber resources and revenue to the government from the sale of those resources (objectives 1, 2 and 3);
2. Reduce the costs both short-term and long-term of managing the lands in the project area (objectives 1 and 2);
3. Provide safe, cost-effective access for logging operations, fuels management and fire suppression (objectives 2 and 7) ;
4. Reduce competition-related mortality and increase tree vigor and growth (objective 1);
5. Provide for the establishment and growth of conifer species while retaining structural and habitat components, such as large trees, snags, and coarse woody debris (objectives 5 and 6);
6. Promote the development of healthy late-successional characteristics in the Riparian Reserve land use allocation (objective 5);
7. Reduce erosion and subsequent sedimentation from roads (objectives 4 and 7).

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

The following documents direct and provide the legal framework for management of BLM lands within the Salem District and for this project:

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 (e.g. complies with management goals, objectives, direction, standards and guidelines) as required by 43 CFR 1610.5 (BLM Handbook H1790-1). 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);

   Land Use Allocations: The area proposed for treatment falls within the following Land Use Allocations (LUA) as defined in the previously described Salem District RMP and Northwest Forest Plan:
   - **Matrix (Matrix LUA).** The management objectives for this land use allocation include: to produce a sustainable supply of timber, provide connectivity between Late Successional Reserves, provide habitat associated with all age classes, and provide

structural components such as down logs, snags and large trees (RMP p. 20). The Matrix land in this project is within the GFMA (sections 7 and 9) and CON (sections 21 and 29). See EA section 1.2.2 for management objectives associated with these land use allocations.

- **Riparian Reserves (Riparian Reserve LUA).** The primary management focus for the Riparian Reserve LUA is to meet the Aquatic Conservation Strategy Objectives described in the RMP (pp. 5-6) "to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands." This includes terrestrial habitat, water quality and quantity, and aquatic habitat. See EA section 1.2.2 for management objectives associated with this land use allocation. For the Gunners Lakes Project, the Riparian Reserve LUA includes the stream and the area extending from the edges of the stream channel (each side) to a distance equal to the height of:
  - For fish-bearing streams and all lakes and natural ponds – a slope distance equal to the height of two site potential trees. For this project this is 480 feet each side of the stream channel.
  - For non-fish-bearing streams and all constructed ponds, and wetlands larger than one acre - a slope distance equal to the height of one site potential tree. For this project this is 240 feet each side of the stream channel.

In addition, the NWFP (p.B-31) also states that "Active silvicultural programs will be necessary to restore large conifers in Riparian Reserves ". The NWFP (p.C-32) and the RMP (p. 11) direct the BLM to apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy 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 3.14 describes the project's compliance with the Aquatic Conservation Strategy, including the nine ACS objectives.

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.

The analysis in the Gunners Lakes Project 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 1994 (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.

Information from the *East Fork Nehalem River Watershed Analysis*, December 1996, has been incorporated into the development of the proposed thinning activities, and into the description of the Gunners Lakes Project 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 Tillamook Resource Area Office.

1.3.1 **Survey and Manage Species Review**

The Gunners Lakes Project is consistent with court orders relating to the Survey and Manage mitigation measure of the Northwest Forest Plan, as incorporated into the Salem District Resource Management Plan.

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in *Conservation Northwest, et al. v. Rey, et al.*, No. 08-1067 (W.D. Wash.) (Coughenour, J.), granting Plaintiffs' motion for partial summary judgment and finding a variety of NEPA violations in the BLM and USFS 2007 Record of Decision eliminating the Survey and Manage mitigation measure. Previously, in 2006, the District Court (Judge Pechman) had invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation had entered into a stipulation exempting certain categories of activities from the Survey and Manage standard (hereinafter "Pechman exemptions").

Judge Pechman's Order from October 11, 2006 directs: "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

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

Following the Court's December 17, 2009 ruling, the Pechman exemptions are still in place. Judge Coughenour deferred issuing a remedy in his December 17, 2009 order until further proceedings, and did not enjoin the BLM from proceeding with projects. Nevertheless, the Gunners Lakes Project has been reviewed in consideration of both the December 17, 2009

and October 11, 2006 order. Because the Gunners Lakes Project entails no regeneration harvest and entails thinning only in stands less than 80 years old as well as replacing culverts on system roads that are in use and removing culverts on roads that are to be decommissioned, we have made the determination that this project meets Exemptions A and B of the Pechman Exemptions (October 11, 2006 Order), and therefore may still proceed to be implemented even if the District Court sets aside or otherwise enjoins use of the 2007 Survey and Manage Record of Decision since the Pechman exemptions would remain valid in such case.

1.3.2 **Relevant Statutes/Authorities**

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

- Oregon and California Act (O&C) 1937 – Requires the BLM to manage O&C lands for permanent forest production, in accord 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.

- 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.

- 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. .

- Endangered Species Act (ESA) 1973 – Directs Federal agencies to ensure their actions do not jeopardize threatened and endangered species.

- Clean Air Act (CAA) 1990 – Provides the principal framework for national, state, and local efforts to protect air quality.

- Archaeological Resources Protection Act (ARPA) 1979 – Protects archeological resources and sites on federally-administered lands. Imposes criminal and civil penalties for removing archaeological items from federal lands without a permit.

- Clean Water Act (CWA) 1987 – Establishes objectives to restore and maintain the chemical, physical, and biological integrity of the nation's water.

- Magnuson-Stevens Fishery Conservation and Management Act of 1996, (P.L. 94-265) as amended and reauthorized by (P.L. 109-479), (2007)

- The Migratory Bird Treaty Act, Executive Order 13186, and Migratory Bird Treaty Reform Act of 2004.

Additional authorities and management direction are described in EA section 3.13 Table 16.

1.4 Scoping

External scoping (seeking input from people outside of the BLM) was conducted by means of a scoping letter for the Gunners Lakes Project sent out to eight municipal government agencies, nearby landowners, and interested parties on the Tillamook Resource Area mailing list on January 20, 2010. In addition, a description of the proposal was included in the Salem Bureau of Land Management Project Updates for November 2009 and February 2010, which were mailed to more than 1000 individuals and organizations.

A total of three comment emails were received as a result of this scoping. A summary of the comments and BLM responses are in *Section 1.4.1*. The scoping comment letters/emails are available for review at the Tillamook Resource Area Office, 4610 Third Street, Tillamook, Oregon. Internal scoping was conducted by the Interdisciplinary Team (IDT) through record searches, field reviews and the project planning process.

1.4.1 Scoping Comments and BLM Responses

Project Record Document 13
Jacob Groves
American Forest Resource Council

BLM Summary of Comments:

AFRC supports using temporary roads for access to harvest units and does not support decommissioning of any permanent roads. They support mechanical harvesting on ground-based treatment areas and regeneration harvest, and are concerned about the effects of seasonal restrictions on the economic viability of BLM timber sales. AFRC is concerned about thinning treatments that produce low volumes per acre, they support thinning in Riparian Reserves and would like to see flexibility in fuels treatment prescriptions.

BLM Response:

In general, the Proposed Action is consistent with AFRCs recommendations, with the exception of regeneration harvest (see *EA section 2.5*), decommissioning of permanent roads, and fuels treatment prescriptions. While not explicitly stated, the Proposed Action does allow for mechanical harvesting in ground-based yarding areas. A detailed description of the proposed project can be found in *EA sections 2.4.1* and *2.4.2*.

Project Record Document 11
Doug Heiken

Oregon Wild and Cascadia Wildlands

BLM Summary of Comments:

Oregon Wild and Cascadia Wildlands (OW/CW) expressed opposition to regeneration harvest, which was originally included in the project but has subsequently been dropped (see *EA section 2.5*). They also expressed concern about large snags and how they are affected by thinning, management objectives in the Matrix LUA, spotted owls and carbon storage.

BLM Response:

Snags are addressed in *EA sections 3.1 and 3.6*, and spotted owls are addressed in *section 3.6*. Carbon storage is addressed in *EA section 3.12*. The Salem ROD/RMP made the decision to allocate these lands to the Matrix LUA and identified management objectives and management direction for them. This project is consistent with those objectives and direction.

Project Record Document 12
Noah Greenwald
Center for Biological Diversity

BLM Summary of Comments:

This email was a copy of the above referenced Oregon Wild and Cascadia Wildlands email with the additional comment that the project area could be a refuge for dusky tree voles.

BLM Response:
Section 3.3 in the EA describes the affected environment and environmental effects for wildlife, including Survey and Manage and ESA-listed species, in this project.

1.5 Decisions to be Made

The following decisions will be made through this analysis:

- To determine if a Supplemental Environmental Impact Statement (SEIS) should be prepared based on whether the proposed action would result in significant impacts to the human environment not already analyzed in the EIS prepared for the Salem District RMP and its amendments.

- If there are any such additional impacts that are significant, we will determine whether the project proposals could be modified to mitigate the impacts so an SEIS would not be necessary. If we determine there is no need to prepare an SEIS, we will document this determination in a Finding of No Significant Impacts (FONSI).

- To determine at what level, where, and how to harvest trees on BLM-administered lands allocated to the programmed timber harvest base within the project area.

2.0 ALTERNATIVES

2.1 Alternative Development

Pursuant to Section 102 (2) (E) of the National Environmental Policy Act (NEPA) of 1969, as amended, Federal agencies shall "…study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." There were no unresolved conflicts concerning alternative uses of available resources, therefore, this EA will analyze the effects of the current "proposed action" and "No Action alternative" (which provides the baseline to evaluate effects).

2.2 Planning and Implementation Process

The BLM would require the timber sale operator to accomplish the following actions as required in the timber sale contracts written by the BLM. The BLM would develop the timber sale contracts to implement the actions described below and the project design features (PDF) that follow (*EA section 2.4.2*). These actions and the PDF, taken together, form the best management practices (BMP) that the IDT developed based on the principles of the BMP described in Appendix G of the RMP/FEIS and Appendix C of the RMP which the IDT adapted to the site specific conditions of the proposed Gunners Lakes Project.

2.3 Alternative 1: No Action

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 the proposed project. Consideration of this alternative also answers the question: "What would it mean for the objectives to not be achieved?" The No Action alternative means that no timber management actions or connected actions would occur at this time. If this alternative were to be selected, the following items would not be done in the project area at this time: silviculture treatments; timber harvest; road construction, renovation, maintenance or decommissioning; and stream crossing projects such as culvert upgrades or removal.

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 lands within the project area.

On private lands adjacent to the project area, forest management and related activities would continue to occur. Selection of the No Action alternative would not constitute a decision to change the land use allocations of these lands. Selection of the No Action alternative would not set a precedent for consideration of future action proposals.

2.4 Alternative 2: The Proposed Action

2.4.1 Proposed Treatments

In the General Forest Management Area LUA

The proposed action in the GFMA land use allocation is to apply commercial thinning on approximately 67 acres in T. 4 N., R. 3 W. sections 7 and 9 (Table 2).

Commercial thinning would be applied in stands of approximately 73 years of age. Stands selected for thinning are overstocked and thinning is needed to maintain good diameter growth rates, live crown ratios and stand stability. The thinning would be designed to maintain good volume productivity of the stand as well as reducing potential losses from *Phellinus weirii* root rot. Curtis relative density[2] after thinning would range from 36 to 40, with a weighted average of 39.

In the Connectivity/Diversity Blocks LUA

The proposed action in the CON land use allocation is to apply commercial thinning on approximately 224 acres in T. 4 N., R. 3 W. sections 21 and 29 (Table 2).

Commercial thinning would be applied in stands of approximately 60 to 70 years of age. Stands selected for this treatment are well-stocked stands where thinning is needed to promote development of late-successional forest structure. Stands would be variably thinned to encourage rapid development of vertical and horizontal diversity while continuing to manage the bulk of the acres as even-aged stands with substantial overstories. Curtis Relative Density (RD) after thinning would range from 32 to 38, with a weighted average of 34.

In the Riparian Reserve LUA

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

The proposed action in the RR is to apply commercial thinning on approximately 217 acres in conjunction with treatment areas proposed for the GFMA and CON land use allocations (Table 2). The thinning prescription in the RR would be the same as the adjacent land use allocation.

The RR encompasses two site-potential tree heights (480 feet) on either side of fish-bearing streams and one site-potential tree height (240 feet) on permanent non-fish bearing streams and seasonally flowing or intermittent streams. The objective of thinning in the RR is to speed the development of large trees that will provide a future source of large woody debris to stream channels. Commercial thinning proposed for both the GFMA and CON would meet this objective and as such, treatment would not be differentiated except where noted in the design features.

Table 2: Land Use Allocations and Logging Systems for Proposed Harvest Units.

Unit Number	*GFMA Treatment (acres)*	*Connectivity Treatment (acres)*	*Riparian Reserve Treatment Acres*	*TOTAL UNIT ACRES*	*Logging Systems (acres)*	
					Ground-based	*Skyline*
7-5	38	0	30	68	61	7
9-4	25	0	27	52	52	0
9-10	4	0	1	5	5	0
21-7	0	26	1	27	27	0
29-2	0	114	91	205	168	37
29-3	0	36	62	98	90	8
29-4	0	7	0	7	7	0
29-7	0	41	5	46	46	0
Total	**67**	**224**	**217**	**508**	**456**	**52**

Connected Actions

Road Construction: Approximately 1.3 miles (6,945 feet) of new road construction would occur. All new roads would be natural-surface (no rock would be added). New roads and landings would be decommissioned and blocked following timber harvest and site preparation activities. Treatment area accessed by new road construction is shown in Table 3.

Table 3: New Road Construction: Estimated Acres Accessed by Each Newly Constructed Road Segment.

Road Number	*Surface Type*	*Approximate Length (feet)*	*Approximate Area Accessed (acres)*
9-1	Natural	660	10
7-1	Natural	1,005	19
7-3	Natural	545	7
29-1	Natural	805	6
29-2	Natural	1,090	14
29-3	Natural	1,015	4
29-4	Natural	410	5
29-5	Natural	1,415	5
Total		**6,945 feet**	**70 acres**

Road Renovation: Approximately 2.0 miles of existing roads would be renovated as necessary to accommodate log hauling during the dry season. This would include brushing, blading, drainage structure improvement or replacement, and spot rocking at deficient locations. Most of the roads to be renovated (1.6 mi.) are natural-surface and they would remain natural-surface following renovation. All natural-surface renovated roads would be decommissioned and blocked following timber harvest and site preparation activities.

Road Maintenance and Improvement: Approximately 14 miles of BLM-controlled roads would have maintenance or improvement performed prior to log hauling. All the roads to be maintained are gravel-surfaced. Maintenance and improvement would consist of 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 cross drains and undersized culverts; and adding rock to replace depleted rock surfaces.

Road Decommissioning: In addition to the new road construction and renovated roads, another 0.3 miles of existing road would be decommissioned. Decommissioning would consist of removing two stream-crossing culverts, decompacting, water barring, seeding or planting with native species, and restricting OHV use. Restricting OHV use may include the strategic placement of boulders, logs, root wads, or other types of earthen barriers.

Fuels Treatments: Fuel treatment strategies would be implemented on portions of the project areas to reduce both the intensity and severity of potential wildfires in the long term (after fuels reduction has occurred) and for site preparation in *Phellinus weirii* pockets. Post-harvest fuels hazard surveys would be conducted and site-specific treatments would be

recommended. A variety of fuels prescriptions may be implemented including slashing, lopping and scattering of slash, pullback of slash, hand or machine piling and burning, landing piling and burning, or selling the material as firewood. These treatments may occur along roads or property lines, on landings, within *Phellinus weirii* pockets, or other areas within the harvest units such as heavily thinned "gap" areas or variable density thinning areas where the fuel load is determined to be hazardous, or where underplanting of trees is recommended. Table 4 shows the approximate number of acres, or the approximate number of piles that would be treated.

Table 4: Proposed Fuel Treatments

Unit Number	Unit Acres	Site Preparation Slashing Acres	Hand Pile Total	Machine Pile Total	Landing Pile Total	Slash Pullback Acres
7-5	68	10	50	3	6	2
9-4	52	8	40	2	3	2
9-10	5	1	5	1	1	1
21-7	27	4	20	1	2	0
29-2	205	31	155	4	8	3
29-3	98	15	75	2	3	2
29-4	7	1	5	1	1	1
29-7	46	7	35	1	1	1
Total	**508**	**77**	**385**	**15**	**25**	**12**

2.4.2 Project Design Features

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

The design features are organized below by Land Use Allocation and benefiting resource.

Design Features Common to All Land Use Allocations

Desirable Stand Features, Diversity, and Protection

- Generally thinning would be from below, favoring the largest, healthiest trees to leave. This would be modified to leave trees with significant damage such as cavities, broken tops, etc. Leaving "the best tree" would also be modified to ensure species other than Douglas-fir are left in stands that are predominantly Douglas-fir. Generally hardwoods (red alder and bigleaf maple) would be harvested except around small *Phellinus weirii* root disease centers.

- When small *Phellinus weirii* root disease centers are encountered outside of designated *Phellinus weirii* treatment areas, more disease-tolerant trees (western redcedar, western hemlock, and hardwoods) would be left, even if they are smaller in diameter than the Douglas-fir. If there are only Douglas-fir or grand fir trees, remove Douglas-fir and grand fir within 30 feet of symptomatic live trees, or infected stumps, stubs, or dead-standing trees or the edge of the brushy openings associated with disease centers.
- Designated *Phellinus weirii* root disease centers, "openings", and "heavily thinned patches" would be planted with indigenous tree species. *Phellinus* areas would be planted with disease-resistant tree species, primarily western redcedar or red alder. Areas with seasonally high groundwater would be planted with tree species adapted to the site such as western hemlock, western redcedar, or alder.
- Site preparation in designated *Phellinus weirii* root disease centers, "openings", and "heavily thinned patches" would include brush cutting and treatment of logging slash to the extent needed to plant the areas.
- Survival and growth of planted seedlings would be promoted by protecting them, as appropriate, with tubes and manual (usually chainsaw) brush release.
- Two reserve trees per acre would be felled and left as CWD. Trees should be at least 20 inches dbh. If in some areas trees of sufficient size are not available then trees at least 16 inches dbh would be left.
- During harvest, all coarse woody debris would be retained and protected to the extent practicable. Snags greater than 20 inches dbh would be protected by reserving a double rank of green trees around them unless they occur in a root rot pocket and directly conflict with other silvicultural prescription criteria. Where necessary for safety or operational reasons, snags may be felled, but must be left on site.
- Log lengths would be limited to 40 feet plus trim.

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

- In commercial thinning treatment units, felling and yarding operations would be restricted during the peak bark-slip period (generally April 1 to June 30).

<u>Water, Fisheries and Soil Resources</u>

- To protect water quality, trees would be felled away from all no-harvest buffers within the harvest area. If a cut tree falls into a no-harvest buffer, the portion of the tree within the buffer would remain in place.

Seasonal Restrictions (See Table 5 for a summary of seasonal restrictions)

- All yarding, whether ground-based or cable, would be restricted to periods of low soil moisture, generally June 1 through October 15. This could be adjusted if unseasonable conditions occur (e.g., an extended dry or wet season). In areas within sections 7 and 29 that have seasonally high groundwater, the low soil moisture period is usually July 1 through October 15.
- Hauling on all BLM-controlled roads would be restricted to the dry season.
- Hauling and maintenance activities would be suspended when conditions exist that may generate excessive turbidity or sediment inputs, such as intense or prolonged rainfall, or from excessive use.
- The BLM would maintain authority to suspend hauling or maintenance activities that may

affect ESA- listed fish or designated critical habitat.

- All road decommissioning, construction, maintenance and renovation would occur during the dry season (generally June 1 through October 15). All work required in live streams (culvert replacement or removal) would be limited to the ODFW in-stream work window (July 1 to August 31).

Yarding

- Ground-based yarding would generally be limited to slopes less than 35%. Ground-based equipment would be restricted to tracked equipment only.
- Designated skid trails would be used to limit the extent of skid trails and landings to less than 10% of each harvest unit. Skid trail and landing cutting limits would be kept to the narrowest width and size necessary to reasonably harvest the unit (for analysis purposes, assume 12-foot-wide skid trails spaced on average 150 feet apart and a 50-foot diameter impact area for landings). Existing skid trails and landings would be used to the extent possible.
- Some existing skid trails in section 29 may be decompacted during or after logging operations to reduce the extent of compacted soils in that treatment area to 10% or less.
- Yarding logs or construction of skid trails through depressions with very moist, poorly drained soils would be avoided where practical. These areas may or may not be identified on the ground prior to logging operations.
- The purchaser may elect to use mechanized, cut-to-length systems provided that the following measures are met:
  - Harvesters, feller-bunchers, and or log processors would be boom-mounted with a minimum operating radius of 20 feet. The equipment would have a ground pressure rating of 8 psi (pounds per square inch) or less. Log harvesting equipment trails would be spaced 40 to 50 feet apart and be no more than 15 feet in width. No more than two passes over the same ground would be permitted.
  - Forwarding or skidding equipment would be restricted to designated trails approved by BLM prior to felling and yarding operations.
  - Harvesters would be required to place slash in front of the machine tracks in order to reduce compaction. Forwarders or skidders would operate on a nearly continuous layer of slash that is at least 6 inches thick.
- Where skyline yarding corridors are needed across stream channels, full log suspension would be required within the no-harvest buffers. At least one-end suspension of logs would be required in all other cable and ground-based logging areas.
- Skyline corridors would generally not exceed 12 feet in width and would be located at least 150 feet apart at one end.
- Riparian no-harvest buffers may have yarding corridors cut through them if necessary, however any trees cut within the no-harvest buffers would be left on site to minimize ground disturbance.
- In the ground-based yarding areas within Riparian Reserves, equipment would be restricted to existing skid trails or roads, unless a mechanized cut-to-length system with the restrictions described above is used.
- Skyline yarding would be restricted in Riparian Reserves to corridors that are as perpendicular to streams as possible.

Road, Skid Trail and Landing Construction, Reconstruction and Decommissioning

- New roads and skid trails would generally be located outside of Riparian Reserves.
- All new road construction would avoid wetlands and where practical avoid depressions with very moist, poorly drained soils.
- Natural-surface roads would be winterized at the end of each operating season by water barring and blocking the roads to vehicle traffic.
- The number of landings and their size would be kept to the minimum required to reasonably harvest the units. Landings would be located by the purchaser and approved by the BLM.
- In general, landings would not be located within 240 feet of streams.
- All of the natural-surfaced roads and landings used during the harvesting activities would be decommissioned. Decommissioning would consist of removing culverts, de-compacting, water barring, seeding or planting with native species, and restricting OHV use. Restricting OHV use may include the strategic placement of boulders, logs, root wads, or other types of earthen barriers.
- Large stumps created by road building or yarding activities would be retained and stockpiled to be used later to block skid trails and roads in areas that could easily be accessed by OHVs.

Survey and Manage and Special Status Species

- No potentially suitable murrelet or northern spotted owl nest trees would be felled and where possible, no openings greater than ¼ acre would be created within one site-potential tree height surrounding a potential murrelet nest tree.
- Any newly discovered marbled murrelet sites (as per the Pacific Seabird Group Marbled Murrelet Technical Committee protocol) would be protected by a 0.5-mile radius buffer on all contiguous existing and recruitment federal habitat.

Invasive / Non-Native Plants

- Prior to entering the sale area each work season, or before returning to the watershed after leaving it, any heavy machinery (with the exception of log trucks and pickup trucks used for daily personnel travel) would have all dirt and adhering vegetation removed by power-washing.
- Post-treatment ground disturbance (i.e. yarding corridors', decommissioned roads, landing margins, etc), will be evaluated to determine the need to seed or plant native vegetation to mitigate invasive/non-native plant introduction.

Cultural Resources

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

Recreation and Access

- To ensure public safety and integrity of the hiking trail near Scaponia Park in section 7, it will be closed during logging operations and will be cleared of all logging debris after logging operations have been completed.

Air Quality, Fire Risk, and Fuels Management

- Prescribed broadcast burning, swamper burning, hand/mechanical pile construction and burning, and landing pile construction and burning may be used individually or in combination in areas where fuel loading is heavy or the fire risk is determined to be high.
- Burning would be conducted in accordance with the *Oregon State Implementation Plan* and *Oregon Smoke Management Plan* and would comply with the provisions of the Clean Air Act. It would be conducted under good atmospheric mixing conditions to lessen the impact on air quality in Smoke Sensitive Receptor Areas.
- Swamper burning piles or hand/mechanical piles would be located at least 20 feet from green trees and snags, where possible, to minimize damage, or on top of Bigleaf maple stumps to help prevent resprouting.
- Landing piles would be located as far as possible from reserved trees to minimize damage.
- Lopping and scattering of fuels would be incorporated in areas where fuel loading is relatively heavy but not heavy enough to warrant burning.
- Pullback of fuels would be incorporated in areas where fuel loading is relatively light (especially along roads and property lines) and not heavy enough to warrant burning.

