The East Fork Nehalem Timber Management Project

Finding of No Significant Impact (FONSI)[1]
for
Environmental Assessment: DOI-BLM-ORS060-2014-0005-EA

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

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Introduction

The Tillamook Resource Area, Salem District Bureau of Land Management (BLM), proposes to implement forest management activities on approximately 719 acres of BLM lands, which includes commercial timber sales, within the East Fork Nehalem River 6th-field subwatershed of the Nehalem River watershed. The proposed action includes regeneration harvest and commercial thinning within the Matrix land use allocation (General Forest Management Area [GFMA] and Connectivity/Diversity Block [CON]), and commercial density management within the Riparian Reserve (RR) land use allocation. The action would occur in forest stands in various conditions. Some stands are at or above the age which produces maximum average annual growth over the lifetime of the stand, other stands are underproductive due to disease, poor stocking or they are stocked with less desirable commercial species, while still other stands are overly dense and in need of thinning to continue healthy growth rates and structural development. Many of the Riparian Reserve stands proposed for treatments are either overstocked with a single aged Douglas-fir overstory that lacks the structural layering characteristic of older stands, or are stocked with hardwoods that are beginning to reach mortality and reduce canopy cover.

[1] This unsigned FONSI is included here along with the East Fork Nehalem Timber Management Project EA in order to provide the public the opportunity to review and comment on both documents. After a public comment period, the Tillamook Field Manager will consider comments received and if appropriate, will finalize and sign the FONSI.

The action also includes construction, maintenance and improvement of roads and culverts, treatment of approximately 29 acres to control the spread of *Phellinus weiri*, a root disease, as well as treatment of a portion of the fuels created by the harvest operations.

The objective of the timber management project and associated actions would be twofold: 1) to contribute to the Salem District's 1995 Resource Management Plan (RMP) requirement (developed to meet the O&C Lands Act of 1937) to produce a sustainable supply of timber to provide jobs and contribute to community stability while balancing cost effectiveness with other required objectives of the RMP; and 2) to maintain and improve the development and function of forests within the Riparian Reserve land use allocation to meet the needs of aquatic species and terrestrial species associated with riparian forests while meeting the RMP's Aquatic Conservation Strategy Objectives.

The area where the East Fork Nehalem Timber Management Project would occur is approximately 5 miles east of the town of Vernonia, Oregon. The project area includes BLM-managed lands within sections 5, 17, and 21, Township 4 North, Range 3 West; and sections 31 and 33, Township 5 North, Range 3 West, Willamette Meridian (WM), in Columbia County, Oregon.

The EA and unsigned FONSI will be made available for public review from ***August 28, 2015*** through ***September 28, 2015***. The notice for public comment will be published in legal notices by the South County Spotlight newspaper of Scappoose, Oregon. Comments received by the Tillamook Resource Area of the Salem District Office, 4610 Third Street, Tillamook, Oregon, 97141, on or before ***September 28, 2015*** will be considered in making the final decision for this project.

Finding of No Significant Impact

Based upon review of the East Fork Nehalem Timber Management Projects EA and the 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 project is a site-specific action directly involving a total of approximately 719 acres of BLM administered land, along with actions occurring on various haul roads. These actions would affect about 3.5% of the 20,608 acre East Fork Nehalem 6th field subwatershed and 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 alternative; 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 the proposed action contained within the East Fork Nehalem Timber Management Projects Environmental Assessment.

1. Impacts may be both beneficial and adverse: The effects of the timber management project are unlikely to have significant (beneficial and/or adverse) impacts *(EA Section 6)* for the following reasons:

<u>Vegetation and Forest Resources</u> *(EA section 6.1):* Effects to these resources would not have significant impacts because:

- The forest stand treatments have been designed with consideration for providing or maintaining important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of valuable structural components such as down logs, snags and large trees.
- No late-successional forest would be harvested.

- Selected Riparian Reserve stands would develop greater structural complexity in a reduced amount of time while maintaining current stream integrity and conditions.