Design Features Specific to CON Land Use Allocation

- Treatment would result in up to 15% of each harvest unit being in "openings" and "heavily thinned patches". Openings are defined as areas generally equal to or greater than one half (1/2) acre and less than one (1) acre in size where all the trees would be cut. The only exception to these opening sizes would occur in two openings located in Unit 29-7. These patches are relatively pure alder and harvesting them would result in openings of about 3 acres and 2 acres respectively. Both of these areas are outside of the Riparian Reserve. Heavily thinned patches are defined as areas equal to or greater than one (1) acre and equal to or less than five (5) acres that would thinned to an average of 30 trees per acre. Openings and heavily thinned patches would not be located within 240 feet of streams. Location of these areas would be designated by BLM personnel prior to marking the unit. The purpose of these treatments is to encourage the rapid development of vertical and diversity as well as lessening the spread of *Phellinus weirii*.
- Within the heavily thinned patches, as much as possible, reserve trees would be distributed as clumps (approximately 70%) and scattered individual trees (approximately 30%). An effort would be made to clump reserve trees around existing high quality snags and/or down coarse wood.
- Priorities for locating patches are:
- *Phellinus weirii* centers (see discussion of *Phellinus* treatment centers).
- Areas of dwarf western hemlock mistletoe (*Arceuthobium tsugense*) infestation
- Red alder clumps.

- Areas of densely-stocked conifer with small crowns and high height-to-diameter ratios (patches less than one acre).
- Areas of lower conifer stocking where trees have large, well-developed crowns.
- The openings and heavily thinned patches would be planted with a mixture of conifers, including *Phellinus weirii* resistant conifers, or in the case of western hemlock dwarf mistletoe, species other than hemlock.
- If western hemlock trees that are infected with dwarf mistletoe are retained in the larger patches, do not leave infested trees closer than 50 feet from the edge of the patch. Leaving infested trees can be beneficial to certain wildlife species.
- Outside of openings and heavily thinned patches, areas prescribed for thinning would generally be thinned to a relative density (Curtis) of about 34. Thinning would be from below and generally reserve the largest, healthiest trees, modified to retain trees with significant damage, to preserve species diversity and to lessen the spread of *Phellinus weirii*.

Design Features Specific to GFMA Land Use Allocation

- Large (one to five acres) *Phellinus weirii* disease centers would be designated by BLM personnel prior to the marking of the treatment areas. The boundaries of these designated areas would extend 30 feet beyond the apparent edge of the *Phellinus* infestation. Inside the designated areas, all trees (other than western redcedar or hardwoods) within 30 feet of the designated boundary would be harvested. Beyond this thirty foot-wide boundary, the trees would be thinned to 20 trees per acre. As much as possible, the reserve trees would be distributed as clumps (approximately 70%) and scattered individual trees (approximately 30%). A maximum of 19 acres of this heavy thinning treatment would be implemented. For the resulting open patches, a mixture of shade-tolerant western hemlock) and *P. weirii* disease resistant conifers (western redcedar) would be planted.
- The designated *Phellinus weirii* treatment areas would not be located within 240 feet of streams.
- Areas prescribed for thinning would generally be thinned to a relative density (Curtis) of about 39. Thinning would be from below and generally reserve the largest, healthiest trees, but modified to lessen the spread of *Phellinus weirii*.

Design Features Specific to RR Land Use Allocation

Water, Fisheries and Soil Resources

- Maintain a minimum 100 foot no-harvest buffer on either side of fish-bearing streams and perennial non-fish bearing streams.
- Maintain a minimum 100 foot no-harvest buffer on the outer edge of ponds, and wetlands larger than one acre.
- Maintain a minimum one tree wide no-harvest buffer on the outer edge of wetlands less than one acre. This requirement may be achieved by leaving reserve trees along the edge of the wetlands; excluding these areas from the treatment units would not be required.
- Maintain a minimum 60 foot no-harvest buffer on either side of intermittent non-fish bearing streams.

Coarse Woody Debris (Snags and Down Wood)

- Retain green trees that have significant defect such as cavities or dead, forked or broken tops.

Table 5: Seasonal Restrictions Incorporated into the Gunners Lakes Project

***Restricted Times are Shaded**

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

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

2.5 Alternatives Considered But Not Analyzed In Detail

- **Additional treatment areas and regeneration harvest in GFMA and CON:** The IDT considered an alternative that included an additional 360 acres of treatment area, some of which was located in T4N R3W sections 17 (GFMA) and 19 (CON), which are not included in the Proposed Action. This alternative was developed to be consistent with the management direction in the RMP, which addresses the need to manage stands to reduce the risk of loss from disease. Regeneration harvest was considered to be the only appropriate harvest treatment of these stands because of the high levels of laminated root rot present in the stands, and the low levels of stocking and relative densities that result from the widespread root rot. This alternative was dropped from further consideration based on direction from BLM management to limit timber harvest treatments to commercial thinning for this project.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

This section of the EA describes the current condition and trend of the affected resources and the environmental effects of the alternatives on those resources. The interdisciplinary team of resource specialists (IDT) reviewed the elements of the human environment, required by law, regulation, Executive Order and policy, 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 3.13), as well as the issues raised in scoping (EA *section 1.4.1*).

The resources potentially affected by the proposed thinning activities are described in the following sections: Vegetation and Forest Stand Characteristics, Hydrology, Fisheries and Aquatic Habitat, Soils, Wildlife, Air Quality and Fire Hazard/Risk, Carbon Storage, Carbon Emissions, and Climate Change, and Recreation, Visual Resources and Rural Interface.

3.1 Vegetation and Forest Stand Characteristics

3.1.1 Affected Environment

The proposed project area lies within the East Fork Nehalem Watershed Analysis Area (USDOI Bureau of Land Management 1996). According to the East Fork Nehalem Watershed Analysis, as of 1996, about 9% of the BLM lands within the watershed were in early-seral habitat; 70% in early- to mid-seral habitat, consisting of immature to mature conifer stands ranging in age from 35 to 75 years; 2% of the stands were composed of conifer more than 76 years old and 19% of the stands were classified as hardwood or mixed conifer/hardwood stands generally 66 to 46 years of age. Since 1996 the only harvest activity within the proposed project area has been 12 acres of regeneration harvest (Section 29), 25 acres of commercial thinning (Section 29) and salvage of scattered blow-down and hazard trees (Sections 7 and 21).

Units planned for thinning range in age from about 57 to 73 years, the weighted average age is 69 years. They are essentially single-storied stands; Douglas-fir-dominated ($\geq$50% by basal area) with the exception of Unit 29-4 (see Table 6). The portions of stands proposed for thinning are currently overstocked as indicated by Curtis Relative Densities above 55 (the approximate density level where competition-related mortality in Douglas-fir stands begins). Thinning these stands would be appropriate to maintain stand growth, increase tree vigor, increase average tree size, and capture mortality that would have occurred as a result of increasing tree-to-tree competition. Scattered pockets of *Phellinus weirii* root rot occur throughout these units, with infection levels estimated at less than 15%.

Table 6: Current Stand Parameters

Unit	Year of origin	Site Index [1]	Trees/Ac. ≥7 in. dbh	Basal Area (ft.^{2})	Quadratic Mean Diameter (QMD) (in.)	Curtis RD	Ave. Ht (ft)	Crown Cover %	Species composition by Basal Area [2]
7-5	1938	132	191	244	15.3	62	138	86	DF(95%), BLM(3%), WRC(2%)
9-4	1936	138	167	302	18.2	71	144	78	DF(94%), BLM(4%), RA(1%), WRC (1%)
9-10	1936	140	121	264	20.0	59	143	78	DF (97%), WRC (3%)
21-7	1939	143	97	248	21.7	53	152	76	DF(91%), WRC(8%), RA(1%),
29-2	1940	118	237	258	14.1	69	118	86	DF(79%), WH(15%), WRC(4%), RA(2%)
29-3	1939	119	173	222	15.4	57	124	81	DF(85%), WH(14%), WRC(1%)
29-4	1942	105	300	295	13.4	81	106	92	DF(45%), WH(41%), WRC(12%), RA(2%)
29-7	1952	124	258	250	13.3	68	104	87	DF(55%), WH(19%), RA(15%), WRC(11%),

[1]DF King (1966), unless noted:
[2]DF= Douglas-fir, WH = western hemlock, RA=red alder, BLM= bigleaf maple, WRC=western redcedar, GF= grand fir

The most abundant understory species are sword fern, Oregon grape, salal and vine maple. Understory density varies inversely with the amount of overstory canopy closure. The understory is often well developed where openings occur. Openings related to *Phellinus weirii* are typically dominated by vine maple. Where the overstory canopy consists of a dense mixture of shade-tolerant and shade-intolerant conifers, such as in Unit 29-4, the understory is rather sparse.

Coarse woody debris levels (includes both down wood and snags) are shown in Table 7. The down wood data on the table is for pieces that meet the minimum dimensions of 20 inches diameter on the large end diameter and 20 ft. long. The column for linear feet of down wood in decay classes I & II relates to ROD guidelines for down wood. As shown on the table, most of the down wood in Sections 7 and 9 is recent (decay classes I & II). For the most part, this down wood is associated with *Phellinus weirii* infected trees that have blown over. The logs in Section 29 tend to be older and are associated with the extensive logging

that took part in that section. Very few snags meet the standard of being equal to or greater than 20 inches at dbh, and equal to or greater than 50 feet tall as well as being in decay classes I or II. Given the average diameter of the stands, it is unlikely any snags meeting these dimensions would be the result of inter-tree competition. In several stands the snag QMD's are actually larger than the live tree QMD's. These larger snags are generally old snags from the previous stand or the result of infection with *Phellinus weirii* root disease. The fact that few snags meet the standard is also reflective of the fact that trees infected with *Phellinus weirii* rarely remain standing for long.

Table 7: Coarse Woody Debris data

Unit	Total Down wood linear ft./ac.	Decay Class I & II Down wood linear ft./ac.**	Snags/Ac.	Snag QMD (in.)	Ave. Snag Ht. (ft.)	Snags/ac. ≥20 in. dbh, ≥50 ft. tall in Decay Classes I & II
7-5	180	113.0	2.7	16.4	33	0
9-4	169	131.0	3.2	14.6	98	1
9-10	207	207.0	0	0	0	0
21-7	49	13.0	6.2	15.8	44	0
29-2*	208	40.0	5.5	23.9	37	0.2
29-3	166	32.0	8	19.8	46	0
29-4	148	0.0	0	0	0	0
29-7	87	0.0	0	0	0	0

**All Down wood min. dimensions: 20 inch large end diameter and 20 ft. long
*snags includes 0.4 RA/ac. all other snags on the table are conifers

Forest health: The major agent affecting stand health is laminated root rot, caused by the native fungus *Phellinus weirii*. It is estimated that in the units planned for commercial thinning, the percentage of the area in disease centers is less than 15%. The disease is continuing to cause mortality of the Douglas-fir component. The actual levels of infection, however, may actually be higher because it is not possible to detect all of the infection with on-the-ground survey techniques.

Douglas-fir and grand fir are highly susceptible to *Phellinus weirii*, (readily infected and killed by it); western hemlock is intermediately susceptible; western redcedar is tolerant or resistant; and all hardwoods are immune (Hadfield et al. 1986). *Phellinus weirii* kills trees directly or makes them prone to windthrow because the disease decays their root systems. Diseased stands usually contain twice as many infected trees as those that are dead or exhibiting crown symptoms (Thies 1984). Tree-to-tree spread is through root contacts with infected trees or stumps (Hadfield et al. 1986). Disease centers are believed to expand radially at the rate of about one foot per year (Nelson and Hartman 1975). *Phellinus weirii* attacks susceptible hosts regardless of tree size, age, or vigor.

Disease centers in the project area range in size from one blown down tree to several acres in size. Tree killing creates openings in the canopy where shrubs, hardwoods, or shade- and disease-tolerant conifer species occupy these various-sized gaps. Because infected trees are windthrown or die standing, the disease is a major source of coarse woody debris and snags.

There are few other significant potential threats to forest health other than the risk of windthrow from severe winter storms, or to some extent, wildfire. Following thinning, the potential for windthrow would be greater for the next decade (generally the first few years following thinning).

3.1.2 **Environmental Effects Alternative 1: No Action**

Under this alternative, thinning would not take place at this time. Forested stands within the project area would continue to grow and develop without management intervention. See Table 8 for predicted unit conditions after 25 years. The identified effects of Alternative 2 would not occur at this time. In the absence of thinning or some other form of canopy disturbance, projections are for the density levels of the stands to increase to fairly high levels over the next 25 years. As the level of competition among the trees remains high, crown development (live crown ratio, crown expansion, and branch growth) will decrease, diameter growth rate can be expected to decline, and competition-related mortality will increase, resulting in coarse wood additions from the smaller-diameter trees that slowly die from suppression. Expanding *Phellinus weirii* centers are also expected to provide inputs of coarse woody debris of varying dimensions. Trees are expected to become less stable as height/diameter ratios increase, and therefore, more likely to experience windthrow or break off in severe winter storms. A declining trend in the red alder component can be expected in the future as they enter senescence.

Table 8: Estimated unit conditions 25 years after implementing Alternative 1: No Action as projected by ORGANON (Hann et al. 2006).

Unit	LUA	Trees/Ac.	BA (sq. ft.)	QMD (in.)	Curtis RD
7-5	GFMA	131	298	20.4	66
9-4	GFMA	119	339	22.8	71
9-10	GFMA	86	337	26.9	65
21-7	CON	93	320	25.2	64
29-2	CON	188	325	17.8	77
29-3	CON	161	311	18.8	72
29-4	CON	231	346	16.6	84
29-7	CON	193	316	17.3	75

In addition, it is expected development toward late-successional forest conditions in the Riparian Reserves and the CON would continue to slow. This trend could be altered by natural disturbances that create openings in the stand, permitting accelerated growth of some overstory trees and providing an opportunity for understory trees, shrubs, and herbs to develop. Competitive mortality will continue to contribute small snags and will occur at a relatively even spatial distribution, maintaining stand uniformity. In most cases it appears that *Phellinus*-related openings centers become shrub-dominated openings containing short-term snags and down logs, however, it is expected that some of these openings will become occupied by western hemlock or western redcedar.

3.1.3 **Environmental Effects Alternative 2: The Proposed Action**

Table 9 displays the predicted harvest unit conditions immediately after harvest. The various unit parameters presented in the table represent the prescriptions for thinning outside of the designated openings, heavily thinned patches and designated *Phellinus* patches. The stands are recommended to be thinned from below (retention of the larger-sized trees) modified to favor conifer species other than Douglas-fir and to retain trees with significant damage. Emphasis on retaining species other than Douglas-fir will increase the relative diversity of species, maintain a seed source for understory trees and improve the general resiliency of the stands to insects, disease and other disturbances. Because of the large numbers of Douglas-fir in the stands now, it is expected that it would remain the major species. Leaving trees with significant damage such as cavities, broken tops, etc. will conserve trees useful to wildlife. Implementing guidelines for treating *Phellinus weirii* root rot pockets, including the planting of large openings with seedling immune or resistant to the disease, will result in a reduced spread of the disease and further contribute to species diversity.

Table 9: Estimated conditions outside of openings, heavily thinned patches and designated *Phellinus* patches, immediately following harvest as projected by ORGANON (Hann et al. 2006).

Unit	LUA	Harvest Acres	Trees/Ac.	BA (sq. ft.)	QMD (in.)	Curtis RD	Est. Canopy Cover
7-5	GFMA	69	76	175	20.5	39	63%
9-4	GFMA	52	68	190	22.7	40	65%
9-10	GFMA	5	54	180	24.7	36	65%
21-7	CON	28	62	180	23.1	38	62%
29-2	CON	202	85	140	17.4	33	62%
29-3	CON	99	80	160	19.1	36	65%
29-4	CON	7	85	160	18.5	37	70%
29-7	CON	44	72	140	18.9	32	63%

Thinning is expected to remove most of the smaller-sized trees that would have likely died from suppression. However, approximately 54% of the Forest Operations Inventory Units acreage considered for harvest in these three sections would be left untreated because of logging difficulties, poor stocking, slope stability, and stream buffers. Leaving variable-sized areas unthinned will provide places where mortality will continue at current rates. Within the harvest units, coarse wood would be expected to increase due to windthrow, damage and breakage during felling, and the requirement to leave at least two reserve trees per acre from those cut for operational purposes.

See Table 10 for predicted unit parameters 25 years after implementing Alternative 2.

Table 10: Estimated unit conditions outside of heavily thinned patches, 25 years after implementing Alternative 2 as projected by ORGANON (Hann et al. 2006).

Unit	Trees/Ac.	BA (sq. ft.)	QMD (in.)	Curtis RD
7-5	72	245	25.0	49
9-2	43	286	34.9	48
9-4	64	265	27.7	50
9-10	53	275	30.9	49
21-7	60	256	27.9	48
29-2	83	218	22	46
29-3	78	241	23.8	49
29-4	84	229	22.3	49
29-7	70	219	23.9	45
29-11	68	192	22.7	40

Connectivity/Diversity LUA:
The expected short-term effects (0-25 years) of the proposed thinning include:

- Increased diameter growth rates and crown development to lessen the time it takes to develop the large trees, snags and logs characteristic of late-successional forests.
- On average, the recommended thinning treatments are expected to remove 61% of the trees per acre and 40% of the basal area. The resultant weighted average Curtis RD is estimated to be 34. Including the heavily thinned patches, the weighted average Curtis RD is expected to be 32
- The initiation of an understory canopy layer both through planting the created patches and natural regeneration occurring throughout the proposed harvest units. In section 29, a substantial amount of western hemlock and western redcedar would be expected to seed-in under the residual trees.
- Increased horizontal diversity by creating openings and heavily thinned gaps planted with

Phellinus-resistant and shade-tolerant conifers.

It is expected that most of the units will require at least one more entry before age 110 years in order to place an emphasis on the development of horizontal and vertical diversity, maintaining live crown ratios and diameter growth, as well as to create some CWD within the units.

General Forest Management Area LUA:
The expected short-term effects (0-25 years) of the proposed thinning include:

- The stands would be thinned from below to a stocking level that will increase tree growth and maintain full site occupancy.
- The recommended levels of thinning should increase overstory tree diameter growth, increase crown development (increase crown length, crown width, and branch size), promote stand stability because of reduced height:diameter ratios, reduce competition-related mortality (decreased production of smaller-sized snags), and result in a greater level of understory development than would occur without thinning.
- On average, the recommended thinning treatments are expected to remove 60% of the trees per acre and 32% of the basal area. The resultant weighted average Curtis RD is estimated to be 39.

Riparian Reserve LUA:
Effects of treatment in Riparian Reserves would be similar to adjacent portions of units that fall within the GFMA or CON. In either situation, reserve trees would respond to the thinning by increased tree diameter growth and increased crown development. Treatment would also result in a greater level of understory development than would occur without thinning. The only significant difference would be that designated *Phellinus weirii* disease centers, openings and heavily thinned patches would not be located within 240 feet of streams.

3.2 Hydrology

The main water resource concern and focus of this analysis is the potential for 1) increases in stream flows, 2) alterations in channel morphologies, and 3) increases in sediment supply and turbidity. The potential water resources effects will be analyzed at the site-scale and at the subwatershed scale for stream flows, at the site-scale for channel morphology, and at the site-scale and the project drainage area for sediment delivery.

The proposed action is not expected to substantially affect other water quality parameters including, chemical contamination, nutrients, bacteria, and dissolved oxygen. Therefore, these water quality parameters were not reviewed for this analysis.

Water temperature would not be affected because the proposed treatment would be a thinning, all streams would have no-cut buffers on them, and perennial streams would have no-cut buffers of at least 100 feet. Riparian buffers of 100 feet or more have been reported to

provide as much shade as undisturbed late successional/old-growth forests (Beschta et al., 1987). In a recent study in Maine, researchers found that streams in clearcut units with 75 feet (23 meters) partial-harvest treatment (60% canopy closure of each side of stream) riparian buffers showed no detectable changes in stream temperatures following harvest (Willerson et al, 2006). For this reason, water temperature is not analyzed for this proposed project.

3.2.1 **Affected Environment**

Physical Setting

The Gunners Lakes drainage area lies in the southern portion of the EFNR 6th-field subwatershed. The subwatershed is approximately 20,590 acres. It is neither a municipal nor a "Key" watershed as defined in the Northwest Forest Plan.

The project area has a mild maritime climate characterized by cool, wet winters and warm, dry summers. Rain is the primary hydrologic flow generating process. Precipitation averages about 60 inches annually. Most of it falls as rain during long-duration low-intensity storm events between November and April. Many years no measurable snowfall occurs. Fog drip is minimal and snow accumulation is rare. The highest elevation within the proposed harvest units is about 1,850 feet, well below the rain-on-snow zone (~2,000 to 3,000 feet in elevation). Consequently, the project area is considered to be at low risk for peak stream flow events based on rain rapidly melting a snowpack. The mean 2-year precipitation event is low for coastal watersheds, at approximately 2.5 inches in a 24-hour period.

Industrial and private forestry is the predominant land use within the EFNR. Lands managed by BLM comprise approximately 22% of the area, distributed in a checkerboard-like pattern. Approximately 95% of the EFNR is coniferous forestland. The remainder is used mostly for agriculture, rural residential, roads, and utilities. There is no urban land.

Private forestlands are generally managed for 30 to 50 year rotations that culminate in clearcut harvest. The majority of the forestlands, including most of riparian areas along smaller streams, were clearcut in the 1980s and early 1990s. Very few areas have forest stands that are more than 100 years old. Approximately 23% of the forestland within EFNR and 5% of the BLM land in EFNR are in an early-seral sapling/pole vegetation class (assumed to be less <20 years of age) or have been thinned or patch-cut and have less than 30% canopy closure. This analysis is based upon a review of 1993 and 2009 aerial photos.

Streams and Wetlands

All proposed action would occur on lands that ultimately drain to the EFNR at the confluence of Jim George Creek. Major stream systems draining this area include a small reach of the mainstem EFNR (5th order), lower Jim George Creek (3rd order), Gunners Lakes tributary (3rd&4th order), Floeter Pond tributary (3rd order), and two unnamed 3rd order streams

bisecting Section 9. Most streams adjacent to proposed harvest units are small, perennial streams. Data collected in the fall 2009 by Tillamook RA staff found that about two of every three streams (~70%) on BLM managed lands within the project area are perennial. Typically, there are more ephemeral or intermittent than perennial streams in coastal watersheds.

In the upper Floeter, Gunners and Jim George drainages lies a complex of low gradient streams connecting a series of ponds (six greater than 1 acre totaling about 22 acres) and wetlands (approximately 18 acres). This area hereafter shall be referred to as the Gunners Lakes Ponds Area (See Figure 3). Most of the larger ponds were probably former beaver ponds that were enlarged in the 1930s by the construction of shallow earthen dams/roads. This area drains approximately 2,090 acres, nearly one quarter of the project drainage area. It is probably having a notable affect on several hydrologic processes within the project drainage area including stream flows, channel morphology, sediment routing, and stream temperatures. Many of the proposed project actions would occur within this area.

Channel Morphology

The most frequent channel habitat types near the proposed harvest units are moderate to high gradient/low flow/headwater channels and moderate gradient/unconfined/ moderate flow channels. Stream channels are typically narrow (generally less than six-feet wide). Most are simplified. They contain low numbers of large woody debris, deep pools, and off-channel areas.

The main past actions that have contributed to current channel conditions in the project area are the logging and road building that occurred in the project area over the past 80 years. Timber harvest increased sediment delivery to streams and reduced large woody debris in channels. The numerous road stream crossings in the project area have directly altered banks and beds within the road prism. In some places, undersized culverts have restricted streams that have resulted in sediment accumulation above culvert inlets or scoured channel banks and beds resulting in plunge pools. Several of the larger ponds or small lakes in the Gunners Lakes Ponds area were probably beaver ponds that were enlarged in the early 1930s by construction of low earth dams/elevated roadways/large log placement. Enlargement of these ponds has probably resulted in a complex of hydrogeomorphic changes including converting complex, multi-channeled drainage networks to simplified single channel networks, altering sediment storage and transport processes, and increasing the amount of open surface water. Sometime this winter, the outlet in a roadway damming one of the Gunners Lakes ponds (approximately 2 surface acres) down-cut. A large amount of water and sediment went downstream. Most of the sediment probably collected in the lower Gunners Lakes.

Stream Flows

There are no gauged streams within the EFNR subwatershed. Peak flows in this area are generally highest during the heaviest precipitation months of December through February.

Low flows occur during the dry months of late July to mid October. In the past fourteen years, the area has been subject to several large storm events.

Stream flows appear to be more moderate and less flashy in the project area than streams in many coastal watersheds. This assessment is based upon the following observations: Most streams flow year around in the project area. Streamflows, based upon casual observations throughout the year, do not appear to fluctuate as much as streamflows observed in other watersheds. Many small and medium size streams are flanked by wetlands and floodplains. Channel substrates are dominated by fine particles (e.g., small gravel, sand, silt, and clay). Stream channels show few signs of downcutting. This would suggest that local streams are less turbulent and have a limited ability to transport sediment.

Forest management activities can increase peak flows through timber harvest and road building. Timber harvest reduces evapotranspiration and canopy interception resulting in increased soil moisture levels (Satterlund and Adams, 1992). Most studies that have documented a change in peak flows associated with timber harvest were located within transient snow-zones affected by "rain on snow" events. In a rain-dominated hydroregion such as this one, forest management activities increase the susceptibility of peak flows only when a large proportion of the subwatershed is harvested within a short period. Grant (2008), after reviewing peak flow data collected from rain-dominated catchments in the Pacific Northwest, found that the first reported value when peak flow response becomes detectable occurred when 40% of the watershed is harvested. (The percent harvested represents a range of basal area cut or canopy removed. It does not make a distinction between patch sizes.) (Furthermore, a compilation of data suggest that peak flow is only detectable where at least 29% of the drainage area is harvested. Most of these watersheds that were analyzed were covered with more than 2% roads. Since only about 23% of the EFNR is harvested (i.e., in an early-seral sapling/pole vegetation class or have less than 30% canopy closure), peak flow enhancement in this subwatershed is unlikely under existing harvest conditions.

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

Road densities, based on the most up-to-date GIS information, are approximately 5.9 mi/sq mi for the EFN and approximately 5.1 mi/sq mi for BLM lands. Most of the approximately 191 miles of road within the EFN are forest roads. Assuming an average road width of 25 feet, roughly 2.8% of the EFN is covered by road surface. Using OWEB's threshold levels, the present risk for peak flow enhancement from roads in the EFN is low.

Water Quality

Beneficial Uses

There are thirteen recognized beneficial uses in the basin (OAR 340-041-0230). These beneficial uses must be protected under the Oregon state's water quality standards. The most sensitive beneficial uses within the project area are fisheries (including salmonid habitat) and other cold aquatic life. There are no known municipal or domestic water users within the subwatershed. There are eight water rights within the EFNR subwatershed totaling about 0.6 cfs. They are principally for logging, railroad, and fish culture uses. There are no surface water rights for domestic use within ten miles downstream of any of the project area that could be affected by the proposed harvest of timber.

State (DEQ) Water Quality Standards

Most of the larger streams in the EFNR subwatershed, including most of the mainstem EFNR, have been 303(d) listed as water quality limited for elevated summer temperatures. In 2003, the Oregon Department of Environmental Quality (DEQ), with the Environmental Protection Agency (EPA) approval, established TMDLs for temperature and bacteria for the northern portion of the North Coast Basin including all of the Nehalem River Subbasin and the project area. While not all streams within the EFNR are overheated, the TMDL developed to control this pollutant would apply to all water bodies within the watershed, including the project area.

In 1998, DEQ added the EFNR (0 to 9.8-mile) to the 303(d) database for excessive sediment. However, the stream reach has not been water quality listed due to insufficient data. There are no quantified sediment data available for the project area. Ocular estimates of fines in riffles were collected by ODFW (2005 and 2007) on the lower reaches of EFNR tributary, Floeter Pond Creek, and Gunners Lakes Creek. Fines ranged from an average of 15% on a moderately steep (8.9%) gradient reach downstream of Gunners Lakes dominated by riffles and cascades to 59% on a gentle (1.2%) gradient reach of Floeter Pond Creek near Floeter Pond. Most of the data are above reference average (~20%) for percent sands and fines in riffles in erodible geologies. While past timber harvest and road building are the most likely human-caused contributing factors to high loads of sediment in streams in the subwatershed, other factors such as erodible geology, moderate stream flows, and concentration of ponds and wetlands may be in play. Most of the timber logging and road building in the project area occurred 50 to 70 years ago. Until a quantified sediment investigation is completed, it is unclear whether the streams are impaired by excessive sediment.

The Gunners Lakes Ponds area is probably having strong influence on sediment storage and transportation in the project area. It is estimated that all of the bedload and over half of the fine sediment that are delivered by streams in this basin is retained.

Roads are most likely the main current source of human caused erosion and sediment delivery in the project area. Relatively heavy use and infrequent spotty maintenance has resulted in roads that are in fair to poor surface condition. Many roads are rutted and covered with "potholes". Most road ditches are filled with sediment and are no longer functioning. Many culverts are undersized, old, and are in poor condition. Some of them are partial or full passage barriers for fish and other aquatic species (see *sections 3.3 and 3.4*). In many places, there are too few cross-drains to maintain good road drainage and to minimize sediment delivery to streams.

Off-highway-vehicle (OHV) use is relatively high in the project area. OHV use has created several large ruts and deep depressions on several roads. The largest known chronic source of fine sediment in the project area is from short segment of the 4N-3-21.4 road upstream of Floeter Pond. The road segment has a deep rut/gully running down most of its 530 feet length that is actively eroding. A long deep rut has also been created on an unnamed natural surface road in section 29. During the wet season, water and sediment moves down the rut and collects in a depression on the 4N-3-20.1 road near a perennial stream. If conditions continue to worsen, it is likely that some the road-produced sediment will enter the stream in the near future.

3.2.2 **Environmental Effects Alternative 1: No Action**

Because BLM would not implement any of the action alternative at this time. Current conditions and trends would continue on stream flows and channel morphology.

Currently trends in sediment supply and turbidity would likely increase slightly. Current and anticipated road maintenance budgets are insufficient to properly maintain all BLM system roads. Without additional funding that the timber sale would provide, the current road conditions within the project area are likely to worsen causing additional erosion, gullying, increased risk for road failures, and increased sediment delivery. Some roads crossings, especially those with undersized stream culverts, would continue to be at risk of plugging, possibly resulting in road washouts. Washout would scour stream channels and send large pulses of sediment downstream. Some culverts would continue to be partial or full passage barriers for fish and other aquatic species. The deep rut/gully in 4N-21.4 would continue to get bigger and delivery additional sediment into the local stream.

3.2.3 **Environmental Effects Alternative 2: The Proposed Action**

Stream Flows

The proposed action, including timber harvest and road actions, is not expected to increase the risk of peak flows nor would it increase the annual water yield or base flow to such a

degree that it would measurably affect channel morphologies or beneficial uses. Timber harvest would maintain an overall canopy closure of at least 50% in the treatment areas. Harvest units are located in a rain-dominated area that is less prone to peak flow increases. There is little evidence that partial harvest where 50% of the basal area is retained contributes to peak flow effects in rain-dominated watersheds (Ziemer, 1981). The Oregon State Assessment (OWEB, 1999) does not consider forest with canopy closure less than 30% to be a substantial factor in rain-on-snow events. Increases in water yield is unlikely. After thinning, the remaining vegetation would quickly use any newly available soil moisture (Troendle et al, 2006).

Most of the roads that would be utilized under this proposal already exist. All of the new, temporary, roads would be built on ridgetops or gentle topography without direct stream drainage network connections. Approximately three new cross-drains would be installed in the road surfaces thereby reducing the roads influence on hillslope hydrology. The total amount of roads and road density would increase slightly (approximately 1.9 miles and <0.01%, respectively) but would remain in the "low risk" OWEB threshold level for peak flow enhancement. Upon project completion, all of the new temporary roads and natural surface renovated roads would be decommissioned. In addition, approximately 0.3 mile of the steep, mid-slope 4N-3-21.4 road would be decommissioned.

Channel Morphology

With the exception of road maintenance and road decommissioning work, the proposed action would not directly alter any stream channels. Ground disturbances from timber harvesting and yarding equipment would be kept at least 60 feet away from all wetlands and stream channels. New road construction would not cross any streams or wetlands.

It is anticipated that approximately six existing culverts at stream crossings would be replaced and two additional culverts would be removed. Streams at these crossing locations are mostly small (the largest active channel width is about 10 feet) and have shallow fill depths (Most are 2 to 4 feet deep; the largest is 10 feet). Direct disturbance would be limited to channel beds and banks at the crossings. There are likely to be some additional indirect effects at four stream crossing locations where undersized culverts have constricted channels. The effects of undersized culverts usually include sediment deposition upstream and decreased sediment supply and scour pools downstream. Following their replacements or removals, there will likely be some channel adjustments including some incision upstream and deposition downstream. Streams at these locations have gentle gradients (<4%) and appear to be stable. Channel alterations from this action would likely not extend more than 100 feet downstream or upstream from the crossings. The alterations would likely take place over several years due to the apparent low energy and stability of these streams. Replacing and removing culverts would improve the channel functions (fish and amphibian passage and natural transport of sediment and woody debris) and reduce the potential for future culvert and road fill failures.

Proposed thinnings near streams may have a long-term indirect affect on some of the channel morphologies by altering the quantity, quality and timing of wood falling into the streams. (See Large Woody Debris (LWD) analysis in the Fish Species with Bureau Status and Essential Fish Habitat section.)

Sediment and Turbidity

The primary means by which the proposed action could contribute sediment and turbidity to local streams are timber yarding, roadwork, timber hauling, and recreation use by motorized vehicles.

Timber Yarding

The proposed timber yarding is not expected to measurably increase sedimentation or turbidity. Hillslopes in harvest units are dominated by gentle to moderate slopes. All areas with potential for slope instability and mass wasting were identified during field work and were removed from the project. All yarding (ground-based and cable) would occur during the dry season. No skyline corridors are anticipated across streams. Forest soils have high infiltration rates. Most sediment produced from logging would travel a short distance before being trapped by duff, woody materials or other obstructions. A recent Washington State study (Rashin et al, 2006) evaluating timber harvest best management practices found that a 10-meter (~33 feet) wide, "no ground disturbance" buffer along streams prevented 95% of harvest related sediment from being delivered to streams. The proposed action would use no-harvest buffers nearly double to triple that width.

Roadwork

Under the proposed action, approximately 1.3 miles of new roads would be constructed, 2.0 miles would be renovated, and approximated 14 miles would be improved and maintained. Following the completion of timber harvest and site preparation activities, all newly constructed and renovated natural-surface roads would be decommissioned (removing culverts, decompacting, water barring, seeding or planting with native species, and restricting OHV use.) A total road reduction of approximately 1.9 miles would be achieved.

Road related ground disturbing activities would be implemented to minimize the risk of sediment delivery from, mass failure, erosion or surface runoff. All roadwork would utilize Project Design Features (PDFs) and Best Management Practices (BMPs) as required by the Federal Clean Water Act. All roadwork would occur during the dry season when surface runoff is not likely and there is very little water flowing in channels. All work in live streams (e.g., culvert replacement) would be done during the ODFW instream work window (July and August).

The proposed new road construction and road renovation are unlikely to increases the risk of road related sediment entering streams and stream turbidity. All of these roads would be or

are located on stable ridgetop locations and gentle sloping topography (<30% slopes) and would not cross any streams or wetlands.

The proposed road improvement and maintenance activities work could potentially both decrease and increase the risk of road related sediment entering streams and stream turbidity. Rocking, blading, brushing out encroaching vegetation, and removing roadside berms would upgrade the quality of the road surfaces and improve road drainage, thereby reducing erosion and risk of sediment delivery to streams. This would include the unnamed natural surface road in section 29. On the other hand, ditch cleaning/reestablishing relief ditches, blading, and spot rocking would expose soil and fines in aggregates that could be potentially transported to streams. Although there is a risk for increased sediment delivery and turbidity, most sediment produced by this action would be trapped and stored in the ditches or on the forest floor below the road. In addition, sediment traps or other appropriate methods will be utilized following roadwork. The net result from these actions is expected to be neutral in the short-term (1 to 3 years) and a reduction in road generated sediment delivery and turbidity in the long-term (3 to 10 years).

In addition to the new road construction and renovation, approximately 0.3 miles (4N-21.4 road segment) would be decommissioned. Decommissioning would include pulling back unstable fill slopes, applying erosion control mulch and/or seed on disturbed areas, planting trees or shrubs, installing water bars, filling in deep ruts and gullies, decompacting the upper gentle portion of the road, and blocking. Decommissioning this road segment would stop large quantities of fine sediment that are currently being transported into a stream located upstream of Floeter Pond.

The proposed in-channel roadwork associated with culvert replacement and removal would generate most of the sediment from the project that would enter streams. Approximately six live stream culverts (18 to 36 inches in diameter) would be replaced. In addition, two culverts (both 48-inch diameters) would be removed. The amount of sediment directly generated from this action is estimated to range from less than 0.25 to 2.0 cubic yards for each site event. With low summer flows at the time of instream work, all of the bedload and most of the fine sediment would travel short distances (less than few hundred feet) and be redistributed downstream. Turbidity levels would increase during implementation, and again during the first winter. The increased turbidity would likely be visible or measureable at the site or a short distance (< ⅛ mile) for a short time period (hours).

Four streams crossings with undersized culverts have accumulated up to several hundred, and possibly several thousand, cubic yards of sediment upstream due to channel constrictions. Roadwork at these locations will result in additional channel adjustments. This period of adjustments would probably span several to many years depending on site conditions. During this time, turbidity would increase briefly, mainly during large storm events, and the accumulated sediment would move short distances downstream in pulses. Three of the four crossings are located above the Gunners Lakes Ponds area, which would store essentially all the generated sediment.

Timber Hauling

Timber hauling is anticipated to occur on approximately 18 miles of unpaved roadway, mainly rock-surfaced roads. Most of the roadways are located on ridgetops and gently sloping topography. Haul routes would cross approximately 32 streams, of which about half are perennial. The vast majority of truckloads would be hauled over an area with streams that drain into the Gunners Lakes Ponds area. Approximately one third of the intermittent and three quarters of the perennial stream crossings are located above the Gunners Lakes Ponds area.

While timber hauling has the potential to transport fine sediment to streams and increase stream turbidity, the risk for this action is low for the following reasons. The roads along the haul route are nearly all rocked and road ditches are well vegetated. Road maintenance prior to timber haul would upgrade the quality of the roadbeds and improve road drainage, which reduces the potential for sediment to runoff into stream courses. Timber hauling would be restricted to the dry season during low soil moisture conditions. There would be no flowing water on road surfaces and ditchlines to transport sediment to streams. Hauling would be suspended when conditions exist that may generate excessive turbidity or sediment inputs. Most fine sediment that washes off roads would be trapped and stored in the ditches or on the forest floor below the road. If haul-generated sediment were to reach stream channels, most of the fine particles would likely be trapped and stored in small tributary streams or in ponds and wetlands before they are able to reach sensitive beneficial uses. Any impacts from the minimal amount of sediment and increased turbidity generated during these activities would be for a short-term duration (one to two years).

Recreation Use by Motorized Vehicles

While it is difficult to predict with accuracy, potential for increased turbidity and stream delivery from increased motorized vehicle use is low. All of the new roads and most of the forest openings that would be created are far away from streams. To minimize the potential of resource damage from motorized vehicles, roads and skid trails would be blocked by the strategic placement of boulders, logs, root wads, or other types of earthen barriers.

Summary

In summary, the proposed timber yarding, roadwork other than culvert work at live streams, and timber hauling are unlikely to measurably increase turbidity or sediment delivery to stream channels. If road generated sediment from these activities were to reach stream channels, most of the fine particles would likely be trapped and stored in small tributary streams or in ponds and wetlands before they are able to reach streams with sensitive beneficial uses.

The roadwork associated with culvert replacement and removal would result in short-term increases in sediment, estimated to total less than 8 cubic yards, and increased turbidity that

would travel short distances (mostly less than a few hundred feet). Moreover, there is likely to be a short-term (hours) increase in turbidity that could be visible up to less than 1/8 mile. Most affected streams have a limited ability to carry sediment, and are located in the Gunners Lakes Ponds area. The amount of sediment and increased turbidity generated from project implementation would be for a short-term duration (one to two years) and would be undetectable at the project drainage-area scale or subwatershed scale. Therefore, the probability of any adverse impacts to water quality and beneficial uses fisheries caused by sedimentation due to road construction, reconstruction, maintenance, or road obliteration, is very low.

In the long-term, the propose project would likely improve the water quality over current conditions. Roadwork would upgrade the quality of the roads, improve road drainage and reduce the risk of erosion, washouts, and subsequent sediment delivery to streams. It would remove the largest known chronic source of fine sediment in the project area, the 4N-3-21.4 road segment. Replacement and removal of culverts would help reestablish drainage patterns and restore hydrologic functions by allowing wood, water, and sediment to move more freely through these streams.

Cumulative Effects

Stream Flows

Because the project proposal is a thinning with limited road building and is unlikely to measurably affect peak flows, the proposed action is unlikely to contribute to any potential cumulative effects to peak flows in this subwatershed.

Channel Morphology

The BLM and Oregon Department of Fish and Wildlife (ODFW) are currently working cooperatively on a fish habitat restoration project which includes culvert replacements or removals, and placing boulders or logs on the East Fork Nehalem and lower Floeter Pond tributary. The only expected alteration to stream channels from the proposed action is from roadwork involving culvert replacements and removals at stream crossings. Effects would be of relatively short duration (one to several years) and be limited to site disturbance (less than 100 feet upstream or downstream). Because effects would be small and localized, the project action would not result in noticeable cumulative effects.

Sediment Supply and Turbidity

Past timber harvest and road building activities have increased sediment levels in channel beds relative to an undisturbed condition in the project drainage area and subwatershed. The proposed action would contribute to this increase. However, sediment loads generated from this project action would be very low compared to those produced by other management actions farther downstream. Most of the project-generated sediment would travel short distances and be stored in small tributary non-fish-bearing and fish bearing streams or ponds

within the Gunners Lakes Ponds Area. The proposed action is not anticipated to increase sediment supplies to a level that would be detectable at the project drainage area scale or risk to beneficial uses of the water, and therefore would not contribute to a cumulative effect on sediment or turbidity.

Similarly, the proposed action, primarily culvert replacements and removals, would increase turbidity levels at stream crossings, mainly during the action and first year following. Increases would be maintained below the limits required by the DEQ and would be dissipated within 1/8 mile downstream. The proposed action would not add to the cumulative effects at drainage area scale or larger nor is it likely to have any effect on designated beneficial uses.

In the long-term, the proposed project is expected to improve water quality in the EFNR.

3.3 Threatened or Endangered Fish Species or Habitat

3.3.1 Affected Environment

The analysis area specific to fisheries for the Gunners Lakes timber sale(s) is located in the East Fork Nehalem Watershed upstream from a point approximately 6 miles upstream of the confluence of the East Fork Nehalem River with the Nehalem River near Pittsburg to the headwaters. The named streams included in this analysis area include Jim George Creek and the East Fork Nehalem River; four other major unnamed tributaries are in the analysis area. Oregon Coast (OC) coho salmon are a federally threatened fish species in the analysis area. Critical habitat for OC coho is also present in the analysis area (Federal Register notice Vol. 73 No. 28, February 11, 2008).

There are two small road segments that go outside the analysis area for timber haul only. One enters into Kenusky Creek downstream of the analysis area in the East Fork Nehalem Watershed on gently sloping ridgeline and crosses the headwaters of a small headwater stream over 1.28 miles from OC coho. The second road segment crosses the ridge that divides the East Fork Nehalem from the Scappoose Watershed. There are no stream crossings on the Scappoose side. No further analysis of these areas is necessary as there are no anticipated effects to T&E fish or their habitat.

There is limited historical data available on coho habitat and distribution in the watershed. It can be assumed that prior to extensive timber harvest, road and railroad construction, and settlement, fish habitat was most likely more complex and coho numbers in the watershed were greater. As depicted in Figure 3, known coho distribution in the analysis area is

different from that mapped in "Streamnet" an online source of fisheries related data in the Northwest. Critical Habitat for OC coho appears to be the same as the Streamnet distribution layer. This data is available at the Streamnet web site (http://www.streamnet.org/).

Fish Passage
The proposed action does not include any activities that affect fish passage for fish listed under the ESA.

Specific Habitat Components and Condition Assessment

As stated in the East Fork Nehalem Watershed Analysis (BLM, December 1996), stream habitats within the East Fork Nehalem watershed have a high potential for protecting and enhancing populations of Oregon Coast (OC) Coho, chinook, steelhead and cutthroat trout. The average stream gradients downstream of the proposed forest thinning project areas yet within the analysis area are in many cases less than 1% and rarely go over 2%. These low gradient reaches are considered high quality potential habitat for OC coho. The existing levels of large woody debris (LWD), spawning gravels, number and quality of pools and channel complexity within the proposed project areas are severely lacking. All of these habitat features are defined by Oregon Department of Fish and Wildlife (ODFW) and National Marine Fisheries Service (NMFS).

Fish habitat conditions in the analysis area vary greatly; the primary differences are stream slope and size. Notable differences between the upper and lower portions of these stream channels occur; discussions of fish habitat are focused on those portions of streams with coho, steelhead or chinook. Stream morphology is discussed in the hydrology section in detail. ODFW aquatic inventory surveys were accomplished in 2007 including the known distribution of OC coho in the analysis area.

Individual habitat components in the analysis area are used to define the current condition; many of these components are used to differentiate the current condition from any changes that may occur by implementing the proposed action.

The habitat components considered include water quality (Temperature, turbidity, chemical or nutrient input, any 303d reaches), habitat access, substrate (% fines or embeddedness), large woody debris (LWD), pools (% area, pool quality, pool frequency), off channel habitat, streambank condition, floodplain connectivity, road density and location, disturbance history, stream influence zone (1^{st} site potential tree height) and refugia. Most actions related to timber sales have potential to affect all of these but usually affect only a limited number i.e. LWD, sediment, temperature, road density. This analysis focuses on LWD and sediment which are considered "undesirable" or "not properly functioning" as defined by ODFW and / or NMFS.

3.3.2 **Environmental Effects Alternative 1: No Action**

No forest management activities would occur within the proposed project area at this time. Forested stands within the project area would continue to grow and develop without management intervention, although at a slower rate in areas heavily infected with *Phellinus weirii* root disease. The identified effects of the action alternatives would not occur at this site at this time. There would be no new roads or landings built, nor additional ground disturbed from forest management activities. There would be no short-term minor inputs of sediment from culvert replacements located in section 21 and 29 and timber hauling. Assuming that the culverts in sections 21and 29 are not removed or replaced fish passage barriers for trout would not be removed.

Cumulative Effects

Current, ongoing erosion processes would continue. The other fish habitat restoration activities would continue in the watershed as described in the cumulative effects section for the proposed action.

3.3.3 **Environmental Effects Alternative 2: The Proposed Action**

Timber cutting and Yarding

With gentle slopes and buffers of at least 100 feet on all perennial streams the potential of impacts to individual habitat indicators for fish resources are limited to 1) wood (CWD) and 2) sediment.

To analyze potential impacts to wood sources to streams from thinning the riparian reserve portion of four harvest units were analyzed using two methods. A tree diameter calculator "ORGVOL Program (based on ORGANON)" and a wood source and routing layer used in the Western Oregon Plan Revision was used. Harvest units upstream of the Gunners Lakes Ponds Area in sections 21 and 29 that would stop wood transport were not analyzed. The Gunners Lakes Ponds Area is shown on Figure XXX and described in the Hydrology section.

Based on this analysis thinning treatments will not influence the availability of CWD in downstream habitat occupied by listed species. Wood deposited in these upper stream reaches is not likely move down to listed fish habitat due to the small stream size, distance to that habitat, and low gradient channels. No harvest will occur within stands on unstable slopes (determined by both map (TPCC typing) and field verification), thus avoiding adverse affects on existing in-stream woody material levels or recruitment rates to area streams.

Sediment is discussed in detail in the hydrology section; timber yarding is unlikely to increase sediment delivery to streams. With the design features used for this project the

probability of sediment entering streams as a result of this action is expected to be un-measurable and discountable to coho or their habitat.

Road Construction and live stream culvert replacements

Road construction will occur in the dry season. There is approximately 1.3 miles of new construction and 2.0 miles of renovation all natural surface road of a semi permanent nature (lasting up to 3 years while sale operations are completed) in addition there are approximately 8 culverts to be removed or replaced, potential indicators affected include 1) riparian reserve 2) sediment (which is discussed in the Hydrology section)

There are five road segments to be constructed in the Riparian Reserve (RR). All are located on gentle slopes 2-11%, the closest of these roads to streams, is 113 feet from an intermittent channel. These new road segments do not involve stream crossings. New road construction is not expected to deliver sediment to streams and will not affect fish.

The removal (or removal and replacement) of approximately 7 culverts (5 on perennial live streams) will result in short term sediment inputs to streams. These inputs are unlikely to have impacts to OC coho or their critical habitat. The majority of the culverts to be worked on with live streams as part of the timber sales are in the Gunners Lakes Ponds Area. OC coho are at least 0.25 miles downstream of the culvert replacements. The streams in the area of these culvert replacements are very flat. Beaver activity is evident with well vegetated, stable stream banks. Any sediment that is input into the stream as a result of this culvert replacement will be minimized through the implementation of BMPs as defined by the Salem District Resource Management Plan (e.g., restricting work to the ODFW instream work window (July 1 to August 31), diverting the streamflow around the work site, stabilization of the fill material as soon as possible, and seeding and mulching exposed soils). Sediment that is released through the implementation of this action is anticipated to be stored in this low gradient reach before reaching coho habitat downstream.

The removal of one culvert (located on 4N-3-29) has the potential to cause up to 1 cubic yard of sediment to enter the stream. The culvert would be removed after the timber sale activity is complete. This stream crossing is located on a section of stream of approximately 4% slope and is 0.57 miles above listed fish habitat (LFH). Due to the timing of removal in July or August (during the low stream flow period) and the distance downstream to LFH, there should no visible turbidity reaching coho. This small amount of sediment is anticipated to begin to move downstream with the larger fall storms and should not have effects to habitat indicators where LFH is reached.

Of the two potentially affected indicators (riparian reserve, and sediment), there are no specific impacts to OC coho or their habitat anticipated. The removal or replacement of culverts will restore some of the stream function (Riparian Reserve) and sediment that is released downstream is anticipated to be of insignificant magnitude.

Road Decommissioning

There are several road segments that are to be used during the thinning operations that will be decommissioned after use. The other road segments are a mixture of new construction and road renovation and all are natural surfaced. None of the road segments cross streams and most are in excess of 100 feet from streams.