Hydrology *(EA sections 2.2 and 6.2):* Effects to these resources would not have significant impacts because:

- The project effects on water quality would comply with Oregon Department of Environmental Quality (ODEQ) water quality standards and the Total Daily Maximum Load (TMDL) standard for the East Fork Nehalem River subwatershed.
- Stream temperature will be maintained within the project area by retaining the current vegetation and shading in the primary shade zone (no-harvest buffers) and nearly all of the current levels of shading provided by the secondary shade zone, and thus will continue to contribute to meeting the TMDL for the East Fork Nehalem River downstream. Establishment of a second canopy layer in some portions of the Riparian Reserve will also contribute to increased shading in the primary and secondary shade zones as trees begin to reach mid-canopy level.
- Water quality would be maintained because logging, road construction/renovation, culvert replacement, road maintenance and timber haul project design features (EA section 4.4) and no-harvest buffers are expected to prevent or minimize sediment from reaching streams and causing sediment/turbidity that would exceed ODEQ water quality standards.
- The project will accelerate the growth of trees in the outer portion of riparian reserves which will result in the potential for higher quality in-stream large wood sooner if and when natural processes recruit wood to the streams.
- The project will not have any detectable effect on stream discharges or peak flows due to the limited scale and intensity of the project relative to the size of the subwatershed (EA section 2.2).

Fisheries Resources - (*Includes ESA listed fish species, BLM Special Status Species, and Magnuson-Stevens Essential Fish Habitat*) *(EA sections 2.2 and 6.2):* Effects to these resources would not have significant impacts because:

- There is not expected to be a measurable reduction in wood recruitment from the project therefore the project is not expected to affect in-stream features that are part of listed fish or Bureau status fish habitat (Oregon Coast coho, steelhead).
- The establishment of shade tolerant conifers and subsequent development of multiple canopy layers within a portion of riparian forests will indirectly benefit listed and Bureau status fish by providing a more naturally functioning forest ecosystem that will contribute to better hydrologic function.
- Stream temperatures in the project area are expected to be maintained and will not contribute to adverse effects to listed fish or contribute to the need to list Bureau status fish.
- Small immeasurable, short duration, increases to sedimentation in project area streams are not expected to have consequences to listed or Bureau status fish.
- No detectable changes to stream discharge or peak flows will occur therefore there would not be any expected effect to listed or Bureau status fish.
- The nearest road maintenance activity to listed fish habitat is over 480 feet away with a median distance of all maintenance activities at 2,228 feet away from listed fish habitat.

Wildlife Resources - *(Includes ESA listed species, BLM Special Status Species, Survey and Manage Species, Migratory Bird Treaty Act species, and certain RMP species requiring coarse wood habitat): (EA sections 2.2 and 6.3)* Effects to this resource would not have significant impacts because:

ESA Listed Species

- The proposed project area does not contain Critical Habitat for either the northern spotted owl or the marbled murrelet.
- The proposed project will have little likelihood of affecting the marbled murrelet because:
    - The project is within Oregon Marbled Murrelet Zone 2, approximately 42 miles from the ocean, where no murrelet nesting has been detected to date.
    - The only known potential nesting structures within the analysis area have been excluded from proposed harvest units by at least 330 feet.
    - In the unlikely event that murrelets are present, disruption of nesting behavior would likely not occur because log hauling and road maintenance are activities that are not disruptive to murrelets, and road

construction, chainsaw use and harvesting are only considered to be disruptive when occurring within 330 feet of nest sites (USFWS 2014).

- Only 1% of the East Fork Nehalem subwatershed is suitable habitat for the northern spotted owl and none of those acres would be treated or otherwise affected by the proposed action.
- Based on the lack of suitable habitat, geographic isolation from blocks of suitable habitat, intensive forest management on private lands (78% of the subwatershed), and no known current or historic spotted owl nest sites, there is little likelihood that spotted owls currently use the analysis area and therefore could be affected by the proposed action.
- The temporary reduction in dispersal habitat in the analysis area from 39.2% to 37.8% caused by the proposed action would have little discernable effect because: 1) The proposed project area is likely not used by owls due to the geographic isolation from blocks of suitable habitat; and 2) private forest lands are fairly well regulated (fairly even age class distribution) which means that as acres of dispersal habitat are harvested, similar numbers of acres develop into dispersal habitat resulting in mostly static levels of dispersal habitat.