There is one additional section of road to be decommissioned that is not associated with haul from thinning operations. This old rocked road (0.32 miles in length) is severely rutted and has a stream crossing culvert. Total decommissioning planned is approximately 1.9 road miles. The decommissioning of roads has the potential to affect the indicators for sediment and road density.

As discussed in the Hydrology analysis, the only road decommissioning activities that are expected to result in sediment delivery to streams are on the .32 mile segment of rocked road with a stream crossing. This action is located upstream of Floeter Pond which will store any sediments released.

The road density indicator will be affected as a result of this project. The net decrease of 1.9 miles of existing roads will move this indicator in the direction of properly functioning condition.

Based on the location of the road decommissioning, lack of sediment transmission downstream to coho, and a net reduction in road miles, the road decommissioning action is anticipated to have a beneficial effect to both sediment and road density indicators with no impacts to coho.

Timber Hauling and Road Maintenance

As discussed in the Hydrology analysis, hauling timber is not likely to deliver sediment to streams in notable quantities. Many of the roads to be hauled on (and have maintenance activities) are upstream of the extensive pond and wetland system that is anticipated to store sediment from actions upstream. The area draining into these pond systems is extensive and streams are low gradient. There are potential sediment inputs discussed in the Hydrology section relating to timber haul, however there are only two haul routes (1 and 4) that have the potential to affect coho or their habitat due to proximity. Refer to Figure 3 for the four haul routes and their relationship to timber harvest units.

Haul route 1 coming out of section 7 is anticipated to have about 257 truckloads of logs. There are only two stream crossings. One is an intermittent channel and the other has a cement bridge. This bridge over the East Fork Nehalem (the only stream crossing over OC coho) has recently had rock added on either side and has a well vegetated ditchline. With the small amount of haul, well vegetated ditch lines and the recent rocking of the bridge approaches, sediment input to LFH is not anticipated in measurable quantities. The timing of any inputs of fine sediment related to road maintenance and haul to the East Fork Nehalem

would be in the fall as rainfall increases. These inputs would be anticipated to occur prior to adults returning to spawn and likely not be visible as the background turbidity also increases that time of year.

The total haul on route 4 (Hawkins Road) is anticipated to be approximately 400 truckloads of logs and 59 truckloads of rock. Use of this road system in the dry season is not anticipated to increase road generated sediment by measurable quantities as there is only one perennial stream crossing 1.3 miles above LFH. There are 7 other stream crossings on this road, however they are all intermittent and would not be flowing while haul is occurring. The planned road improvement "spot rocking" should further lower the potential of road related sediment from entering streams.

In combination, the total log haul (anticipated 2371 truckloads of logs on the four haul routes) and the road maintenance (spot rocking 174 truckloads, blading, cross drain installation and ditch cleaning) have the potential to affect one indicator, sediment. Most of these activities are not near LFH and most are within the Gunners Lakes Ponds Area in sections 21 and 29 which is anticipated to trap sediments. Table 11 below denotes the four haul routes, the road surfacing, distance to coho habitat (LFH) and the number of truckloads that will be hauled.

Table 11. Aggregate and Natural-Surface Haul Route Information

Haul Route by road #	Season of Use[1]	Miles of Haul	Type of Road Surface (A,N)[3]	Approx. no. of Loads	Number of Crossings Over:				Nearest Distance (ft) from Crossing To LFH by Type:		Road Length Within 100' of LFH/CH[2]
					LFH		Other Peren.	Inter.	Peren.	Inter.	
					Bridges	Culverts					
Route 1	Dry	1.4	A	257	1	0	0	1	NA	790	0
Route 1	Dry	.3	N		0	0	0	0	NA	NA	0
Route 2	Dry	8.3	A	1543	0	0	6	2	3000	8480	0
Route 2	Dry	1	N		0	0	0	0	NA	NA	0
Route 3	Dry	1.9	A	171	0	0	8	3	1700	2850	0
Route 4	Dry	4.6	A	400	0	0	1	7	7100	502	30ft
Route 4	Dry	0.1	N		0	0	0	0	NA	NA	0

Notes: Haul routes broken into 4 groups (see map)

[1] Season of use: dry season only, year-round

[2] Road length within 100' of LFH is a measure of "draw bottom" roads used by haul route, does not include distance at crossings, which is already accounted for in the previous columns.

[3] A = aggregate, N = natural-surface

With the small amount of haul from routes 1 and 4, and the location of the Ponds Area downstream of routes 2 and 3, haul and road maintenance is not anticipated to have any adverse effects to coho or their habitat. Minor sediment inputs are possible however the probability is low that there would be any measurable effects to coho or their habitat. Best management practices and project design features such as sediment traps, wattles and

seeding, have the potential to reduce sediment inputs in some locations below the current condition resulting in a net reduction of sediment entering streams.

Cumulative Effects

The proposed action is not expected to result in any measurable change to water quality or the fish habitat indicators at the scale of the analysis area or sixth-field watershed, and would be unlikely to have any measurable effect on listed fish or their habitat.

There is additional work planned in this analysis area in the next 1-3 years, including the addition of LWD as a fish habitat improvement project and fish passage improvements at an existing culvert. As described in the LWD portion of this analysis, several indicators are considered Not Properly Functioning. This instream restoration work is designed to increase the levels of LWD which in turn beneficially affects the number, size complexity of pools. Additional benefits anticipated include increased floodplain connections and creation of, or access to, off-channel habitat. Instream fish habitat restoration, due to its location and the use of heavy equipment in or near stream channels, has some direct adverse effects on listed fish. These restoration projects are described in the East Fork Nehalem Project Environmental Assessment.

The Gunners Lakes proposed action is not anticipated to have adverse effects to fish listed under ESA or their habitat. With no adverse effects the proposed action does not increase the effects of the other actions in the analysis area, i.e. beneficial or adverse.

3.4 Fish Species with Bureau Status, Essential Fish Habitat and other fish

3.4.1 Affected Environment

See description of analysis area and habitat conditions in Threatened and Endangered Fish Species and Habitat section.

When the Magnuson-Stevens Act (MSA) of 1976 was re-authorized in 1996, it directed Regional Fishery Management Councils to identify Essential Fish Habitat (EFH) for commercial fish species of concern. Effects analysis contained here address potential effects to EFH (i.e., effects to coho and chinook salmon habitat). Essential Fish Habitat is defined as 'those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. 1802(10))'. Oregon Coast steelhead are a Bureau Sensitive species. The other fish species within the analysis area include lamprey, cutthroat and sculpins. Little is known of the distribution of lamprey and sculpins; however cutthroat distribution is well documented in the analysis area.

3.4.2 **Environmental Effects Alternative 1: No Action**

No forest management activities would occur within the proposed project area at this time. Forested stands within the project area would continue to grow and develop without management intervention, although at a slower rate in areas heavily infected with *Phellinus weirii* root disease. The identified effects of the action alternatives would not occur at this site at this time. There would be no new roads or landings built, nor additional ground disturbed from forest management activities. There would be no short-term minor inputs of sediment from culvert replacements located in section 21 and 29 and timber hauling. Assuming that the culverts in sections 21and 29 are not removed or replaced fish passage barriers for trout would not be removed.

3.4.3 **Environmental Effects Alternative 2: The Proposed Action**

As the distribution is the same for coho and steelhead in the analysis area refer to the discussion for Threatened and Endangered Fish Species. Because both coho and steelhead have very similar habitat need the analysis for coho and potential effects of the proposed action are the same. The discussion on each of the action items i.e. Timber haul, Road decommissioning etc will have the same effects, no more than a discountable or insignificant to these species or their habitat.

Chinook salmon have a smaller distribution than coho, that is they are further downstream in the analysis area, therefore the potential for effects to chinook is less than coho.

Cutthroat have the largest distribution in the analysis area shown on Figure 3 . The proposed action, primarily culvert replacement and removal, will have direct effects to cutthroat in sections 21 and 29 that will be beneficial and adverse. There are 4 planned culvert replacements on cutthroat streams are described in *EA sections 2.4 and 3.2*. Effects to cutthroat from replacing these culverts will include their removal with electro-fishing equipment from the area around the culvert to be removed or replaced.

As sediment will be released with these culvert replacements and adjustments to the channel, cutthroat will have two periods of increased sediment to cope with. At the time of culvert removal or replacement impacts should be of short duration and have limited scope (close proximity to the culvert) due to design features and best management practices. The scope of effects will be greater for channel adjustments as these will occur in the winter, and move a greater volume of sediment downstream. Sediment movement is expected to be intercepted by the Ponds Area, as described in the Hydrology section. The response anticipated by cutthroat in these areas would be changes in behavior; they would actively seek out small tributary streams or areas upstream of the sediment source. The benefits of these culvert actions will include access to more habitat, and more natural sediment storage and routing processes.

Cumulative Effects

The proposed action is not expected to result in any measurable change to water quality or the fish habitat indicators at the scale of the analysis area or sixth-field watershed, and would be unlikely to have any measurable effect on Bureau Sensitive or MSA listed fish or their Essential Fish Habitat.

There is additional work planned in this analysis area in the next 1-3 years, including the addition of LWD as a fish habitat improvement project and fish passage improvements at an existing culvert. As described in the LWD portion of this analysis, several indicators are considered Not Properly Functioning. This instream restoration work is designed to increase the levels of LWD which in turn beneficially affects the number, size complexity of pools. Additional benefits anticipated include increased floodplain connections and creation of, or access to, off-channel habitat. Instream fish habitat restoration, due to its location and the use of heavy equipment in or near stream channels, has some direct adverse effects on listed fish. These restoration projects are described in the East Fork Nehalem Project Environmental Assessment.

The Gunners Lakes proposed action is not anticipated to have adverse effects to fish listed under the MSA or their Essential Fish Habitat. With no adverse effects the proposed action does not increase the effects of the other actions in the analysis area, i.e. beneficial or adverse.

Essential Fish Habitat Analysis

Oregon Coast coho and chinook are included under the Magnuson-Stevens Fishery Conservation and Management Act provisions for Essential Fish Habitat. The analysis area contains Essential Fish Habitat.

MSA species life histories and habitat use in the analysis area are discussed in the affected environment section above.

Oregon Coast Coho (*Oncorhynchus kisutch*)

See Threatened and Endangered Fish Species and Habitat.

Chinook (*Oncorhynchus tshawytscha*)

Chinook EFH is much smaller in the analysis area than that used by coho. See description of habitat in affected environment section of Threatened and Endangered Fish Species and Habitat write up. With a smaller distribution i.e. distance downstream the potential of impacts from the proposed action are further reduced. See text under environmental effects proposed action.

Description of the Project/Proposed Activity

For a full description of the Proposed Action see *EA section 2.4.*

Proposed Mitigations
Adverse effects are anticipated to be minimal, however mitigation criteria are discussed in *EA section 2.4.2* (*Project Design Features).*

Effects of the Proposed Action on Essential Fish Habitat and MSA species
OC coho and chinook spawn and rear in the analysis area. Juvenile salmon emerge from the gravel substrate early in the spring, and begin feeding and increasing in size. It is likely juvenile coho will be the only MSA-listed fish in the analysis areas during implementation of timber harvest or road related actions. Adult OC coho and chinook generally return to the East Fork Nehalem to spawn in the late fall. After hatching, chinook juveniles migrate quickly downstream towards the ocean and would be out of the analysis areas before the timber harvest or culvert work starts.

Water Quality, Water Quantity, and Substrate Characteristics
The proposed action would affect water quality, and substrate characteristics of the treated stream reaches through culvert replacements or removals, however all of the activities that are anticipated to affect these characteristics are located upstream of Essential Fish Habitat . Water quantity would not be expected to change as a result of implementing the proposed actions.

There would likely be a short-term water quality disturbance associated with equipment working in stream channels for the implementation of culvert removals or replacements. This short-term disturbance would consist of possible sediment pulses while equipment is moving materials in the stream channel and would be limited to 2 hours per day during implementation. Water quality would be impacted at the time of placement and potentially the first few times stream-flows increase after the instream work is completed. Due to the distance downstream to Essential Fish Habitat (>0.25 miles) and predicted turbidity transmission of approximately 0.125 miles, no adverse effects are anticipated at the time of culvert removal or replacement.

There is the potential for affects to water quality after the culvert replacements at four locations in section 21 during winter storm events. Sediment stored upstream of these currently undersized culverts is anticipated to move over a two-year period after culvert replacement. Due to the location of these culverts above ponds, the localized movement of stream sediments is not anticipated to affect Essential Fish Habitat downstream as its timing would correspond to high water events and likely be limited to suspended silt and organic material. These fine materials will not be detectable where Essential Fish Habitat is reached.

Large Woody Debris (LWD) in channel and source areas
See analysis in T&E fish section.

Fish Passage

There would be no adverse effect to fish passage associated with the proposed actions**.** All proposed culvert replacements or removals are well outside the range of known distribution for coho or chinook salmon.

Forage Species

The proposed action would not have any adverse effect on forage species for MSA-status fish. The thinning actions in riparian areas are anticipated to increase the size of future LWD while maintaining shade and water temperature. Aquatic insects require cold, clean water and feed on detritus and other organics. These processes are not anticipated to be interrupted and may be augmented when the seven culvert upgrades are completed. The proposed actions would have minimal and localized effects on forage species during project implementation located upstream of Essential Fish Habitat.

Channel Geometry

Streams are dynamic, and it is expected that channel geometry would change following implementation of the proposed actions. Changes in channel geometry would most likely occur over a one- to two-year period after the culvert replacements and removals, as the channels move water and bedload in a more natural manor. These changes would occur during high water events. This alteration is intended and an expected outcome of the project, and these actions are located upstream of Essential Fish Habitat.

Road Density

No new permanent roads are proposed in the East Fork Nehalem projects. The road density will increase for the period of the timber sales, approximately 1-3 years, then go down by an estimated 1.9 miles. The potential effect to indicators such as RR will be short-term and is not anticipated to have any effects to Essential Fish Habitat due to the lack of connections to streams. The decommissioning of these roads will slightly lower the road density in the analysis area.

Conclusion

Overall there would be minor short term-insignificant effects to MSA fish or their habitat (EFH). In the short-term (0-2 years after implementation) these insignificant effects could include elevated levels of suspended particulates in the water column during high water events. This elevated level would likely not be discernable above the normal background particulate levels during storm events. The scope and intent of the project, especially thinning in the RR, would have long-term beneficial effects to EFH and MSA species. Currently tree size is not sufficient to meet LWD standards or provide CWD past 110 feet from streams. The implementation of all elements of the proposed action would not have any long-term measurable effects on EFH.

3.5 Soils

The main soil resource concerns and focus of this analysis are how the proposed action (timber harvest and road building) would affect long-term soil productivity.

The analysis area encompasses all of the proposed timber harvest units, new roadwork, and fuel treatment areas.

3.5.1 Affected Environment

Physical Setting

The project area is dominated by gently to moderately sloping, rounded mountain ridgetops and benches interspersed with small areas of short (generally <100 feet long) steep sideslopes. Approximately 95% of the proposed timber harvest area are on slopes are less than 50%. Duff layers in the project area are rather thin (typically 1/4 to 2 inches).

The dominant mass wasting processes in the subwatershed are debris slides and debris flows. Most past slope failures are associated with roads, very steep (>80%) hillslopes that have been clearcut, and streamside inner gorges. No harvest units were observed to have slopes of more than 75 feet length of 70% or greater slope. All areas with high risk for mass wasting were identified during field work for the project and were removed from proposed treatment units.

Soil Types

The dominant soil in the project area is the Tolany. They occupies nearly two-thirds (65%) of the proposed timber, including harvest units 21-7 and . They formed mainly from young, ejected volcanic material, primarily basalt and ash. They are more than 60 inches deep, are well drained, and have loam or silt loam textures. They, like most Andisols in this region, have very favorable physical properties for growing tress. The site index , the most common measure for potential forest productivity, ranges from 108 to 128 on Douglas-fir, 50-year basis.

The remaining third of the project area is occupied by soils that developed from sandstone. They are the Mayger, Scaponia and Braun soil series. Mayger soils occupy most of the gentle benches in harvest units 7-5 and 9-4. They have a silt loam surface overlying a mottled silty clay loam or silty clay subsoil at 13 to 25 inches deep. Water is perched on top of a "claypan" at a depth of 18 to 36 inches from November through May. Organic matter and nutrients in these soils are concentrated in the upper soil horizon due to biocycling. Their fertility is more dependent on maintenance of organic matter and nutrient content than for other soils. The site index ranges for Mayger is 117 on Douglas fir, 50-year basis and for Bacona the site index ranges is 126 on Douglas fir, 50-year basis.

Scaponia and Braun occur on steeper portions of harvest units 7-5, 9-1, and all of 9-4. They are well drained and have silt loam or loam textures. Scaponia soils are 40 to 60 inches deep and Braun soils are 20 to 40 inches deep to soft sandstone or siltstone. The site index ranges for Scaponia from 125 to 131 on Douglas fir, 50-year basis and for Braun the site index ranges from 118 to 133 on Douglas fir, 50-year basis.

Existing Soil Conditions

Existing soil conditions reflect past actions and disturbances. The main past actions that have contributed to current soil conditions are wildfires in the 1920s and early 1930s, followed by salvage logging and extensive clearcutting in the late 1930s to early 1950s. During field work several OHV trails were observed located on mostly old skid roads and skid trails.

Currently, most soils within proposed harvest units have good physical and biological properties for growing forest vegetation. They are susceptible to compaction from heavy equipment when they are moist or wet. Once deeply compacted they require long periods to recover if they are not treated. Visible skid trails and landings currently cover about 2 to 5% of the harvest units. This estimate is based upon a soil scientist field observations and review of aerial photos. The largest concentration of visible skid roads and landings (roughly 20% of the area) is in a 26-acre area located west of the 4N-3-29.1 Road in Section 29. Brush and small trees now cover most of these surfaces. This area is rated fragile suitable restricted compaction (FSR2) under Salem District Timber Production Capability Classification (TPCC).

Approximately 34 acres are rated fragile restricted groundwater and nutrient (FWPR1). These are the somewhat poorly drained Mayger soils. Mayger soil are very susceptible to windthrow especially in areas in topographically exposed landform positions, adjacent to clearcut edges, or areas where there are root disease infestations. In addition, approximately 9 acres are fragile due to being moderately well to poorly drained (FWR1).

3.5.2 **Environmental Effects Alternative 1: No Action**

There would be no new ground disturbance from road construction, cable yarding, or ground-based yarding. The processes and trends described in the existing soil condition section would continue. Soil compaction from past harvests would very slowly decrease thereby increasing water availability and conditions for beneficial fungi. Needles, twigs, and small branches, along with decomposing larger woody material would continue to accumulate on the soil surface providing nutrients for tree growth. Soil productivity would continue to improve gradually until there is disturbance such as timber harvest or wildfire.

3.5.3 **Environmental Effects Alternative 2: The Proposed Action**

Physical Soil Disturbance

Project activities that have the highest potential to result in severe soil disturbance that could reduce soil productivity are: timber harvest, roadwork, and fuel treatment.

Timber Harvest - Ground-based Yarding

Approximately 460 acres would be thinned by ground-based systems. Most of the severe disturbance would likely be compaction, mainly on primary skid trails and landings where most of the equipment traffic would occur. Skid roads (trails) and landings are expected to cover less than 10% of any harvest unit after yarding (RMP standards and guidelines (p. C-1-2)). Existing skid trails would be used to the degree practical and count toward the 10% affected area.

The severity and amount of disturbance would vary with the soil, equipment operator, soil moisture conditions, and the kind of equipment used. If a tractor/skidder is used, there would likely be less overall disturbance but more severe disturbance concentrated in skid trails and landings. If mechanized harvest or cut-to-length system is utilized, slash placed in front of machine tracks would reduce soil compaction and displacement. Ground disturbance for these machines would be more dispersed.

Timber Harvest - Skyline Yarding

Skyline yarding systems would thin about 56 acres. It would result in heavy soil disturbance in landings and thin, discontinuous strips of compaction and displacement in skyline corridors. About half of the landings would be located in roadbeds. Erosion and rutting would be minimized by constructing waterbars and leaving slash on corridors.

Roadwork

Construction of approximately 1.3 miles of temporary, native surface road would remove topsoil and cause severe, deep compaction on approximately 2.5 acres of forestland. Forest clearings created by new roadwork would be narrow (~25 feet width) and have a minimal effect on overall tree spacing and stocking. Road renovation and maintenance would be on existing severely disturbed surfaces and would have minimal affect on soil productivity.

Fuel Treatments

The proposed fuel treatments (hand piling and burning of hand piles in harvest units) would result in small (< 0.5 acre), scattered, localized areas of severe soil disturbance potentially altering nutrient availability, soil infiltration, and soil structure. To minimize soil damage,

burning would be restricted to wet soil conditions when soil resources are less vulnerable to impacts.

Soil Productivity

Soil productivity is a complex interaction of physical, chemical, and biological processes. Many factors affect forest productivity. Forest soils properties and climatic conditions vary widely. Maintenance of adequate porosity (i.e., soil compaction) and organic matter are key factors in retain site productivity. Most long-term productivity studies are less than 10 years old. It is thought that it takes at least 20 years to correctly evaluate the consequences of different forest management practices on tree growth (Morris and Miller 1994). Soil productivity studies have focused upon the affects of clear-cut harvesting. Changes in site productivity from thinning treatment are not well documented. Consequently, it is difficult to accurately measure the long-terms effects of forest management activities on soil productivity. However, several early findings have emerged. Long-term effect of these disturbances on productivity depend largely upon soil resiliency and recovery processes. Potential impacts on soil productivity are best evaluated on site-specific, growth-determining factors (Miller, 1996; Heninger, 2002; Scott et al, 2004). Soil compaction can have various effects on soil productivity, neutral, positive, or negative.

The proposed action is expected to maintain soil productivity and is expected to be within the range of effects analyzed in the 1995 Salem ROD/RMP, to which this EA is tiered.

Project Design Features and Best Management Practices would be implemented to limit severe soil disturbance (See Water, Fisheries and Soil Resources PDFs). Best management practices for fragile FWPR1 areas would include minimizing practices that disrupt natural drainage, avoiding use of ground-based equipment when soils are wet, and planting with site adapted tree species. All timber yarding, road decommissioning, construction, and renovation would occur during the dry season when soils are stronger and less prone to compaction.

The humid mild climate is favorable for growing trees. Most soils within proposed harvest units have good physical and biological properties (deep, low bulk density, high organic matter content) for growing forest vegetation making them resilient from intensive timber management. Results of beginning long-term productivity studies in coastal Washington on similar soils and climates of the project area found that altered soils from forest harvest have little or no impact on early growth of Douglas-fir seedlings (Miller et al, 1996, Adrian, et al 2005). In another study in the central Oregon Coast Range with similar climate and soils, with the exception of Mayger soils, commercial thinning using ground-based equipment on 20- to 60-year old Douglas-fir stands on dry soils, did not reduce, but slightly increased tree growth in trailside residual trees (Miller et al, 2007).

The proposed treatment is a thinning. Soil disturbances in thinnings are likely to be less widespread and less severe than clearcutting. They would leave most of the vegetation, root systems and litter in place. Leftover logging slash and coarse wood would increase soil

moisture available throughout the growing season, reduce erosion, add organic matter and nutrients.

Upon completion of the timber harvest, all of the natural-surfaced new and renovated roads approximately 2.3 miles) with favorable subsoils (approximately 90%) used during the harvesting activities would be de-compacted. Moreover, some skid trails and landings (especially the 26-acre area in the southwest corner of Unit 29-2) would probably also be decompacted. Subsoiling would increase infiltration of water and decrease water runoff. However, soil function and long-term productivity for these roads would likely remained impaired for 50 years or longer due to the loss of topsoil.

Cumulative Effects

The effects from the project action would be localized, and there would be no other uses affecting this resource within the project area. The proposed logging and roadwork would add a small net increase in soil compaction and displacement over existing levels. Given the slow rate of natural recovery from compaction for these soils, if the ground-based harvest units are re-entered in less than 10 to 25 years, there is a strong likelihood that there would be a cumulative (additive) effect, especially if the routes of heavy equipment (e.g., roads and skid trails) are not reused.

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

The analysis below includes the direct, indirect and, in separate sections, cumulative effects. Unless otherwise noted, the analysis was conducted on an area equal to ¼ Township (5,760 acres or nine Sections) from the centroids of the four sections where the proposed action harvest activity would occur. The portions of the analysis areas for the four sections overlap therefore the total analysis area is 16,687 acres. Within the analysis area there are 5,117 acres of BLM land with the remaining 11,570 acres being private land; primarily industrial forest land. See the Environmental Effects section of the Forest Vegetation analysis for a detailed description of the expected impacts to the forest vegetation component of wildlife habitat.

3.6.1 Affected Environment

Northern Spotted Owl

The proposed action area is within the Matrix land use allocation and is not within Designated Critical Habitat for the spotted owl. All of the stands to be treated currently are good quality dispersal habitat and are between 59 and 75 years old at the time of analysis. Some of the stands have QMD's over 18 inches dbh but due to the lack of structural diversity would not support owl foraging or nesting and therefore cannot be considered suitable

habitat. There are only about 210 acres of what could be considered low quality suitable spotted owl habitat within the analysis area, all of it on BLM land. The suitable stands are less than 80 years old also but due to some previous thinning and laminated root rot infection areas the stands are less dense and therefore have larger trees with some snags and down wood and generally are more diverse than the proposed action stands. The total dispersal habitat within the analysis area is about 5,391 acres with 4,061 of it on BLM land. There are no known spotted owl nests anywhere near the proposed project area. A check with Oregon Dept. of Forestry and the U.S. Fish and Wildlife Service did not yield any further information on owls on the east side of the northern Oregon Coast Range.

The spotted owl would be affected by this project only through the modification of dispersal habitat. Due to the minor impact to a component of spotted owl habitat, informal consultation with the U.S. Fish and Wildlife Service is warranted and would be completed programmatically within the appropriate years (year of sale if the proposed action is selected) Habitat Modification Biological Assessment in the "Light to Moderate Thinning" category.

3.6.2 **Environmental Effects Alternative 1: No Action**

By not managing the density of the 59-75 year old stands, development of suitable spotted owl habitat would be retarded in the long term by the slowed growth rate and increasing instability of the stands. This would be particularly true in the Connectivity Blocks (Sections 21 and 29) where the rotation age is 150 years and there is a management expectation that late successional habitat would be a dominant feature there. The lack of understory and structural diversity would limit the potential habitat for spotted owl prey species and prolong the period for the development of large platform structures suitable for owl nesting. Eventually the stands would self thin and small scale disturbances such as insect and windthrow events would open the stands, release some of the trees, and begin providing quality snag habitat, thus providing structural diversity. Without density management now, the process toward developing fully functional late seral habitat would be prolonged by several to many decades.

Cumulative Effects

There would not be adverse cumulative effects resulting from selecting the "No Action" alternative. The private lands are expected to be managed in the same way as described in the cumulative effects sections of the proposed action alternative. The forested environment on federal lands within the analysis area would continue to age and other density management projects would be expected to continue to occur and eventually the forested area on federal lands would diversify into a more complex forest structure or in the case of the GFMA lands may be regeneration harvested. Selecting the "No Action" alternative would neither positively or negatively contribute to the impacts already occurring in the analysis

area and would not change the status of owls or their habitat. By not implementing the proposed action, another area within the Tillamook Resource Area would be selected for density management and many if not all of the impacts associated with the proposed action would occur in a different area.

3.6.3 **Environmental Effects Alternative 2: The Proposed Action**

The proposed action would open the stand canopy and provide more growing room for trees on about 508 acres of Douglas-fir dominated forest. After thinning the canopy closure would, on average, remain about 60%. The understory brush layer would respond to additional sunlight as would shade tolerant understory trees such as western redcedar and western hemlock. In the short term, perhaps the next 10 to 15 years, the overstory canopy closure would be more open than desirable for spotted owls but would close again after 20-30 years. The additional understory structural diversity would benefit owls by providing a boost to a second canopy layer from which owls can hunt more effectively while possibly improving habitat for the prey base. The thinning would also provide a small burst of down CWD at the time of harvest which would be beneficial to small mammals. The long term benefits of the action would be best realized in the Section 21 and 29 project areas (Connectivity Blocks) where the rotation age is 150 years. The most deleterious effect of the thinning would be the halting of the natural snag production process by removing those trees that might otherwise die from the effects of tree-to-tree competition. Snags are important habitat elements for spotted owls in that they are the primary nesting and cover habitat for the northern flying squirrel (Carey 1991), which is the principal prey species for spotted owls in the northern Coast Range (Forsman et al., 1991). All-in-all the thinning of 508 acres of dispersal habitat would have a miniscule effect on spotted owls from the perspective that it is highly unlikely (although not impossible) that owls are still extant in the analysis area and that the habitat is currently not remarkable and would still function as dispersal habitat at the completion of the proposed action.

Cumulative Effects

In addition to the impacts of the proposed action on spotted owls, there are also past activities, other current activities occurring nearby on other lands, and future actions that are reasonably certain to occur that may also affect owls. Such actions include the BLM's *East Fork Nehalem Fish and Wildlife Enhancement Project* which is placing logs and trees in fish bearing creeks, understory planting conifers in Riparian Reserves where the overstory is open, and creating snags and large down woody debris. Also occurring is commercial timber harvest on private lands in the analysis area. There is very little timber anywhere nearby that is over 80 years and stands as young as 40 are being clearcut harvested. Aerial photo estimates show that about 8% of the private land within the analysis area is currently spotted owl dispersal habitat and none of it is suitable habitat. What can also be seen on the photos is the new road networks built into some of the remaining dispersal habitat stands, presumably

with the intention of harvesting those stands in the near future. With the exception of the two trees per acre average that the Forest Practices Act requires (which are almost always left in a discrete clump to be harvested in the future) there are virtually no snags or large down logs left on private land. It is likely that within 20 years private land will provide no habitat of any type for the spotted owl. Compared with the ongoing effects of habitat loss on private land, the proposed action is of little consequence. It is not likely that spotted owls could breed anywhere near the analysis area due to the overall habitat conditions, but if an owl were dispersing through the area survivability would probably be similar regardless of whether the proposed action occurred or not. The Fish and Wildlife Enhancement Project would most likely complement the proposed action and would offset some of the negative snag effects of the proposed action.

3.7 Special Status (BLM 6840 Policy), SEIS Special Attention (Salem RMP), and Migratory Bird Treaty Act Wildlife Species and Habitat

The analysis below includes species that could occur within the Tillamook Resource Area; have the potential to be impacted by the Gunner's Lakes Project; and are on either the BLM State Director's Special Status Species List from February 2008 or the USFWS's 2008 "Birds of Conservation Concern" list for the U.S. portions of the Northern Pacific Forest Bird Conservation Region. Both of these list are the most recent available. See Table 17 in *EA Section 8* for the complete list and a brief impact synopsis which shows which species may be impacted and are thus carried forward to the analysis below.

3.7.1 Affected Environment

Terrestrial Mollusks - Bureau Sensitive and Survey and Manage

The Gunners Lakes project area is within the range and contains habitat for six BLM Sensitive terrestrial mollusk species, three of which are also on the 2001 Survey and Manage list, and an additional species that is on the 2001 S&M list but is not on the BLM Sensitive list (see Table 17). These species are generally associated with the organic duff layer and moss on the floor of cool forested areas containing coarse woody debris, sword ferns, hardwood brush species and for some species, hardwood trees, especially big-leafed maple.

Warty jumping slugs are a very common slug on the west side of the Coast Range in northern Oregon with many hundreds of known sites entered in the database and many more hundreds of sites located but not in the database. On the east side of the Coast Range the warty jumping slug is less common but has been regularly encountered during surveys. The Tillamook westernslug occurs in the same general habitat and area as the warty jumping slug and is also very common on the west side of the northern Coast Range, but to date has not been found on the east side. The Oregon megomphix is a fairly common snail that is found much more regularly on the east side of the Coast Range in northern Oregon than on the west side.

The other four species either have never been found in the Tillamook RA after approximately 9,500 acres of survey or have only been encountered a very few times. There are three known sites of the Puget Oregonian in the Tillamook RA which represents a range extension of what was thought to be a Washington Cascades and Columbia gorge species and these sites are the only records in the Coast Range. According to the BLM's regional database the only site of the crowned tightcoil in all of Oregon and Washington is in the Nestucca drainage more than 60 miles southwest of the project area. Little is known about the spotted taildropper; and there appears to be some disagreement about which specimens actually represent the spotted taildropper. The Tillamook RA has one record of finding a specimen that according to Nancy Duncan (BLM mollusk expert, retired) represents the species and there are only three other records in the Northwest Forest Plan area. The salamander slug has not been encountered in the Tillamook Resource Area.

While Survey and Manage surveys are not specifically required for the Gunners Lakes project because the project falls under a Pechman exemption (see section 1.3.1),some surveys were done in the vicinity of the project areas in the autumn of 2009 and during the early part of 2010 during periods of favorable weather (within the protocol parameters). Approximately 360 acres were surveyed and five individuals each of Oregon megomphix and warty jumping slug were found.

Johnson's Hairstreak- Bureau Sensitive

Johnson's hairstreak is a small butterfly that is dependent on coniferous forests that contain mistletoes of the genus *Arceuthobium*. The mistletoes occur mainly on western hemlock and occasionally true firs. The eggs of this butterfly are laid in mistletoe masses and the chrysalids overwinter there. The larvae feed on the leaves of the host plant. Historically the Johnson's hairstreak was thought to occur throughout the Pacific Northwest in old-growth forests. The current range is uncertain with most of the records for this species in Oregon being pre-1980. There have been some recent sightings in eastern Multnomah County but no known records of the species occurring near the proposed Gunners Lakes project. Many of the stands in Section 29 contain a component of western hemlock and some of these stands contain mistletoe, particularly in the eastern portion of the section.

Migratory Bird Treaty Act

Executive Order (EO) 13186, issued Jan. 17, 2001 directs federal agencies to enter into a Memorandum of Understanding (MOU) with the U.S. Fish and Wildlife Service to further the goals of the Migratory Bird Treaty Act of 1918. The pertinent goals of the EO are to "support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures and practices into agency activities and by avoiding or minimizing to the extent practicable adverse impacts on migratory bird resources when conducting agency actions"; and to "ensure that environmental analyses for Federal actions required by the NEPA or other established environmental review processes evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern".

To date the BLM has not completed the MOU process, but has issued interim guidance in the form of Instruction Memorandum No. 2008-050 instructing administrative units to minimize unintentional take as defined by EO 13186 and to optimize migratory bird efforts related to BLM activities.

The Gunners Lakes project would cut and remove trees; and construct, renovate and decommission roads which could result in the unintentional take of adult or nestling birds that are covered by the MBTA, or result in failed nesting attempts. In general thinning of young dense conifer forests results in greater abundance of birds and, depending on the presence of other habitat features such as snags, hardwoods, etc, can also increase bird species richness. Of the bird species that are included in the USFWS's 2008 "Birds of Conservation Concern" list for the U.S. portions of the Northern Pacific Forest Bird Conservation Region only the **olive-sided flycatcher, purple finch** and the **rufous hummingbird**, occur within the analysis area and have the potential, either negatively, positively or both, to be impacted by the Gunners Lakes Project.

Olive-sided Flycatcher

In the Coast Range, the olive-sided flycatcher builds nests in mature conifer stands, preferring western hemlock and Douglas-fir, with openings nearby such as early seral forest stands, marshes, ponds etc. over which they forage. This bird arrives on the breeding grounds in early- to mid-May with nest building most evident in early to mid-June and fledging in mid-July. Olive-sided flycatchers are conspicuous when singing and flycatching from high perches on snags or tall trees adjacent to openings.

The Gunners Lakes area contains some marginal olive-sided flycatcher habitat in the mid-seral habitat with larger trees, particularly along forest edges, in laminated root rot pockets, and along the ponds and marshy areas in the vicinity of the proposed project, although the oldest stands in the area are still a little younger than that preferred by olive-sided flycatchers.

Purple Finch

Purple finches are breeding residents of low to mid elevation, open to semi-open conifer forests in western Oregon and parts of the Blue Mountains of eastern Oregon. Winter residency in Oregon is erratic, varying from year to year with most individuals migrating south for the winter. While purple finches are still somewhat common, their numbers have been declining in recent years. The reasons for the perceived decline are unclear but loss of habitat from conversion of forestland to urban or agricultural uses and competition from the house finch are thought to be contributors (M. Patterson; *in* Birds of Oregon: A General Reference, 2003).

Purple finches undoubtedly breed in the vicinity of the Gunners Lakes Project along riparian corridors, at the edges of laminated root rot pockets, along edges of old clearcuts and in other areas of reduced canopy cover. With the exception of the outer edges, the proposed thinning

units are probably not preferred purple finch habitat in that the canopy is rather closed and the shrub layer is rather simple.

Rufous Hummingbird

Rufous hummingbirds can be found in a variety of habitats as long as a well developed flowering shrub layer is present. Foraging consists of feeding on nectar from flowering shrubs such as red-flowering current and red elderberry, as well as on tiny insects, spiders and mites that are gleaned from plants. Nests are generally found between ground level and about 16 feet (D. Vroman; *in* Birds of Oregon: A General Reference, 2003). This hummingbird is the most common hummingbird in Oregon and is the only breeding hummingbird in the Gunners Lakes area. Areas of recent clearcut on private land in the vicinity of the proposed density management units provide good habitat for the rufous hummingbird. The proposed units themselves do not include good hummingbird habitat in that there is little foraging opportunity

3.7.2 **Environmental Effects Alternative 1: No Action**

Terrestrial Mollusks

Under the "No Action" alternative none of the impacts associated with forest stand thinning would occur. The microclimatic conditions would be affected by slow changes in the forest condition as the stands age with the occasional small scale disturbance events, such as windthrow or insect and disease attacks causing crown openings to develop. The forest stands would grow more slowly as competition for site resources become more intense resulting in mortality of the competition "losers" which would benefit those terrestrial mollusks that seem to favor coarse woody debris, such as the warty jumping slug. In areas where salal and Oregon grape dominate the shrub layer, habitat for terrestrial mollusks would continue to be poor for those species that like moister sites dominated by sword fern such as the Oregon megomphix. Overall the current cohort of species would continue to persist with little change within the foreseeable future.

Johnson's Hairstreak

Under the "No Action" alternative none of the impacts associated with forest stand thinning would occur. Mistletoe would continue to persist within the stands where it currently exists and would very slowly radiate out from the current population concentrations. Although the likelihood that Johnson's hairstreak is present in the proposed project area is low, if it is there conditions would persist for the indefinite future and would become better habitat over the long term (many decades) as that stands move toward a late seral condition.

Cumulative Effects – Terrestrial Mollusks and Johnson's Hairstreak

The terrestrial mollusks analyzed here and the Johnson's hairstreak all occupy small site ranges and could persist (if present) within the BLM lands the Gunners Lakes project area regardless of the impacts that have, are, or will be occurring on private lands nearby. The BLM's *East Fork Nehalem Fish and Wildlife Enhancement Project* will continue to occur for the next year or so but would not contribute any impacts to the same area as the Proposed Gunners Lakes project. Consequently, there would not be any cumulative effects associated with selecting the "No Action" alternative beyond those direct and indirect impacts identified above.

Migratory Bird Treaty Act

Under the "No Action" alternative none of the activities described for the Proposed Action alternative would occur. The current habitat condition for Migratory Bird Treaty Act listed Species of Concern would be unaffected now and in the near future. Neither the negative nor the beneficial effects to habitat for migratory birds would be realized. The stands would continue to grow at a declining rate and become less stable over time. Eventually disturbances such as windthrow or insect attack (or possibly fire) would influence the character of the stands and introduce more structural diversity into the ecosystem. Not thinning the proposed action stands would maintain less desirable habitat conditions for the rufous hummingbird and the purple finch in the near term (next few decades) and possibly into the long term since both of these species favor more open forested conditions. The olive-sided flycatcher may also find the unthinned stands less favorable than thinned stands but that assessment is less clear in that stands that are too open are not favored for nest site selection. However thinned stands that maintain high growth rates and then recover canopy closure with larger, denser crowns that mimic late-seral conditions may be more beneficial to olive-sided flycatchers within a few decades as long as open foraging areas still occur nearby. Due to the limited scale of the project area and the small potential for impacts, neither the proposed action nor the "No Action "alternative would affect the population viability or trends for the purple finch, rufous hummingbird or the olive-sided flycatcher.

Cumulative Effects – Migratory Bird Treaty Act

While the actions on private lands in the analysis area probably benefit the rufous hummingbird, they are most likely detrimental to the purple finch and olive-sided flycatcher and the East Fork Nehalem Fish and Wildlife Enhancement Project would have little impact on any of these species. Considering the scope of activity on private land compared to the potential for impacts, or lack thereof, from the "No Action" alternative, no cumulative impacts are expected from a decision to select the "No Action" alternative.

3.7.3 **Environmental Effects Alternative 2: The Proposed Action**

Terrestrial Mollusks

In general, light to moderate thinning of mid-seral forest stands cause minor changes in the microclimate at the ground level post harvest. Results from studies of microclimate changes between various thinning densities compared to unthinned stands seem to indicate that, although thinned stands are warmer and dryer than unthinned stands, there is considerable overlap in conditions between them suggesting that these stands provide a wide range of microclimates (Chan et. al. July 2004). The Gunners Lakes project proposes to thin the stands from below and will result in canopy closure after harvest of approximately 60%. Considering that even in unthinned stands there are long periods in a given year when the climate is unsuitable for terrestrial mollusk activity, it stands to reason that there may only be a slight change in the average time when conditions in the thinned stands are unsuitable for mollusk activity compared with the unthinned stand condition; presumably on the cusps of the dry weather in the early summer and later fall; and if there is a change, it may be within the range of natural variability. Also, the additional cover at the ground level provided by the increase of the shrub layer due to the thinning would moderate some of the effects of additional solar radiation and air movement through the stand. On approximately 15% of the acres, treatment in laminated root rot pockets would include the cutting of gaps (1/4 to 1 acre in size) or thinning heavily leaving approximately 30 trees per acre and possibly treating the resulting slash by burning or some mechanical method; however the average for the whole treatment area will still remain ~60%. In the "gap" or heavy thinning areas, ground conditions could be changed to a point where they are unfavorable to terrestrial mollusks for a longer portion of a year, perhaps by as much as 6-8 weeks. Additionally, harvest activities, especially ground-based harvesting can have direct impact on mollusks by crushing individuals or breaking apart later decay stage coarse wood.

The principles of conservation biology hold that species with patchy distribution and that have genetically isolated populations are at greater risk of extinction. With so little available information and few records of the crowned tightcoil, salamander slug, spotted taildropper and Puget Oregonian (in Oregon) it is impossible to accurately assess the impacts of a project like the Gunners Lakes project on these species. The true rarity of these species cannot be determined by the available data since only the Puget Oregonian, Oregon megomphix and warty jumping slug were included in the Survey and Manage program and thus the other species were not specifically searched for during surveys (although all good surveyors learned to identify all species encountered, the non-S&M species were not always recorded). That said, we expect the level of direct and indirect impacts to Sensitive and Survey and Manage mollusks to be minor based on the design features.

Johnson's Hairstreak

Although the total number of hemlocks within the stands would be reduced they will be maintained within the thinned stands at approximately the same proportion that they occur now or possibly at a slightly increased proportion. Since there would be no intention to eradicate mistletoe from any of the thinning units, overall there could be a very minor potential impact to Johnson's hairstreak habitat by the incidental removal of some of the young hemlocks that are infected with mistletoe. Over the long term (greater than 20 years) the thinned stands would continue to develop into later seral stage forest including those trees

that remain with mistletoe infections and over time may develop into improved habitat by allowing hemlocks to maintain or increase their growth. Overall there could be a minor short-term negative impact to Johnson's hairstreak habitat as some mistletoe infected hemlock is removed, but in the long term the habitat would improve as mistletoe continues to develop on trees that have been released through the thinning.

Cumulative Effects – Terrestrial Mollusks and Johnson's Hairstreak

The Sensitive species addressed by this analysis generally require attributes found in forests that are in the mature to late-seral stage. The project area is barely on the cusp of qualifying as suitable habitat for these species; however it is the best habitat available in the East Fork Nehalem subwatershed. There is very little private land in the subwatershed that has trees that are 70 years old or older. Generally forest management on private land is aimed at maximizing the production of Douglas-fir and there is no requirement to reserve any down woody debris. Bare ground and young plantations of Douglas-fir are not favorable habitat for Sensitive terrestrial mollusks and hemlock mistletoe is considered a tree pest to be eradicated. While the thinning of about 508 acres of conifer forest on BLM land may temporarily reduce the habitat quality on those acres, its cumulative impact compared to the intensity of impacts on private lands would be imperceptible and would not result in any additional population viability loss.

Migratory Bird Treaty Act

Olive-sided Flycatcher

There is a small possibility that the proposed thinning could affect individual flycatcher nests that could be present in the stand, and thus result in "Take" under the MBTA. The proposed project would generally benefit flycatcher habitat by providing more early seral openings (root rot pockets) in the vicinity of the mid-seral stands that are being thinned, thus providing additional foraging opportunities.

Purple Finch

The proposed action would generally benefit the purple finch by increasing or improving breeding habitat through the opening of the canopy and treatment of laminated root rot pockets by removing the majority of trees in infected patches thus creating small early seral gaps/edges. It is possible that through the harvesting process that one or more nests could be destroyed if individual purple finches chose to nest within the proposed units, therefore "Take" under the MBTA is possible, although somewhat remote.

Rufous Hummingbird

The proposed action most likely would not directly impact any hummingbirds except for the very slight possibility that there may be a few nesting in a proposed harvest unit near an opening with suitable forage. "Take" under the MBTA is possible but remote. On the other

hand, the expected development of the understory brush layer from the thinning of the overstory, especially in the "gap" areas, would improve hummingbird habitat for the next ten to twenty years.

Cumulative Effects – Migratory Bird Treaty Act

Considering the low level of potential impacts associated with the proposed action there are not expected to be any cumulative impacts caused by the proposed action relative to the impacts occurring on the private lands in the analysis area. From a population viability perspective, the low level of impact and the relatively small scale of the project compared to the range of the three species analyzed here would not result in any additional cumulative effects.

3.8 Recreation

3.8.1 Affected Environment

The Gunner's Lakes project area includes Scaponia Park in Section 7. Scaponia is a BLM campground managed by Columbia County under the authority of a Recreation and Public Purposes Act lease. The campground is open to the public throughout the year, with peak use between June and September. The short (approximately 900 feet long) hiking trail connecting Scaponia Park with the Jim George Road (4N-3-7.3) is used primarily by park visitors and receives relatively low use. Design features have been incorporated to reduce impacts to the trail. The entire project area is used during deer and elk hunting seasons with the most use during the rifle seasons in October and November.

With the exception of section 7, which is behind a locked gate, the project area is open for public access. Recreational opportunities within the area include driving for pleasure, hunting and OHV use. Lands within the project area are designated as "open" for OHV use. Evidence of moderate OHV use can be seen throughout the area. Oregon Department of Forestry is developing a designated riding area near Nicolai Mountain, approximately 60 miles northwest of the project area. A designated area, in relatively close proximity, may lessen the amount of OHV use within the project area as users move to a more developed, looped system.

3.8.2 **Environmental Effects Alternative 1: No Action**

There would be no effects on recreational activity within the project area under this alternative. Current recreational uses within the project area such as hunting, sight-seeing, OHV riding, camping and hiking would continue.

Cumulative Effects

Because there are no direct or indirect effects on recreation under the No Action alternative, there would also be no cumulative effects.

3.8.3 **Environmental Effects Alternative 2: The Proposed Action**

Implementation of the Proposed Action within Section 7 would affect the use of the trail connecting Scaponia Park to Jim George Road in that it would temporarily prevent use of this trail during operations. Scaponia Park would be buffered from the project although visitors to the area may see and hear activity during periods of operation closest to the park.

Construction of roads and skid trails have the potential of providing additional riding opportunities for riders with the exception of those roads and skid trails that are to be closed or decommissioned upon completion of the project. Closure of these roads and skid trails would be incorporated to limit sediment delivery to streams, ensure growing opportunity for young trees, and limit further soil displacement. Roads and skid trails that are closed or decommissioned at the completion of the project will need to be closed in a manner to limit OHV access. Possible closure methods would include placing stumps or boulders at the access points and placing materials within the boundaries for the first 100 to 500 feet. Signage marking the road or skid trail closed to motorized use may be incorporated if materials are not available for placement. It is unlikely that this project would cause an increase in OHV use within the area.

Cumulative Effects
Under the proposed action, no cumulative impacts are expected. Recreation use, including OHV use, would continue at near-current levels with potential for increasing or decreasing use over time.

3.9 Invasive, Nonnative Species (Executive Order 13112)

3.9.1 **Affected Environment**

Existing vegetation consists of a 35-75 year-old conifer overstory, scattered pockets of hardwoods, an under-story of common shrubs and scattered populations of grasses and forbs. A comprehensive plant species list is located at the Tillamook Resource Area field office.

Varieties of habitats are represented throughout the project area (substrates, rock, features, elevations, slopes, aspects, water, and topography). Any ground-disturbing activity that occurs within these habitats offers opportunity for the introduction of noxious weeds and/or invasive non-native plant species based on the existence of a seed source. Botanical surveys for Invasive, non-native plant species within the Gunners Lakes project area began in June 2009 and will be concluded by August 2010. Completed surveys indicate that where mature native plant communities were established, non-native species were not dominant or were non-existent. Species that were identified within the proposed project areas consisted of Bull thistle, (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), Scotch broom (*Cytisus scoparius*), Tansy ragwort (*Senecio jacobaea*), Himalayan blackberry (*Rubus* discolor), Reed Canary grass (*Phalaris arundinacea*) and St. Johns-wort (*Hypericum perforatum*). These species were located along road edges and exposed areas that tended to have soil disturbance (i.e. open meadows, past commercial thinning, riparian areas and OHV trails). These species are designated as category B (established infestations) on the Oregon Department of Agriculture (ODA) Noxious weed list. These aggressive weed species are prevalent throughout Western Oregon and proliferate easily through vectors such as human traffic, animal movement, wind, and water. Ground disturbing activities such as new road construction, reconstruction and decommissioning, yarding corridors, tractor skid trail development, landing use, and haul road maintenance are the most likely activities that could produce conditions conducive to noxious weed establishment. Some degree of noxious/exotic weed introduction or spread is probable as management activities occur in the project area.