BLM Special Status Species, Survey and Manage Species, Migratory Bird Treaty Act species, and certain RMP species requiring coarse wood habitat: (EA sections 2.2 and 6.3)

- All acres of the project area that required surveys have been surveyed.
- No survey and manage mollusk species were found during surveys and there is not expected to be any loss of persistence at any undetected mollusk sites.
- No suitable red tree vole habitat exist within any harvest unit and therefore red tree voles would be unaffected by the proposed action.
- The proposed action would only have the possibility of minor effects to migratory birds by potentially disrupting breeding for one season at the site of activities, or by creating or possibly improving habitat for species that favor earlier seral habitat or edge habitat. The proposed project would have little possibility to adversely affect other Bureau Sensitive species.
- The project is not expected to adversely affect any bat species of concern identified in the Salem District RMP and Project Design Features requiring the reservation of larger green trees would benefit some bat species into the future.
- Based on current and expected snag levels the proposed action would likely continue to support populations of cavity nesting birds at least at the 40% population potential level at the completion of the project.

<u>Botany and Invasive Plants</u> - (*Includes BLM Special Status Species and Survey and Manage Species*): Effects to this resource would not have significant impacts because:

BLM Special Status Species and Survey and Manage Species: (EA section 2.2)

- All proposed action acres were surveyed for Survey and Manage and Special Status plant species and only one site of one species was found. The single site of *Cetralia cetrariodes* (designated S&M category E lichen under both 2001 and 2003 ASR) would be either excluded from the unit or buffered from the harvest area within a reserve tree clump.

Invasive, Non-native Species (Executive Order 13112): (EA section 6.4)

- The current assemblage of invasive, non-native species that exist within the project area are generally not tolerant of shade and should they emerge on additional disturbed sites within the project area it is expected that they would not persist as the canopy becomes closed again.
- Project Design Features that include equipment washing, monitoring, and eradication of discovered "Early Detection Rapid Response" (EDRR) species (particularly those invasive species that can become established in shady understories) is expected to keep new infestations of EDRR species from becoming established.
- Gravel sources, which can be vectors for invasive, noxious weeds would be inspected for EDRR species prior to approval for use.

<u>Soils</u> *(EA sections 2.2 and 6.5):* Effects to this resource would not have significant impacts because:

- Fragile soil sites including very steep areas have been excluded from the action area.

- Project design features and Best Management Practices, including limiting compaction to 12% of the project area or less (BMP's from IM no. OR-2011-074; Table 31 of the EA), have been incorporated to specifically reduce soil compaction and displacement which in turn should reduce soil productivity loss associated with the project.
- Soils in the project area are very deep and resilient and are less susceptible to productivity losses resulting from timber harvest than are shallower soils.
- Project design features require the use of previously disturbed areas to the extent practicable which will reduce the area disturbed by harvesting equipment.

Air Quality, Fire Risk and Fuels Management *(EA section 2.2):* Effects to this resource would not have significant impacts because:

- Any dust and smoke resulting from the proposed action will be localized and not affect populated areas or contribute negatively to human health and safety.
- Any burning that is done would be done in strict compliance with State of Oregon Smoke Management regulations.
- Project design features will reduce the potential for fire ignition by managing fuels most susceptible to ignition near roads. Small easily ignitable fuels will decay within a short time after harvest with a corresponding reduction in fire risk.

Carbon Storage, Carbon Emissions, and Climate Change *(EA section 2.2):* Effects to this resource would not have significant impacts because:

- The incremental increase in carbon emissions as greenhouse gasses that could be attributable to the proposed action is of such small magnitude that it is unlikely to be detectable at global, continental or regional scales or to affect the results of any models now being used to predict climate change.
- Models indicate that after 35 years, carbon sequestration and storage would be similar to that modeled for the No Action alternative.

Recreation *(EA section 2.2):* Effects to this resource would not have significant impacts because:

- The project will not change the types of recreation opportunities available, generally hunting and special forest products gathering.

Visual Resources *(EA section 2.2)* Effects to this resource would not have significant impacts because:

- Analysis for Visual Resource Management was conducted and the project was found to adhere to visual resource management objectives for VRM class IV, the class which all of the project area lands are in. The proposed action includes a buffer of trees between unit 17-2 and the Scappoose – Vernonia road, an area where the motoring public may receive a glimpse of the harvest unit as they travel by.