3.9.2 **Environmental Effects Alternative 1: No Action**

No Effect – Surveys completed show that most invasive/non-native species found were located along existing roadways. No appreciable increase in the noxious weed populations identified during the field surveys is expected to occur if no action is taken. Plant communities within the project area would continue to be dependent on ecological processes currently in place if no action is taken. No appreciable increase in the non-native or invasive plant species populations identified during the field surveys is expected to occur within the interior of existing stands. However, as regeneration harvest occurs on lands adjacent to public lands, an increase of non-native invasive plant species would invade the areas that are exposed to higher intensities of light and seed sources have become established.

3.9.3 **Environmental Effects Alternative 2: The Proposed Action**

Category B designated noxious weed species found were located along existing roadways. Initial increase in population size and new establishment due to density management thinning activities should be confined to disturbance areas as described above in "affected environment" and would be expected to decrease over time as native species revegetate and the recovery of canopy closure occurs. The Invasive/Non-native plant species identified do not tolerate overtopping and can be negatively affected by competition for light. Design

features that are incorporated into this project such as introducing native plant species on disturbed sites and washing equipment prior to entering the project area, would mitigate increases in weed populations.

Cumulative Effects

The analysis area for cumulative effects to noxious/non-native invasive plant species is in the Northern Oregon Coast Range approximately 5 miles southeast of the town of Vernonia, Oregon located in the upper reaches of the Nehalem River watershed. Examples of forest management activities within the affected area that will create soil disturbance and influence the spread of noxious/non-native invasive plant species are: commercial and pre-commercial density management thinning, young stand maintenance, new road construction, road decommissioning, road maintenance, culvert replacements, helicopter landing zones, and off highway vehicle (OHV) trails. Activities that do not necessarily create disturbance but influence the spread of weed seeds are recreational hiking, biking, horseback riding, fishing, and hunting. Other sources of seed dispersal are from wildlife that are either passing through or frequent the area, water movement, natural dehiscence and wind. Many past and present management activities tend to open dense forest setting and disturb soils therefore providing opportunities for widespread weed infestations to occur. Many, if not all of the weed species designated as category B (established infestations) on the Oregon Department of Agriculture's (ODA) noxious weed list are present throughout the area. Because they are present in and adjacent to the project area, newly formed seed is readily available and/or an established seed bank is present. Most non-native weed species are not shade tolerant and will not persist in a forest setting as they compete for light when tree canopies close and light to the under-story is reduced. So, based on what we know about invasive plants distribution, dispersal mechanisms and their ability to establish in newly disturbed sites we can expect new and old populations to fluctuate over time within the analysis area based on these factors as described.

No cumulative effects are expected with regard to invasive /non-native plants because the project would not contribute to the spread of invasive species populations or to the introduction of new species with the implementation of project design features and because little or no difference in the composition or numbers of invasive/non-native species populations have been observed in similar projects on BLM lands in the vicinity.

3.10 Special Status and SEIS Special Attention Plant Species and Habitat

It is the policy of the BLM to conserve Threatened and Endangered species and the ecosystems they depend upon primarily by prescribing management for conservation of lands these species inhabit (BLM Manual Chapter 6840). The primary goals of the Threatened and Endangered Species Program are inventory, monitoring, plan preparation, and plan implementation to ensure the maintenance and recovery of these species.

Similarly, it is BLM policy to manage Candidate species and their habitats to ensure that BLM actions do not contribute to the need to list any Candidate species as Threatened or Endangered. The Oregon BLM Director has the authority to designate Sensitive (or Special Status) Species, which are to be managed under the same policy as Candidate species. It is also BLM policy to carry out management for the conservation of state-listed plants. Surveys being conducted for the Gunners Lakes Project area are compliant with these management policies.

As discussed in Section 1.3.1, this project is exempt from Survey and Manage Standard and Guide requirements.

3.10.1 **Affected Environment**

The proposed project area lies within the East Fork Nehalem Watershed. According to the East Fork Nehalem Watershed Analysis, as of 1996, about 9% of the BLM lands within the watershed were in early-seral habitat; 70% in early- to mid-seral habitat, consisting of immature to mature conifer stands ranging in age from 35 to 75 years; 2% of the stands were composed of conifer more than 76 years old and 19% of the stands were classified as hardwood or mixed conifer/hardwood stands generally 66 to 46 years of age. Since 1996 the only harvest activity within the proposed project area has been 12 acres of regeneration harvest (Section 29), 25 acres of commercial thinning (Section 29) and salvage of scattered blow-down and hazard trees (Sections 7 and 21).

Units planned for thinning range in age from about 57 to 73 years, the weighted average age is 69 years. They are essentially single-storied stands, Douglas-fir-dominated. The most abundant understory species are sword fern, Oregon grape, salal and vine maple. Understory density varies with the amount of overstory canopy closure. The understory is often well developed where openings occur.

Plant surveys began in April 2009 and will be completed by August 2010. A complete record of the field surveys including a comprehensive plant list is available for review at the Tillamook Resource Area field office. No Threatened or Endangered, Special Status, or Survey and Manage species have been identified to date.

3.10.2 **Environmental Effects Alternative 1: No Action**

There would be no effects to Special Status and Special Attention plant species and habitats under the No Action alternative.

3.10.3 **Environmental Effects Alternative 2: The Proposed Action**

Any listed species found as a result of conducting further surveys will be subject to protection using management recommendations for that species. If these types of recommendations are not available then an assessment will be conducted to consider protection based on specific habitat requirements.

Cumulative Effects

The analysis area for cumulative effects for sensitive plant species is in the Northern Oregon Coast Range approximately 5 miles southeast of the town of Vernonia, Oregon located in the upper reaches of the East Fork Nehalem Watershed. Much of the lands within the scope of this project are located behind locked gates and access is difficult. BLM managed lands are in a checkerboard pattern throughout this part of the coast range. Much of the adjacent ownership is in private holdings and has been observed at an accelerated harvest rate and only requires compliance with the Oregon State forest practices act concerning habitat alteration. Because the forest practices act does not require the private land owners to conduct pre-disturbance surveys and identify sensitive plant sites, a considerable amount of habitat adjacent to the project area is continuously being reduced, therefore increasing the importance of known site protection of sensitive plant species on public lands. Design features such as establishing no-cut stream buffers, harvest by commercial thinning vs. regeneration harvest, and increasing the amount of down woody debris, all contribute to the essential habitat requirements for sensitive plant species throughout the project area. Sensitive plant species located within or adjacent to the analysis area only have the ability to colonize or populate where required habitat is available.

3.11 Air Quality, Fire Risk and Fuels Management

3.11.1 **Affected Environment**

Air Quality

The major source of air pollutants within the Gunners Lakes 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 unsurfaced roads in association with road construction, road maintenance, and log hauling.

Smoke and dust contain pollutants consisting of small particles called particulate matter (PM). Particulate matter can cause health problems, especially in individuals with respiratory illness. Smoke in the air also affects visibility. Air quality standards are set by the Environmental Protection Agency and provide health and visibility protection as directed by the Clean Air Act of 1970, with amendments. The state of Oregon also sets standards to help protect air quality.

The project areas are located 10 - 15 miles west of the cities of Scappoose and St. Helens, Oregon, and closer to numerous unincorporated, smaller communities. St. Helens is classified as a Smoke Sensitive Receptor Area under the *Oregon State Implementation Plan* and *Oregon Smoke Management Plan.* The anticipated haul routes will include BLM, private, and county maintained asphalt, gravel, and dirt surfaced roads.

Fire Risk

The climate in Northwest Oregon is generally mild and wet in the winter. Occasionally, 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 60.5° F with high temperatures reaching the mid to upper 90's, 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 lightning and people. Dry lightning (lightning that that has no accompanying moisture) that occurs during the summer months is rare in Northwest Oregon. Approximately 4% of fire starts in the analysis area are attributed to lightning. The highest risk ignition source within the analysis area is people. Section 7 is located behind a locked gate but is still relatively accessible to the public by walking in on Jim George Road, or on a hiking trail that leaves the Scapponia Recreation Site and ties in with the Jim George Road. Sections 9, 21, and 29 are accessible to the public via rocked roads.

Fire Regime and Condition Class (FRCC)

The modeling predictions of fire regimes within the Gunners Lakes analysis area are listed in Table 12.

Table 12: Modeling Predictions of Fire Regimes for the Project Area

Vegetation Community (Potential Natural Vegetation Group)	Fire Regime	Condition Class	Fire Severity	Fire Regime Characteristics			
				Percent of fires	Mean interval (years)	Minimum Interval (years)	Maximum interval (years)
Douglas-fir / western hemlock (dry mesic)	III	1	Replacement	25%	300	250	500
			Mixed	75%	100	50	150
Douglas-fir / western hemlock (wet mesic)	V	1	Replacement	71%	400		
			Mixed	29%	>1000		

The fire regime classifies the role fire would play across the landscape in the absence of modern human intervention. The analysis area 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. The Condition Class classifies the amount of departure from the natural fire regime. The timber stands in the analysis area generally fall within Condition Class 1 with species composition and structure functioning within their natural (historical) range. Some stands are moving into Condition Class 2 with moderate increases in tree density, recent fire exclusion, and replacement of shrubs with woody fuels and litter.

Timber Stand and Fire History

The Gunners Lakes analysis area has experienced numerous management activities over the past 100 years. Prior to the formation of the BLM under the General Land Office (GLO) in the 1920's and early 1930's, timber was harvested in Sections 7, Section 9, and Section 21. (See Metskers Atlas of Columbia County) In 1938 with the formation of the GLO's Oregon and California Revested Lands Administration (O & C Administration) timber was harvested in Section 29 following the Columbia County Burn that occurred in the 1930's. This burn was likely caused by escaped slash burns, as this was a common cause of wildfires during this era of logging in Northwest Oregon. Files show that the NW ¼ of Section 29 (Unit 29-2), including approximately 50 acres of the proposed project area was salvaged. Douglas-fir and redcedar were removed. In addition, the contract required a snag felling strip along the north side of BLM Road 4N-3-29.3 from the junction of Jeppeson Rd (4N-2-20.1). This was a common clause in timber sale contracts of this era to help reduce the potential for wildfire starts and to reduce the intensity and spotting potential if a fire did start. BLM records also show that another salvage sale occurred within Unit No. 29-2 in the SE ¼ of the NE ¼. Douglas-fir and Western redcedar were also salvaged during this sale. A 1966 timber sale harvested the final residual trees within the section. The majority of timber stands in the

analysis area were established during the mid to late 1930's to the early 1940's. It has been 70 to 80 years since these fires occurred in the area, well within the range of a normal fire return interval.

Fire Effects

The fire effects on forested areas are influenced by fire frequency, fire duration, and fire intensity (Van Wagner 1965). These factors in turn, vary with forest type, depending on fuel type and structure, topography, and weather variables (east winds often have a major influence on wildfire events in the area). Previous wildfires, fuels treatments, and timber harvests, proposed treatments in the analysis area that would occur in the future, as well as the suppression priorities placed on BLM land by the Oregon Department of Forestry (the contracted agency responsible for fire protection on BLM land) would result in a continued low risk of a major stand replacement wildfire.

The National Fire Plan (August, 2000) and the Ten-Year Comprehensive Strategy for Reducing Wildland Fire Risks to Communities and the Environment (May, 2002) places a priority on working collaboratively within communities to reduce their risk from fires. The Healthy Forest Restoration Act of 2003 (HFRA) builds on existing efforts of the Ten-Year Strategic Plan and stresses the need for development of Community Wildfire Protection Plans (CWPP). The Gunners Lakes analysis area is located within Columbia County, OR. The county completed a CWPP in September, 2007. This plan identifies "Communities At Risk" within the county where natural cover and wildland fires pose a potential threat to people and their homes. The analysis area is not adjacent to any identified "Communities At Risk", nor any BLM or county Wildland Urban Interface areas. Collaboration is essential to meet the objectives of the HFRA so fuels treatments that would reduce the likelihood of wildfire starts on federal land spreading to private land and eventually "Communities at Risk" would help the county to meet the goals of their CWPP.

Fuels Management

Commercial thinning prescriptions will change the structure of the timber stands in the analysis area. Management direction within the Matrix land use allocation (Connectivity/Diversity Blocks and General Forest Management Area) calls for minimizing intensive burning. Prescribed fires should minimize the consumption of litter and coarse woody debris (CWD). The current dead fuel load in these timber stands identified during stand exams and by using GTR PNW-105 *Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest* (Maxwell and Ward, 1980) is listed in Table 13.

Table 13: Coarse Woody Debris (CWD)

Unit Number	Curtis Relative Density Pre-Harvest	Curtis Relative Density Post-Harvest	Decay Class	Current CWD tons/ac.	Additional CWD ton/ac.	Future Snag to CWD tons/ac.	Total Future CWD tons/ac.
7-5	62	39	2 / 4	1 / 1	22 - 27	6	30 - 35
9-4	71	40	2	2	22 - 27	6	30 - 35
9-10	59	36	2	3	22 - 27	6	31 - 36
21-7	53	38	0	0	22 - 27	6	28 - 33
29-2	69	33	3 / 4	1 / 2	22 - 27	6	25 - 30
29-3	57	36	4	2	22 - 27	6	30 - 35
29-4	81	37	3	3	22 - 27	6	25 - 30
29-7	68	32	4	1	22 - 27	6	23 - 28

All of the existing course woody debris falls within Decay Classes 2 - 4. The stands currently fall under NFDRS Fuel Model 10 (Timber - (closed timber litter)). Following commercial thinning, management direction further requires leaving 240 lineal feet of logs (Decay classes 1 & 2) per acre, that have a minimum diameter of 20 inches at the large end, and that are at least 20 feet in length. This equates to approximately 1 ton per log or 12 additional tons of CWD per acre.

When harvest has been completed, fuels surveys will be conducted and commercial thinning units that are identified as containing hazardous fuels or as areas that need site preparation (*Phellinus weirii* pockets) for reforestation may have hand piles constructed within areas containing dense slash. Machine piles may be constructed along roads, and landing piles may be constructed where logs are hauled to roads. If fuel loads are relatively light along property lines or roads, slash pullback may be incorporated as the desired fuels treatment.

3.11.2 **Environmental Effects Alternative 1: No Action**

Air Quality

With no commercial thinning there would be no need for road construction or log hauling, and little need for road maintenance. There would be little need for hazard reduction and no need for site preparation prior to reforestation. Consequently, there would be no need for prescribed burning and no localized effects to air quality.

Fire Risk / Fuels Management

With no commercial thinning the no action alternative would allow the analysis area to 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) as well as the fine fuel load (1, 10, and 100 hour fuels) in these timber stands as stress-induced mortality within the stands increases. Areas infected with the root disease *Phellinus weirii* would see somewhat larger increases in fuel loading as Douglas-fir tree roots are weakened and the trees fall in small 1 to 2 acre pockets. Ladder fuel densities would continue to 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. There would be little need for hazard reduction anywhere except along roads, and no need for site preparation. As a consequence, there would be no need for hand or machine piling and burning, or landing burning, and no risk of one of these treatments escaping and starting a wildfire. The same areas currently behind locked gates would remain relatively inaccessible to the public. The risk of a wildfire would gradually increase as the fuel load accumulates and the stands near the mean interval for a naturally occurring return of fire.

Cumulative Effects

Under the no action alternative there would be no commercial harvest of timber, no log hauling, and no prescribed burning. Cumulative effects to air quality would be limited to small amounts of dust created by timber harvesting and prescribed burning on adjacent private land, and the recreational use of the road systems in the analysis area. The risk of a fire start would remain low. The stands would continue on their trajectory toward a natural return of fire as the main disturbance mechanism with the fuel load slowly increasing over time and with it the potential for producing large quantities of smoke associated with a wildfire.

3.11.3 **Environmental Effects Alternative 2: The Proposed Action**

Air Quality

The project areas will have timber harvested and logs will be hauled over short sections of BLM and other roads. Dust created from vehicle traffic on gravel or natural-surface roads, from road construction, road maintenance, logging operations, and log hauling would contribute short-term effects to air quality. Hauling logs would not create dust above threshold levels. These effects would be localized to the immediate vicinity of the operations.

If the increased fuel load resulting from harvest is determined by the BLM to be a fire hazard, or to significantly reduce the ability to reforest then prescribed burning in the form of hand or machine piling and burning, or landing burning would be conducted and smoke will be created. Hand or machine pile burning, and landing pile burning that would occur during the fall/ winter time period would be coordinated with the local Oregon Department of Forestry office. All burning will 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 SSRA's 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.

Where hand or machine pile burning, or landing pile burning is the designated hazard reduction or site preparation strategy the short term impacts to air quality within one-quarter to one mile of units would persist for 1-to-3 days. 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 the major 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.

Slash created by the harvest of timber and the addition of coarse woody debris for wildlife habitat would add an estimated 22 to 27 tons/acre of dead fuel to the commercially thinned harvest units.

Wildfire or prescribed fire has a major influence on vegetation in the analysis area. It specifically affects seedbed preparation, nutrient cycling, successional pathways, fish and wildlife habitat, vegetative species composition, age, and structure, insect and disease susceptibility, and fire hazards.

Fire effects from wildfire may include: total tree mortality, formation of snags, loss of plant, fish and wildlife habitat, loss of resources on adjacent private land, elimination of the duff and litter layers, reduction of the downed woody component (especially logs in later stages of decay), loss of soil productivity, increased soil erosion, increased sediment loading to streams, decreased infiltration rates, and short term, high level inputs of smoke into the air. All commercial thinning harvest projects result in short term (1-5 year) increased fire ignition potential because of the increase of fine dead fuels.

The first strategy to reduce the risk of a fire is to reduce fuels in accessible areas. The project area in section 7 is relatively inaccessible behind a locked gate. Sections 9, 21, and 29 are readily accessible to the public via BLM, private, and county roads.

Commercial thinning from below will remove ladder fuels (fuels that provide a "ladder" for fire to climb from the surface into the crowns) and decrease tree crown density (or crown bulk density) to levels that would be unlikely to sustain a high intensity crown fire. A relative density of 35-45 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 (See Table 14) falls within or below this range.

Surface fuel reduction in strategic locations such as landing areas, along roads, property lines, and in *Phellinus weirii* pockets through hand piling and burning, machine piling/landing piling and burning or slash pullback will further reduce the risk in accessible areas. Increasing the height to the live crown base, opening canopies, and reducing surface fuels should result in lower fire intensity, less probability of torching, and a lower probability of an independent crown fire.

The second strategy to reduce the potential of a large fire is through aggressive initial attack of all fire starts. BLM managed lands in Western Oregon are protected through a contract with the Oregon Department of Forestry. BLM land managed under the Matrix LUA within the analysis area has been identified for aggressive initial attack.

For the short term, the fire risk associated with the commercially thinned timber stands in the analysis area would remain low. Over the long term, the fuel load would steadily increase, primarily as a consequence of increased mortality of diseased (*Phellinus weirii* infected) and other stressed trees in the stands, but also as a result of the wildlife trees left as snags and other trees left for future coarse woody debris (CWD) recruitment.

Fuels Management

The fuel load will increase as a result of the proposed action. Slash created by the harvest of timber and the addition of Decay Class 1 and 2 coarse woody debris for wildlife habitat would add an estimated 22 - 27 tons/acre of dead fuel to the commercially thinned harvest units.

Treatment of selected, high hazard fuel concentrations is planned for hazard reduction and site preparation. Hand piling and burning, machine/landing piling and burning, slashing, lopping and scattering, and pullback of slash to create fuel free zones will be used individually or in combination in the project area.

Fuels treatments in areas with elevated risk of human-caused ignition would reduce potential fire starts. Fuels treatments adjacent to areas with high value resources such as riparian habitat, and private lands, would reduce potential costs associated with fire suppression. The proposed fuel treatments associated with prescribed burning would result in small (<0.5

acre), scattered, localized areas of severe soil disturbance. This would potentially alter nutrient availability, soil infiltration, and soil structure. To mitigate this damage burning would be conducted during the fall with wet soil conditions, when soil resources are less vulnerable to impacts. Piles will not be constructed in riparian buffers. See Table 4 for approximate treatment acres and numbers of piles to be constructed in each unit.

Cumulative Effects

Under the proposed action alternative, air quality issues will be local and of short duration during timber harvest, log hauling, road maintenance, and the burning of hand, machine, and landing piles. With the current trend in the public's activities on federal lands the potential for wildfire starts would be expected to remain the same or increase slightly if recreational activities increase. The commercial thinning units within the analysis area would likely see a decrease in use as a result of the slash created during harvest. There would be a decrease in the potential for wildfire moving from surface fuels in the harvest units into the crowns with the removal of ladder fuels, however there would be a cumulative short term one to five (1 - 5) year increase in the risk of a fire start due to the residual slash left following harvest. This increase will be somewhat mitigated by the burning of hand, machine, and landing piles. Cumulative potential for a wildfire start would decrease in the longer term over the next few decades as the logging slash decays, and because the potential natural increase in the fuel load as a result of suppression mortality would not be present following harvest.

3.12 Carbon Storage, Carbon Emissions, and Climate Change

Resource Specific Methodology

On July 16, 2009, the U.S. Department of the Interior withdrew the Records of Decision (2008 ROD) for the Western Oregon Plan Revision. The information contained in the Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management (2008 FEIS) is relevant since it examined recent and applicable science regarding climate change and carbon storage. That analysis concluded that effects of forest management on carbon storage could be analyzed by quantifying the change in carbon storage in live trees, storage in forests other than live trees, and storage in harvested wood. The discussion on Volume I, Pages 220-224; Volume II, Pages 537-543, and Volume III, Appendices, Pages 28-30 are relevant to the effects analysis for this project and are incorporated by reference.

Context –Greenhouse Gases, Climate Change and the Spatial Scale for Analysis

Uncertainty about the nature, effects and magnitude of the greenhouse gases and global climate change interrelationship is evident in a wide range of conclusions and recommendations in the literature reviewed. However, Forster et. al. 2007 (pp. 129-234),

which is incorporated here by reference, concluded that human-caused increases in greenhouse gases are extremely likely to have exerted a substantial effect on global climate.

The U.S. Geological Survey, in a May 14, 2008 memorandum to the U.S. Fish and Wildlife Service, summarized the latest science on greenhouse gases and concluded that it is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. This defines the spatial scale for analysis as global, not local, regional or continental. That memorandum is incorporated here by reference. Based on the BLM's review of statutes, regulations, policy, plans and literature, the BLM accepts the conclusions above as appropriate context for a reasoned choice among alternatives.

Context – Temporal Scale for Analysis

This analysis will assess short-term and long-term effects on carbon storage and carbon emissions. The BLM has selected 0-10 years as the analysis period for short-term effects on carbon storage and carbon emissions, because this time period would encompass the duration of all of the direct emissions from the proposed thinning.

The BLM has selected 11-50 years as the analysis period for long-term effects on carbon storage and carbon emissions for this project. Within 50 years following the proposed thinning, net carbon storage would equal or exceed the carbon storage prior to thinning, therefore this period would be expected to encompass the duration of the direct and indirect effects on carbon storage and carbon emissions from thinning in the Gunners Lakes project area. In addition, 20-50 years following the proposed thinning in the Matrix LUA, BLM staff would assess the stands for regeneration harvest or another partial cut harvest based on how well the trees grew during the 50 year period, and whether the trees would meet the RMP timber management objectives of achieving a balance between wood volume production, quality of wood, and timber value at harvest (RMP p. 46). In 20-50 years, the BLM would also assess portions within the Riparian Reserve LUA to determine whether any further density management treatments would increase the development of late successional habitat conditions in line with the Aquatic Conservation Strategy.

Context – Calculations of Carbon Storage and Carbon in Greenhouse Gas Emissions, Project Area Scale

The purpose of the calculation of carbon storage is to provide a basis for evaluating the significance of carbon storage relative to the temporal and spatial scale. The BLM calculated estimates of existing carbon stores, of carbon to be removed by the proposed thinning, of storage of removed carbon, and of future carbon storage in the remaining trees in the stand. The Gunners Lakes Carbon Calculation notes (GC Carbon Notes in Project Record) are incorporated here by reference.

The BLM used site specific data from stand exams as input to the Oregon Growth Analysis and Project System Growth and Yield Project for Northwest Oregon Forests (Version 8.0 –

2005) (ORGANON) (a forest stand model) to determine stand growth over the analysis period. With the Gunners Lakes stand growth data, the BLM calculated carbon in the live trees and other than live tree pools using the methodology described in the 2008 FEIS Appendix C, pp. 28-29.

The analysis of carbon stored in harvested wood in the 2008 FEIS used a factor for converting board feet of harvest wood to mass of carbon from Smith et al. 2006, p. 35. Based on information developed after the 2008 FEIS, this factor has been refined to better account for regionally-specific conditions and the fraction of harvested volume that is typically milled into solid wood products and into processed wood products. Harvest volumes were converted to cubic feet, converted to pounds of biomass, and then to carbon content, yielding an overall conversion factor of 1,000 board feet = 1.326 tonnes of carbon.

Of this total amount of carbon in harvested wood, 63.8% of harvest volume is considered as sawlogs and 36.2% as pulpwood (GTR RM-199, Table B-6), for evaluation using the storage rates over time from Smith et al. 2006, p. 27. The improved conversion factor is used in this analysis to evaluate the amount of carbon stored in harvested wood. Information on the development of this conversion factor is on file in the BLM office and is available for review upon request and is incorporated here by reference (R. Hardt, personal communication, 11/6/09, on file in the Salem BLM Office). The effect of the 2008 FEIS alternatives on carbon storage has been reanalyzed based on this improved conversion factor.

This re-analysis revealed a slight increase in the amount of carbon storage over time for all alternatives and less difference among the alternatives than described in the 2008 FEIS, pp. 537-543. Overall, this re-analysis revealed no change in the magnitude or trend of effects on carbon storage from that described in the 2008 FEIS.

Carbon emissions from equipment used in harvest operations were calculated based on BLM staff interviews with purchasers who buy timber sales in the local area, fuel consumption specifications from equipment manufacturers' published information, and field observations by BLM personnel. The BLM fuels specialist calculated the carbon associated with the burning of harvest generated fuels.

3.12.1 **Affected Environment**

Climate Change

The Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management (2008) described current information on predicted changes in regional climate (pp. 488-490) and is incorporated here by reference. That description concluded that the regional climate has become warmer and wetter with reduced snowpack, and continued change is likely. That description also concluded that changes in resource impacts as a result of climate change would be highly

sensitive to specific changes in the amount and timing of precipitation, but specific changes in the amount and timing of precipitation are too uncertain to predict at this time.

Because of this uncertainty about changes in precipitation, it is not possible to predict changes in vegetation types and condition, wildfire frequency and intensity, streamflow, and wildlife habitat.

In addition, The U.S. Geological Survey, May 14, 2008 memorandum to the U.S. Fish and Wildlife Service (incorporated here by reference), summarized the latest science on greenhouse gases and concluded that it is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location.

Carbon Storage

The following show total quantities of carbon in forest ecosystem vegetation[3] worldwide, in the United States, the Pacific Northwest and in the Gunners Lakes project area.

- Total carbon, forest ecosystem vegetation, Worldwide (Matthews et al, 2000, p. 58) = 132-457 Gt[4]
- Total carbon, forest ecosystem vegetation, United States (US EPA, 2009) = 27 Gt
- Total carbon, forest ecosystem vegetation, Pacific Northwest, Cascades Range =1.5-1.7 Gt (Hudiburg, et al., 2009)
- Total carbon, forest ecosystem vegetation, Gunners Lakes proposed thinning units = 112,097 tonnes, which consists of live tree carbon (90,568 tonnes) and other than live tree carbon (21,529 tonnes).
- The annual accumulation of carbon from forest management in the United States is 191 million tonnes (.191 Gt), and 1.69 million tonnes (.00169 Gt) from current management on BLM-managed lands in western Oregon (2008 FEIS, p. 4-537).

3.12.2 **Environmental Effects Alternative 1: No Action**

Under the No Action alternative, no carbon as greenhouse gases would be emitted from harvest operations or fuels treatments. Carbon stored in live trees would not be converted to the harvested wood carbon pool, and would be converted to the other than live tree pool through ongoing processes of tree mortality. Table 15 shows live tree carbon would increase to 166,116 tonnes after 50 years of growth, an increase of 75,548 tonnes from the 2010 levels (90,568 tonnes). The No Action alternative would result in greater increase in net carbon over the 50 year analysis period than the proposed action by approximately 35,367 tonnes.

[3] Carbon contained in both above ground and below ground parts of trees and forest vegetation, and downed wood, litter and duff. It does not include mineral carbon in soil, nor fossil fuels.
[4] Metric tons are referred to in this document as tonnes. A Giga-tonne (Gt) is one billion tonnes (metric tons).

Cumulative Effects

The increase of 75,548 tonnes of live tree carbon associated with the No Action alternative would contribute to an annual average of 1,510 tonnes, or 0.000007% to the U.S. annual accumulation of carbon from forest management of 191 million tonnes; or 0.0008% of the annual accumulation of 1.69 million tonnes of carbon as a result of current implementation on BLM-managed lands in western Oregon. (2008 FEIS, p. 4-537).

3.12.3 **Environmental Effects Alternative 2: The Proposed Action**

Total carbon in forest ecosystem vegetation can be divided into three pools: live trees (foliage, branches, stems, bark and live roots of trees), forest carbon other than live trees (dead wood and roots, non-tree vegetation, litter and soil organic matter) and harvested wood products. As a result of thinning, BLM carbon calculations show that the overall on-site forest ecosystem vegetation carbon storage would decrease from 112,097 tonnes C to 77,658 tonnes C. The proposed thinning would cause direct effects on greenhouse gas levels by emitting carbon from harvest operations and fuel treatment.

Short-term Effects (0-10 years after timber harvest):

Harvest Operations

Harvest operations would emit carbon as greenhouse gases. BLM staff calculated an average fuel consumption of 2.65 gallons per 1 mbf (timber volume) from standing timber on site to the sawmill.

Fuel consumption for harvest operations for all of the Gunners Lakes timber sales would total an estimated 24,499 gallons. This represents total emissions of approximately 67 tonnes of carbon (GC Carbon Notes).

Live Trees Pool

Thinning would directly affect the live trees pool because the project would remove live trees. The proposed thinning would remove approximately 34,440 tonnes of carbon from the live trees pool. Approximately 56,127 tonnes of carbon would be retained in the live trees pool available for future growth and carbon storage, from the pre-treatment levels of 90,568 tonnes of carbon.

Harvested Wood Products Pool

Some of the carbon in harvested trees is stored in various forms; some is emitted to provide energy; and some is emitted without energy capture. Harvested saw log gross volume at Gunners Lakes of 9,246 Mbf would contain 12,260 tonnes (1 Mbf = approximately 1.3 tonnes carbon).

Much of the emissions from harvested wood would occur shortly after harvest. In the first 10 years after harvest, approximately 2,794 tonnes of carbon (23 % of the total carbon in sawlogs) would be emitted as a result of the proposed project.

Forest Carbon Other Than Live Trees Pool

The remaining 12,260 tonnes of carbon from the live trees pool would be converted to forest carbon other than live trees - dead material that would remain on-site. Pile burning approximately 242 tonnes of biomass from 508 acres would emit a total of approximately 110 tonnes of carbon as greenhouse gases.

The remainder of the on-site dead material would decay over time. In all alternatives, including the No Action alternative, the decay of dead material (dead wood and roots, non-tree vegetation and litter) would result in some portion of carbon emitted and some portion of the carbon entering into long-term storage as soil carbon. The rate of emissions from decay of dead material is unknown. Furthermore, it is not known whether the rate of emissions from decay of dead material, or the amount of dead material would differ between the proposed action and the No Action alternative. Therefore, emissions from decay of dead material are not quantified in this analysis.

Long-term Effects (11-50 years after timber harvest):

Live Trees Pool:

Following thinning, approximately 54-85 of the largest trees per acre would remain on site. These trees would store carbon as they grow. Table 14 shows that live tree carbon would increase to 130,749 tonnes after 50 years of growth, an increase of 74,622 tonnes from the post harvest of 56,127 tonnes. Fifty years after thinning, there would be an overall increase in live tree carbon of 40,181 tonnes from pre-harvest levels (short term change in live tree pool + long term change in live tree pool).

Harvested Wood Products Pool

From 11-50 years after harvest an additional approximately 1,069 tonnes of carbon *(of the total carbon in sawlogs)* would be emitted from harvested wood. Approximately 8,398 tonnes (of the total harvested carbon) of the carbon would remain stored in wood products still in use, in landfills, or emitted with energy capture (2008 FEIS, pp. 540-541; Appendices, p. 30).

Summary of Changes in Carbon Storage

Table 14: Summary of Carbon Storage and Carbon in Greenhouse Gas Emissions

Source	Tonnes Carbon (C)		Notes
	Proposed Action	No Action Alternative	
#1. C Storage in live trees pool 2010 (current conditions)	90,568	90,568	
Carbon Storage			
#2. C Storage in live trees pool (after thinning) 2010	56,129	90,568	
#3. Increase, C Storage in live trees pool, Growth Period (50 years)	74,620	75,548.11	#4 - #2
#4. C Storage in live trees pool, 2060	130,749	166,116	#2 + #3
#5. C Storage in harvested wood after 50 years	8,398	0	71% of C in harvested wood products (5,962.37 tonnes C)
#6. Total Carbon Storage, Analysis Period (2010-2060)	139,147	166,116	#4 + #5
Carbon Emissions			
Short Term Emissions (0-10 years)			
#7. Harvested wood	2,799	0	
#8. Harvest operations	67	0	
#9. Fuel treatment (burning)	110	0	
#10. Total Short term emissions	2,970	0	
#11. Long term emissions from harvested wood (11-50 years)	1,068	0	
#12. Total Carbon Emissions, Analysis Period (2010-2060)	4,039	0	
#13. Net Carbon Storage, Analysis Period (2010-2060)	135,108	166,116	#6 - #12
#14. Net Increase - Carbon Storage, Analysis Period (2010-2060)	44,540	75,548	#13 - #1
#15. Net Increase - C Storage in live trees pool, Analysis Period (2010-2060)	40,181	75,548	#4 - #1
Increase, C Storage in live trees pool, Growth Period (10 years)	17,272	18,288	Tree growth

Table 14 shows that during the 50 year analysis period the effects of the proposed thinning would be a net increase in carbon storage of 44,540 tonnes C. BLM carbon calculations show that 10 years after treatment, the live tree carbon in the thinned stands (73,137 tonnes C) exceeds the carbon emissions resulting from the proposed thinning (2,970 tonnes C).

Carbon calculations also show that 50 years after treatment, the live tree carbon in the thinned stands (130,749 tonnes C) exceeds the carbon storage before thinning (90,568 tonnes C).

Cumulative Effects

The proposed thinning would contribute to cumulative effects to carbon storage and carbon emissions. *Table 3* shows that carbon emissions resulting from the proposed thinning over the next 10 years would total 2,970 tonnes of carbon or 10,901 tonnes of carbon dioxide (tonnes C*3.67) (0.00005 GT). Current annual global emissions of carbon dioxide total 25 billion tonnes (25 GT) of carbon dioxide, (IPCC 2007, p. 513), and current annual U.S. emissions of carbon dioxide total 6 billion tonnes (6 GT) (EPA 2007, p 2-3). Global emissions over 10 years total 250 billion tonnes of carbon dioxide and U.S. emissions of carbon dioxide total 60 billion tonnes. Therefore, the short-term emissions from the proposed thinning would constitute 0.0000004% of current global emissions and 0.000001% of current U.S. emissions for the 10 year period. This emission would be so small that its incremental contribution to global and national emissions would be not be measurable at the level of precision of the global and national emissions.

In addition, the net carbon emissions would be of short duration. Within 10 years, the remaining trees in the harvest units would sequester 73,152 tonnes of carbon, restoring the carbon loss from fuel burning, harvested wood, and harvest operations emissions (Table 16). Over the fifty years following the proposed thinning, *t*he increase of 39,988 tonnes of live tree carbon would contribute to an annual average of 800 tonnes (0.001 million tonnes), or 0.000004% of the U.S. annual accumulation of carbon from forest management of 191 million tonnes; or 0.0004% of the annual accumulation of 1.69 million tonnes of carbon as a result of current implementation on BLM-managed lands in western Oregon. (2008 FEIS, p. 4-537).

The 2008 FEIS (p. 4-538), which is incorporated here by reference, states that by 2106, the No Action alternative (management under the 1995 RMP) would result in a total carbon storage of approximately 628 million tonnes, 9% higher than average historic conditions (576 million tonnes, 2008 FEIS, 3-224, as reanalyzed in November 6, 2009 memo, on file and incorporated by reference, Cascades Resource Area) (See Methodology earlier in this section).

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

Table 15: Elements of the Environment Review based on Authorities and Management Direction

Element of the Environment /Authority	Remarks/Effects
Aquatic Conservation Strategy	In compliance with PCFFA IV (Civ. No. 04-1299RSM), this project complies with the Aquatic Conservation Strategy described in the Northwest Forest Plan and RMP. This project also complies with the PCFFA II (265 F.3d 1028 (9th Cir. 2001)) by analyzing the site-scale effects on the Aquatic Conservation Strategy. EA sections 3.1, 3.2, 3.3, 3.4 and 3.14 show how the Gunners Lakes Project meets the Aquatic Conservation Strategy in the context of the PCFFA cases.
Air Quality (Clean Air Act as amended (42 USC 7401 et seq.)	This project is in compliance with this direction because air quality impacts would be of short duration. Addressed in Text (EA section 3.11).
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 and it would have no effect on this element because cultural resource inventories of the affected area would precede management actions that include any ground disturbing activities that could potentially damage cultural resources.
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 it 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 it would have no effect on low income populations.
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 it would have minimal short-term adverse effects and long-term beneficial effects on MSA species and Essential Habitat. Effects to this element are addressed in text (EA section 3.4).
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 in the project area.
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 treatments would decrease the risk of fire and help restore forests to healthy functioning condition (EA section 3.11)

Element of the Environment /Authority	Remarks/Effects
Migratory Birds (Migratory Bird Act of 1918, as amended (16 USC 703 et seq)	This project is in compliance with this direction because treatments would generally enhance habitat for migratory birds. Addressed in text (EA section 3.7).
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 direction because Project Design Features would prevent establishment of new populations of invasive plant species and because vegetation development would result in decline in both number and vigor of invasive plant populations in the project area. Addressed in text (EA section 3.9)
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 public access would be controlled within the project area during operations and the project would not create hazards lasting beyond project operations.
Threatened or Endangered Species (Endangered Species Act of 1983, as amended (16 USC 1531)	This project is in compliance with this direction because there would be no adverse effects on Threatened or Endangered Species (EA sections 3.3 and 3.6).
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 Oregon State water quality standards would be adhered to and the area hydrology would not be changed measurably. Addressed in text (EA sections 3.2)
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 project area and adjacent wetlands would be protected by buffers. (EA section 3.2)
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.
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.

3.14 Compliance with the Aquatic Conservation Strategy

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

- ***ACS Component 1 - Riparian Reserves:*** The project would comply with Component 1 by maintaining canopy cover along all streams and wetlands, which protect stream bank stability and water temperature. No-harvest buffers would protect streams from direct disturbance from logging. Road and landing locations have been minimized in Riparian Reserves. Addressed in text (EA sections 3.2 and 3.3)
- ***ACS Component 2 - Key Watershed***: The project would comply with Component 2 by establishing that the Gunners Lakes 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 CFCWA and MCWA.
  - Density management and thinning in Riparian Reserve to develop and maintain late seral stand characteristics. 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 at least 50% crown closure in Riparian Reserve. Untreated areas provide additional range of species and density mix.
  - Develop standing dead and down LWD by leaving enough trees for future recruitment if needed. Thinning would leave many times the recommended retention to develop large trees for future recruitment. This goal would be achieved over time.
  - Road densities. Roads to be constructed, improved or renovated for use in this project would be located on ridgetops and stable, gentle slopes to avoid sedimentation impacts.. Newly constructed roads and 1.6 miles of existing road used in the project would be stabilized and closed after use.
  - Noxious weeds. Equipment washing required. Vegetation Management EIS provides further guidance.
  - Riparian Condition and LWD on Federal Lands, accelerate growth for recruitment of LWD for stream structure. Thinning is designed to accelerate growth. Suitable large trees would be available years to decades sooner than without treatment.
  - Stream flows, water quality, ODEQ 303(d), and stream temperatures. The project would not contribute to detectable changes in these elements.
  - Soils, Slope Stability and Mass Wasting: Project design avoids erosion. There are no slides or bare slopes identified in the project area.
  - Timber Management in the Matrix Land Use Allocation. Provide timber sales that are marketable, provide a balance between wood volume/quality/value, and maintain a healthy forest ecosystem. The project was designed so that the proposed action achieves these objectives.
- ***ACS Component 4 - Watershed Restoration*** The project would comply with Component 4 by the combination of thinning and unthinned areas in Riparian Reserves, which would further enhance terrestrial habitat complexity in the long- and short-term. Thinning in all LUAs would be expected to result in long-term restoration of large conifers and the potential for material that would contribute to in-stream habitat complexity in the long-term.

Tillamook 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 3.1, 3.6, 3.7*). 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.

   Proposed Action: The proposed treatment would maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features. Commercial thinning treatments in the GFMA would maintain good timber productivity of the stand as well as reducing potential losses from *Phellinus weirii* root rot. Variable density thinning in Connectivity/Diversity 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). This would occur sooner than from the No Action alternative. Thinning treatments in Riparian Reserves would the same as the adjacent LUAs. It would increase the growth of residual trees and reduce the time for those trees to become large enough to provide a future source of large woody debris to stream channels.

2. **ACSO 2: Maintain and restore spatial and temporal connectivity within and between watersheds.** Addressed in Text *(EA sections 3.1,3.3, 3.4, 3.6, 3.7)* In summary:

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

   Proposed Action: Long term connectivity of terrestrial watershed features would be improved by enhancing conditions for stand structure development. In time, the Riparian Reserve LUA would improve in functioning as refugia for late successional, aquatic and riparian associated and dependent species.

   Both terrestrial and aquatic connectivity would be maintained, and over the long-term, as the Riparian Reserve LUA develops late successional characteristics, lateral, longitudinal and drainage connectivity would be restored.

3. **ACSO 3: Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.** Addressed in Text (*EA sections 2.4.2, 3.2, 3.3, 3.4*). In summary:

No Action Alternative: It is assumed that the current condition of physical integrity would be maintained.

Proposed Action: Physical integrity of short channel segments at existing stream crossings would be altered for one to several years following replacement of approximately six culverts and removal of two other culverts under the Proposed Action. Alterations would be localized in channel surfaces, banks and beds at stream crossings. Following stream crossing work, there will likely be some channel adjustments when existing undersized structures, which are increasing sediment deposition upstream and reducing sediment deposition and increasing scour downstream, are replaced with larger culverts or are removed. Because the streams are stable and low gradient at these stream crossings, adjustments would not extend more than 100 feet downstream or upstream. In the long-term, this action would maintain and restore the physical integrity of the aquatic systems at these stream crossings and reduce the potential for future culvert and road fill failures.

4. **ACSO 4: Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems.** Addressed in Text (*EA sections 2.4.2, 3.2, 3.3, 3.4*). In summary:

   No Action Alternative: It is assumed that the current condition of the water quality would continue a gradual downward trend with more sediment delivery and higher turbidity due to a poorly maintained road system.

   Proposed Action: Sediment delivery rates and turbidity levels in the affected subwatershed are likely to increase over the short-term as a direct result of road maintenance, road decommissioning, and hauling. Sediment increases would not be visible beyond 1/8th mile downstream from road/stream intersections and would not be expected to affect recognized beneficial uses. Over the long-term (beyond 3-5 years), current conditions and trends in turbidity and sediment yield would likely be slightly improved under the proposed action. The proposed action would be unlikely to have any measurable effect on other water quality parameters including bacteria, stream temperatures, pH, or dissolved oxygen.

5. **ACSO 5: Maintain and restore the sediment regime under which aquatic ecosystems evolved.** Addressed in Text (*EA sections 2.4.2, 3.2, 3.3, 3.4*). In summary:

   No Action Alternative: It is assumed that the current levels of sediment delivered to streams would continue to gradually increase primarily due to lack of road maintenance.

   Proposed Action: Short-term localized increases in stream sediment can be expected during temporary roadwork (mainly at stream crossings) and, to much more limited extent, timber hauling. Project planning, PDFs and BMPs would be implemented to minimize sediment delivery to streams. Over the long-term (beyond 3-5 years), the sediment inputs would decrease with road maintenance and road improvements.

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 2.4.2, 3.2, 3.3, 3.4*). In summary:

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

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

   The proposed project would remove less than half the existing forest canopy and only a small fraction of the forest cover (roads and landings). The total amount of roads and road density would increase slightly but would remain in the "low risk" OWEB threshold level for peak flow enhancement. Therefore, the Proposed Action 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 2.4.2, 3.2, 3.3, 3.4*). In summary:

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

   Proposed Action: With the exception of approximately six culvert replacements and two culvert removals at stream crossings, there would be no alteration of any stream channel, wetland or pond morphological feature. All logging equipment would be kept a minimum of 100 feet from all large wetlands (larger than one acre) and perennial stream channels, and 60 feet from all small wetlands (one acre or less) and intermittent stream channels. Thus, the current condition of floodplain inundation and water tables would be maintained

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 2.4.2, 3.2, 3.3, 3.4*). 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: No-cut buffers (from 60 feet on intermittent streams to 100 feet on perennial streams) would maintain the current species composition and structural diversity of plant communities in riparian areas and wetlands. Riparian areas adjacent to no-cut buffers would retain a canopy closure of 50% or greater.

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 2.4.2, 3.2, 3.3, 3.4, 3.6, 3.7*). In summary:

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

   Proposed Action: The proposed action would have no adverse effect on riparian dependent species. Although thinning activities may affect some invertebrates within the treatment areas, adjacent non-thinned areas should provide adequate refugia for the species. In the long term, the treatments would restore elements of structural diversity to treatment areas in 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.

3.15 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 and revenue to the government from the sale of those resources (objectives 1, 2 and 3);*

2. *Reduce the costs both short-term and long-term of managing the lands in the project area (objectives 1 and 2); and*

3. *Provide safe, cost-effective access for logging operations, fuels management and fire suppression (objectives 2 and 7;*

   Decision Factors 1-3: The No Action alternative would not meet these factors since no timber sales would take place. The proposed action would provide 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.

4. *Reduce competition-related mortality and increase tree vigor and growth (objective 1);*

   Decision Factor 4: The No Action alternative would not meet this factor. The proposed action would meet this factor.

5. *Provide for the establishment and growth of conifer species while retaining structural and habitat components, such as large trees, snags, and coarse woody debris (objectives 5 and 6); and*

6. *Promote the development of healthy late-successional characteristics in the Riparian Reserve land use allocation (objective 5).*

   Decision Factors 5 and 6: The No Action alternative does not meet these factors. Under this alternative, stand health and tree growth rates would decline if stands are not thinned. Competition would result in mortality of smaller trees and some co-dominant 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). This alternative retains existing elements, but does not enhance conditions to provide these elements for the future stand. Trees would continue to grow slowly until reaching suitable size for large woody debris, snags and late successional habitat.

   The proposed action would meet decision factors 5 and 6. 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.

7. *Reduce erosion and subsequent sedimentation from roads (objectives 4 and 7);*

   Decision Factor 7: The proposed action meets this factor because existing roads would be maintained, renovated or decommissioned, reducing the risk of erosion and sedimentation associated with the existing road system, and because new road construction and renovation would not cause sedimentation.

4.0 LIST OF PREPARERS

Table 16: List of Preparers

Resource	Name
IDT Leader	Bob McDonald
Botany	Kurt Heckeroth
Cultural Resources	Debra Drake
Engineering	Joel Churchill
Fire/Fuels	Kent Mortensen
Fisheries	Matt Walker
Hydrology/ Water Quality	Dennis Worrel
Logging Systems	Clint Gregory
Recreation	Debra Drake
Silviculture	John Johansen, Carrie Miller
Soils	Dennis Worrel
Wildlife	Andy Pampush

5.0 CONTACTS AND CONSULTATION

5.1 Consultation

5.1.1 US Fish and Wildlife Service (USFWS)

The spotted owl would be affected by this project only through the modification of dispersal habitat. Due to the minor impact to a component of spotted owl habitat, informal consultation with the U.S. Fish and Wildlife Service is warranted and would be completed programmatically within the appropriate years (year of sale if the proposed action is selected) Habitat Modification Biological Assessment in the "Light to Moderate Thinning" category.

5.1.2 National Marine Fisheries Service (NMFS)

Consultation with the National Marine Fisheries Service on the potential effects of the proposed action on Oregon Coast coho salmon will be completed with project specific consultation (Section 7 Streamlined Consultation) or one of the programmatic consultation processes available at the time of implementation for actions that require consultation.

Required consultation for Magnuson-Stevens Fisheries Conservation and Management Act Essential Fish Habitat for the proposed action is included in *EA Section 3.4.3*.

Section 7 Endangered Species Act Consultation will be completed prior to the Field Manager authorizing an action.

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 March 17, 2010 to June 18, 2010 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 *South County Spotlight* and *Hillsboro Argus* newspapers. Written comments should be addressed to Stephen M. Small, Field Manager, Tillamook Resource Area, 4610 Third Street, Tillamook, Oregon, 97141. Emailed comments may be sent to robert_mcdonald@blm.gov.

6.0 GLOSSARY AND COMMON ACRONYMS

6.1 Glossary

303(d) Water Quality Listing - Impaired waters that do not meet water quality standards, identified by DEQ, as required by the Clean Water Act.

acre - A measure of surface land area in U.S.customary units that is 43,560 square feet, which is 1/640 of a square mile (or approximately 0.4 hectares).If square, it is nearly 209 feet on each side.

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

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

allowable sale quantity - The timber yield that a forest can produce continuously under the intensity of management outlined in the RMP from those lands allocated for permanent forest production.

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

anadromous fish - Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Includes species such as salmon and steelhead. Also see *salmonid.*

analysis - The scientific evaluation of the environmental impacts of proposed planning decisions.

analytical assumption - A judgmental decision that is based on the science and relationships of natural systems assumed to be true and from which conclusions can be drawn to supply the missing values, relationships, or societal preferences needed for proceeding with an analysis of alternatives.

(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.

aquatic habitat - Habitat for vertebrate and invertebrate wildlife species and vascular and non-vascular plants occurring in free water (e.g. lakes, ponds, streams, rivers, springs and seeps).

authority - The right and power to make decisions and give orders such as the United States Congress exerts when passing legislation (e.g. the O&C Act and the Endangered Species Act).

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. BMPs can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (40 CFR 130.2, EPA Water Quality Standards Regulation).

biological assessment A biological assessment is a document that evaluates potential effects of a proposed action to listed and proposed species and designated and proposed critical habitat and determines whether any such species or habitats are likely to be adversely affected by the

action.It is used in determining whether formal consultation or conferencing with the U.S.Fish and Wildlife Service or National Marine Fisheries Service is necessary (50 CFR 402.12[a])

(BO) biological opinion - An opinion by the U.S, Fish and Wildlife Service or the National Marine Fisheries Service as to whether or not a federal action is likely or not to jeopardize the continued existence of listed species, or would result **in** the destruction of or adverse modification of critical habitat. The opinion may contain reasonable and prudent alternatives, a statement of anticipated take of listed animals, and conservation recommendations for listed plants.

Bureau Strategic Species - A special status species category established by the Oregon/Washington BLM that includes animal, plant and fungi species that are of concern in the two states. The special status species policy (BLM **6840**) does not apply to these species, and no analysis of them is required in NEPA documents. Field units are required to collect occurrence field data and maintain records. Also see *Bureau sensitive species*.

Bureau Sensitive Species - A special status species category established by the BLM that includes those plant and animal species eligible for status as federally listed, federal candidate, state listed, or state candidate (plant) species; **on** List 1 of the Oregon Natural Heritage Database or approved for this category by the BLM state director; or included under agency species conservation policies. Also see *Bureau strategic species*.

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 closure - 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.

checkerboard land ownership pattern - A land ownership pattern in which square-mile sections of federal lands are typically intermixed, on the basis of alternating sections, with adjoining private lands. The O&C lands of western Oregon are an example of checkerboard ownership. This ownership pattern resulted from the revestment back to the federal government of lands granted by the federal government to early railroad companies. The checkerboard ownership pattern of the O&C lands creates additional access, management, and perception issues.

(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.

dropped (e.g. some of the canopy gaps and the 117 year old stand) – dropped from this proposed action. The actions may be considered in the future and would be documented in an environmental analysis with a new decision. Dropping these areas does not constitute a change in land use allocations.

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

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

floodplain Level lowland bordering a stream or river onto which the flow spreads at flood stage.

Forest Operations Inventory (FOI) - An intensive inventory that provides managers with information regarding the age, species, stand location, size, silvicultural needs, and recommended treatment of stands based on individual stand conditions and productivity.

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.

green tree - A live tree.

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. Also see *analysis*.

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. NMFS is an agency in the National Oceanic Atmospheric Administration (National Marine Fisheries Service [NMFS] is now called NOAA Fisheries)

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*.

(NWFP) Northwest Forest Plan - 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 Related Species within the Range of the Northern Spotted Owl (1994) (Northwest Forest Plan). A 1994 common management approach for the 19 national forests and 7 BLM districts located in the Pacific Northwest ecological region and jointly approved by the Secretary of Agriculture and the Secretary of the Interior.

nutrient cycling - Circulation of elements (such as carbon or nitrogen) between vegetation/organic material and soil, water and air.

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.

plan conformance - The determination that a management action is consistent with the terms, conditions, decisions, and is within the anticipated environmental consequences, of an approved resource management plan.

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 and quadratic mean diameter*.

(RMP) Resource Management Plan - Salem District Record of Decision and Resource Management Plan (1995). A BLM planning document, prepared in accordance with Section 202 of the Federal Land Policy and Management Act that presents systematic guidelines for making resource management decisions for a resource area. An RMP is based on an analysis of an area's resources, their existing management, and their capability for alternative uses. RMPs are issue oriented and developed by an interdisciplinary team with public participation.

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

salmonid - 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. Also see *anadromous fish.*

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.

site index – A measure of forest productivity expressed as the height of the tallest trees of a particular species (e.g. Douglas-fir) in a stand at an index age (e.g. 50-years).

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.

standards and guidelines - 1995 RMP rules for managing the different land use allocations.

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.

structurally complex stage - Stage at which stands develop characteristics approximating "old-growth" stands.

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.

wetland - land with presence and duration of water, sufficient to support wetland vegetation

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.

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

6.2 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
EA - Environmental Assessment
EFH – Essential Fish Habitat
ESA – Endangered Species Act
FONSI – Finding of No Significant Impact
GFMA – General Forest Management Area land use allocation (Matrix)
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NEPA – National Environmental Policy Act (1969)
ODEQ – Oregon Department of Environmental Quality
RIA – Rural-Urban Interface (recreation, visual and sociological issues)
RMP/FEIS – Salem District Proposed Resource Management Plan / Final Environmental Impact Statement (1994)
ROW – right-of-way (roads)
RR – Riparian Reserve Land Use Allocation (Riparian Reserves)
SPZ – Stream Protection Zone (no-cut protection zone)
TMDL – total maximum daily load
USDI – United States Department of the Interior
USFS – United States Forest Service

7.0 Literature Cited

Altman, B., Olive-sided Flycatcher. Pp. 374-376 in Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. 2003. Oregon State University Press, Corvallis, OR.

Alvis E. August 8, 2007. Aquatic Inventory Project, *East Fork Nehalem Stream Report*. Oregon Department of Fish and Wildlife.

Alvis E. July 31, 2007. Aquatic Inventory Project, *East Fork Nehalem tributary Stream Report*. Oregon Department of Fish and Wildlife.

Alvis E. August 6, 2007. Aquatic Inventory Project, *Floeter Pond Creek Stream Report*. Oregon Department of Fish and Wildlife.

Alvis E. July 31, 2007. Aquatic Inventory Project, *Gunners Lake Creek Stream Report*. Oregon Department of Fish and Wildlife.

Ares, A.; Terry, T.A.; Miller, R.E.; Anderson, H.W.; Flaming, B.L. 2005. Forest harvest effects on soil physical properties and Douglas-fir growth. Soil Science Society of America Journal. 69: 1822-1832.

Beschta R.L., Bilby R.E., Brown G.W., Holtby L.B., Hofstra T.D. 1987. Stream temperature and aquatic habitat: fisheries and forestry interactions. In *Streamside Management: Forestry and Fishery Interactions,* Salo E.O., Cundy TW (eds). Institute of Forest Resources, University of Washington: Seattle, WA; 191–232.

Carey, A. B. 1991. The Biology of Arboreal Rodents in Douglas-fir Forests. Gen. Tech. Rep. PNW-276. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 9-12

Chan, S. S., D. Larson, and P. D. Anderson. 2004. Microclimate Patterns Associated with Density Management and Riparian Buffers. An interim report on the Riparian Buffer Component of the Density Management Studies. Corvallis, OR: USDA Forest Service, Pacific Northwest Research Station: 41pp.

Curtis, R. O. 1982. A Simple Index of Stand Density for Douglas-fir. For. Sci. 28:92-94

(was IPCC 2007) Denman, K.L., et al. 2007: Couplings Between Changes in the Climate System and Biogeochemistry. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United

Kingdom and New York, NY, USA. http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter7.pdf

Forsman, E. D., I. Otto, and A. B. Carey. 1991. Diets of Spotted Owls on Olympic Peninsula, Washington and the Roseburg District, Bureau of Land Management. Page 527 in L. R. Ruggiero, K. B. Aubry, A. B. Carey, and M. H. Huff, Tech. Coors. Wildlife and Vegetation of Unmanaged Douglas-fir Forests. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Gen. Tech. Rep. PNW-285

Forster, P, et al. 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S. D., Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller, Eds. Cambridge University Press, U.K. and New York, N.Y. (pp. 129-234). http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf

Grant, G. E.; Lewis, S. L.; Swanson, F. J.; Cissel, J. H.; McDonnell, Jeffrey J. 2008. Effects of forest practices on peak flows and consequent channel response: a state-of-science report for western Oregon and Washington.. Gen. Tech. Rep. PNW-GTR-760. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p.

Hadfield, J.S., D.J. Goheen, G.M. Filip, C.L. Schmitt, and R.D. Harvey. 1986. Root diseases in Oregon and Washington conifers. USDA For. Serv., For. Pest Manage. R6-FPM-250-86. PNW Region, Portland, OR. 27 p.

Hann, D.W., M. Ritchie, C. Wang, and A.A. Zumrawi. 2006. Oregon Growth Analysis and projection system (ORGANON). NW Oregon Version, Edition 8.1. College of Forestry, Department of Forest Resources, Oregon State University, Corvallis.

Hardt, R. 2009. Personal communication. Memo on Carbon in Harvested Wood. On file, Cascades Resource Area, Gordon Creek Analysis file.

Heninger, et al., 2002. Soil disturbance and 10-year growth response of coast Douglas-fir on nontilled and tilled skid trails in the Oregon Cascades. Wildlife Monographs. 149: 1-35.

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

King, J.E. 1966. Site index curves for Douglas-fir in the Pacific Northwest.

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

McLaughlin, M. March 18, 2005. *Upper Nehalem Habitat Assessment,* Stream Report. Oregon Department of Fish and Wildlife.

Miller, R.E., Scott, W., and Hazard, J.W. 1996. Soil Compaction and Conifer Growth after Tractor Yarding at Three Coastal Washington, Locations. Can. J. For. Res. 26:225-236.

Miller, R. E.; Smith, J.; Adams, P. W.; Anderson, H. W. 2007. Growth of Douglas-fir near equipment trails used for commercial thinning in the Oregon Coast Range.. Res.

Morris, L.A.; Miller, R.E. 1994. Evidence for long-term productivity changes as provided by field trials. In: Dyck, W.J.; Cole, D.W.; Comerford, N.B. [Eds.]. Impacts of forest harvesting on long-term site productivity. Chapman and Hall, London: 41-48.

National Oceanic and Atmospheric Administration "Endangered and Threatened Species: Final Threatened Listing Determination "Oregon Coast Evolutionarily Significant Unit of Coho Salmon" Federal Register Notice Volume 73 no. 28 (February 11, 2008), pp 7816–7873 [08–552]

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

Oregon Department of Fish and Wildlife. February 26, 2007. Oregon Coast Coho Conservation Plan For the State of Oregon. Oregon Department of Fish and Wildlife. Salem OR.

Oregon Watershed Enhancement Board, *Oregon Watershed Assessment Manual*. 1999.

Patterson, M., Rufous Hummingbird. Pp. 346-348 in Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. 2003. Oregon State University Press, Corvallis, OR.

Rashin, E.B., C.J. Clishe, A.T. Loch, and J.M. Bell. 2006. Effectiveness of Timber Harvest Practices for Controlling Sediment Related Water Quality Impacts. Article in Journal of the American Water Resources Association, p. 1307-1327.

Satterlund, D.R. and P.W. Adams. 1992. Wildland watershed management. John Wiley and Sons, New York. 436p.

Scott, D. A.; Tiarks, A. E.; Sanchez, F. G.; Elliott-Smith, M.; Stagg, R. 2004. Forest Soil Productivity on the Southern Long-Term Soil Productivity Sites at Age 5. Gen. Tech. Rep. SRS–71. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. pp. 372-377.

Streamnet GIS Data, 2003. Metadata for Pacific Northwest coho salmon fish distribution spatial data set. Portland (OR): Streamnet, May 2003. [31 Jan 2005]. URL: <http://www.streamnet.org/online-data/GISData.html>.

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

Thompson, J. 2008. Growing trees where trees grow best: short-term research sheds light on long-term productivity. Science Findings 107. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 5 p.

USDA - Forest Service, USDI - Bureau of Land Management. January 2008. Interagency Special Status / Sensitive Species Program (ISSSSP) - BLM Oregon and Washington State Director's Special Status Species List is available on line at: http://www.fs.fed.us/r6/sfpnw/issssp/documents/ag-policy/6840-im-or-2008-038-att1-tes-list.xls

U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Portland, OR, Pap. PNW-RP-574: 33 p.

USDA - Soil Conservation Service. November 1986. Soil Survey of Columbia County, Oregon. 198 pages + maps.

USDI - Bureau of Land Management. IM 2008-050 Migratory Bird Treaty Act – Interim Management Guidance. Attch: Western BLM Bird Species of Conservation Concern. Source: USDI Fish and Wildlife Service Migratory Bird Program Strategic Plan 2004-2014.

USDI - Bureau of Land Management. December 1996. East Fork Nehalem Watershed Analysis. Tillamook Resource Area. 83 pages + appendices.

USDI - Bureau of Land Management. 1996. Scappoose Creek Watershed Analysis. Tillamook Resource Area, Salem District, Bureau of Land Management Record. 94 p.

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

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

USDI US Geological Service, 2008. May 14, 2008 Memorandum to the U.S. Fish and Wildlife Service: The Challenges of Linking Carbon Emissions, Atmospheric Greenhouse Gas Concentrations, Global Warming, and Consequential Impacts (Carbon Emissions and Climate Change)

Vroman, D. P., Purple Finch. Pp. 598-599 in Birds of Oregon: A General Reference. D. B. Marshall, M. G. Hunter, and A. L. Contreras, Eds. 2003. Oregon State University Press, Corvallis, OR.

Weyerhaeuser Company, Forestry Research Center, Centralia, WA. Weyerhaeuser Forestry Paper 8. 49 p.

Wilkerson, E; Hagan, JM; Siegel, D; Whitman, AA. 2006. The effectiveness of different buffer widths for protecting headwater stream temperature in Maine. FOREST SCIENCE, 52 (3): 221-231.

Ziemer, R. R. 1981. Stormflow response to road building and partial cutting in small streams of northern California. Water Resources Research 17(4): 907-917.

8.0 ADDITIONAL SUPPORTING DATA AND MAPS OF THE ACTION ALTERNATIVES

8.1 Tables

Table 17: BLM Sensitive Wildlife That Could Occur Within The Gunners Lakes Project Area

Common Name	Status*	Impact Synopsis
Mammals:		
Columbia White-tailed Deer (*Columbia River DPS*)	ESA-Endgrd.	Not affected – Not in range
Fringed Myotis	BLM-Sen., Salem RMP	Not affected – negligible impact to low quality habitat
Long-eared Myotis	Salem RMP	Not affected – negligible impact to low quality habitat
Long-legged Myotis	Salem RMP	Not affected – negligible impact to low quality habitat
Silver-haired Bat	Salem RMP	Not affected – negligible impact to low quality habitat
Townsend's Big-eared Bat	BLM-Sen., Salem RMP	Not affected – No roosting habitat in area
Red Tree Vole	BLM-Sen.	Not affected – No older habitat, history of area makes presence unlikely
Birds:		
Bald Eagle	BLM-Sen.	Not affected – No suitable habitat within project area
Black Swift	MBTA	Not affected – No habitat within project area
Harlequin Duck	BLM-Sen.	Not affected – Project not within suitable habitat

Common Name	Status*	Impact Synopsis
Horned Lark (*strigata* ssp.)	MBTA	Not affected – Project not within suitable habitat
Lewis' Woodpecker	BLM-Sen.	Not affected – Project not in suitable habitat
Marbled Murrelet	ESA-Thtnd.	Not affected – No suitable or potential habitat exists within the project area.
Northern Spotted Owl	ESA-Thtnd.	**Affected – See Sec. 3 for analysis**
Olive-sided Flycatcher	MBTA	**Affected – See Sec. 3 for analysis**
Oregon Vesper Sparrow (*affinis* ssp.)	MBTA, BLM Sen.	Not affected – Project not in suitable habitat
Peregrine Falcon	MBTA, BLM Sen.	Not affected – No habitat affected
Purple Finch	MBTA	**Affected – See Sec. 3 for analysis**
Purple Martin	BLM-Sen.	Not affected – No habitat affected
Rufous Hummingbird	MBTA	**Affected – See Sec. 3 for analysis**
Willow Flycatcher	MBTA	Not affected – Fairly common species in early seral habitat
Reptiles and Amphibians:		
Cope's Giant Salamander	BLM-Sen.	Not affected – No impact to stream habitat
Northwestern Pond Turtle	BLM-Sen.	Not affected – No habitat within project area
Painted Turtle	BLM-Sen.	Not affected – No habitat within project area
Invertebrates (Mollusks):		
Crowned tightcoil (snail)	BLM-Sen.	**Affected – See Sec. 3 for analysis**
Evening Field slug	BLM-Sen., S&M	Not affected – Preferred habitat excluded from project
Oregon Megomphix	S&M	**Affected – See Sec. 3 for analysis**
Pacific Walker (snail)	BLM-Sen.	Not affected – Not in range
Puget Oregonian (snail)	BLM-Sen., S&M	**Affected – See Sec. 3 for analysis**
Salamander slug	BLM-Sen.	**Affected – See Sec. 3 for analysis**
Spotted taildropper (slug)	BLM-Sen.	**Affected – See Sec. 3 for analysis**
Tillamook Westernslug	BLM-Sen.	**Affected – See Sec. 3 for analysis**
Warty jumping slug	BLM-Sen., S&M	**Affected – See Sec. 3 for analysis**
Invertebrates (Arthropods):		
Johnson's Hairstreak (butterfly)	BLM-Sen.	**Affected – See Sec. 3 for analysis**

ESA-Endgrd. – Listed under Endangered Species Act as Endangered
ESA-Thtnd. – Listed under Endangered Species Act as Threatened
BLM-Sen. – Listed as Sensitive under the BLM's 6840 Special Status Species Policy
Salem RMP – Species with specific management direction in the Salem RMP
MBTA – Bird covered by the Migratory Bird Treaty Act
S&M – Survey and Manage (SEIS Special Attention Species in Salem RMP)

8.2 Maps

Figure 1. Gunners Lakes Project Location Map

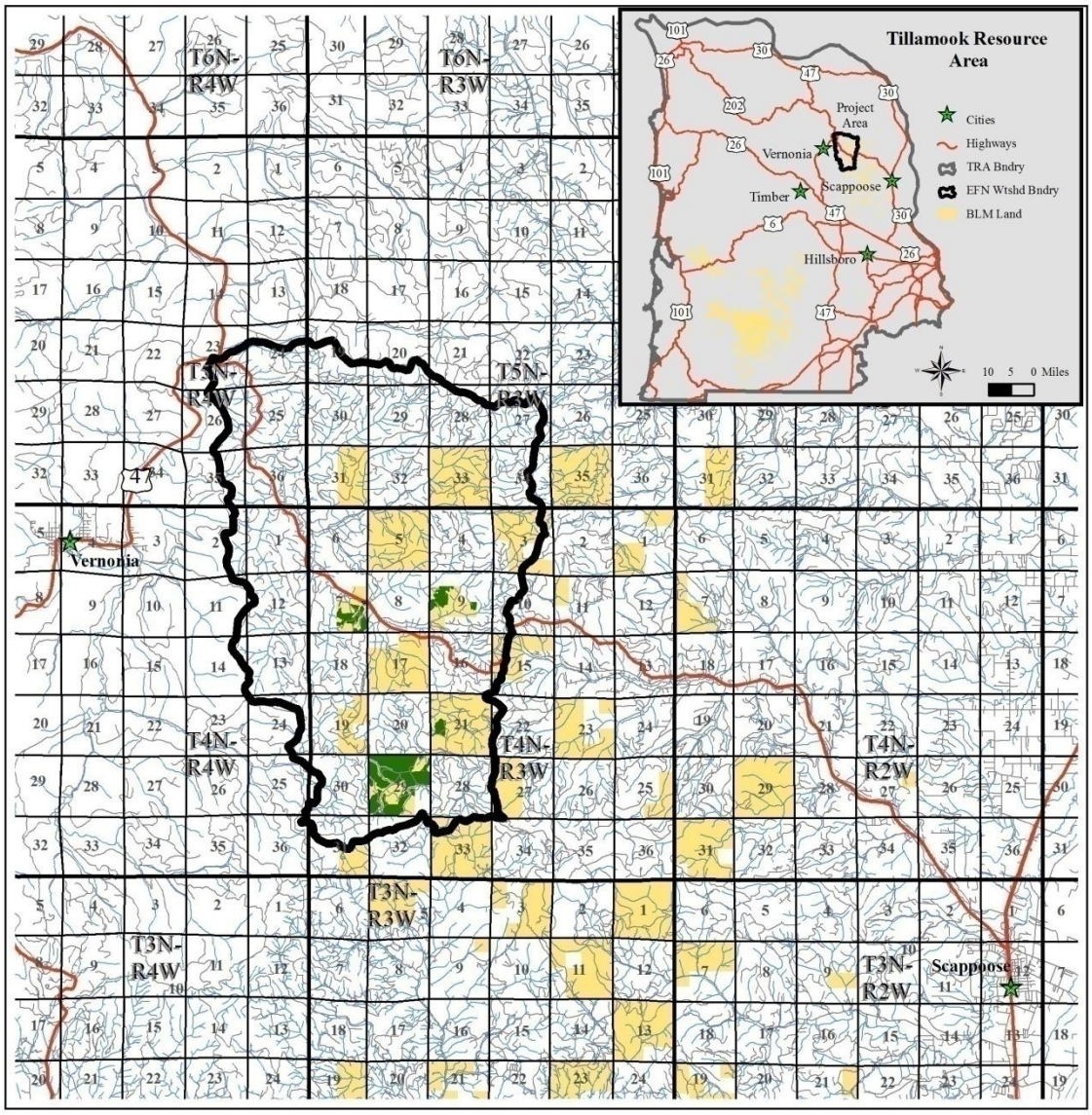

Figure 2. Proposed Treatments

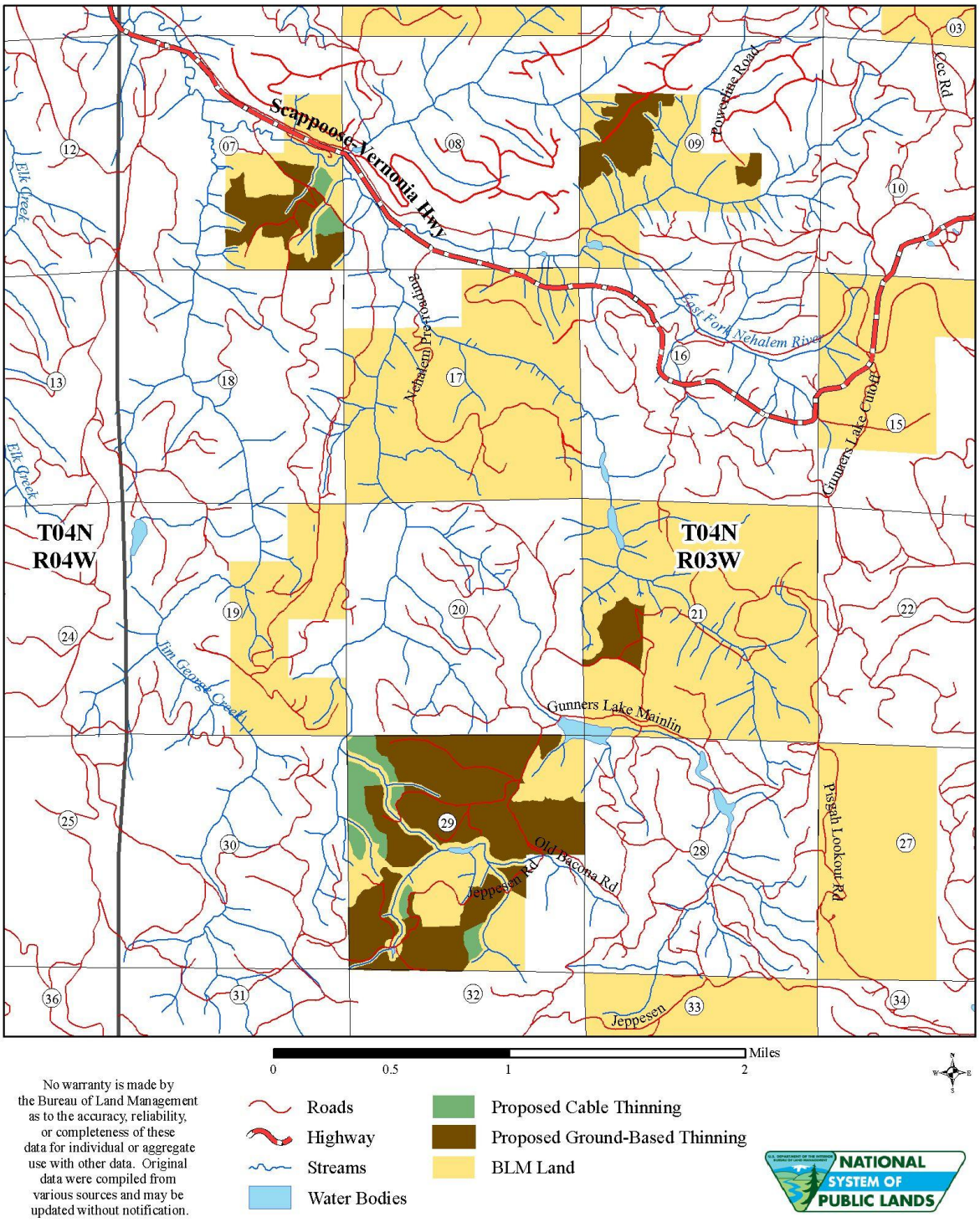

Figure 3. Fish Distribution & Haul Routes