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 projects are comparable to other timber management projects that include regeneration harvest, commercial thinning and density management 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**. No historic or cultural resource sites have been identified within the project areas. There are no park lands, prime farm lands, or wilderness areas located within the project area. There are no federally designated Wild and Scenic Rivers within the project areas. There are no known wetlands within the proposed project area; however, if any are discovered during project implementation, there are project design features incorporated into the project to protect them.

There are no other known ecologically critical areas within or adjacent to the project areas.

4. **The degree to which the effects on the quality of the human environment are likely to be highly controversial.** Scoping of the proposed projects resulted in three comment letters indicating that the level of concern is no greater than most other projects the BLM proposes. The disposition of public comments is contained in section 11 of the EA.

The effects of the proposed projects 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 projects is contained within Section 6 of the EA.

5. **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.** The proposed projects are 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 with the potential for significant impacts 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 the context of past, present and reasonably foreseeable actions (sections 5 and 6). A complete disclosure of the effects of the action alternatives is contained in Section 6 of the EA. Cumulative effects have been identified for Vegetation and Forest Resources (EA Sections 6.1), Wildlife Resources (EA sections 6.3), and Soils Resources (EA Section 6.5). None of the identified cumulative effects were determined to be significant.

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 project was assessed, including field reconnaissance, for its potential to contain important cultural properties and none were found (EA section 2.2). Therefore, 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. Project Design Features have been incorporated that would protect any cultural resource should they be discovered during project implementation (EA section 4.4).

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 proposed project is not within critical habitat for either the marbled murrelet or the spotted owl.

The spotted owl would be affected by the removal (299 acres) and modification (395 acres) of dispersal habitat. Those acres where modification would occur would continue to function as dispersal habitat after treatment. The impact to dispersal habitat would likely have little effect to spotted owls owing to the lack of known spotted owl activity within the project area, near total lack of suitable habitat within the geographic area of northwestern Oregon where the project is proposed, and the limited extent of public land where management for owls could occur. These facts make consideration of spotted owl dispersal habitat nearly inconsequential (EA section 6.3.1).

The proposed project would not affect marbled murrelet habitat and there is a very low probability that marbled murrelets could be using the small amount of suitable structures within the East Fork Nehalem analysis area; therefore disturbance to murrelets associated with the proposed action is very unlikely (see *Wildlife Resources* in section 1 above).

Because an unlikely possibility still exists that the proposed action could result in effects to spotted owls and marbled murrelets, informal consultation with the US Fish and Wildlife Service (USFWS) pursuant to Section 7 of the Endangered Species Act of 1973, as amended, would occur prior to any decision to implement the proposed action (EA section 8). Consultation would be completed by including the projects (timber sales resulting from implementation of the East Fork Nehalem Timber Management Project) within the appropriate programmatic biological assessment prepared by the interagency Level 1 Team (terrestrial subgroup) for the North Coast Province. The projects would be submitted for inclusion in the appropriate programmatic consultation for the years in which the project(s) would be implemented. If any

of the projects are determined to not be in compliance with the standards of the programmatic consultation, the project would be modified to be in compliance with the programmatic consultation while remaining within the scope of impacts analyzed in the EA, or a project-specific consultation would be conducted. In either case, all of the appropriate Terms and Conditions of the appropriate Letter of Concurrence would be incorporated.

The East Fork Nehalem Timber Management Project would not affect any fish species listed under the Endangered Species Act; therefore no consultation with National Marine Fisheries Service is warranted.

10. **Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment**. The proposed projects do 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, Migratory Bird Treaty Act and Executive Order 13112 (Invasive Species). State, local, and tribal interests were given the opportunity to participate in the environmental analysis process. Furthermore, the proposed projects are consistent with applicable land management plans, policies, and programs.

Prepared by: _____ _____

Andy Pampush Date
IDTeam Leader & Environmental Coordinator

Approved by: _____ _____

Karen M. Schank Date
Tillamook Field Manager

East Fork Nehalem Timber Management Project
Environmental Assessment

Environmental Assessment Number DOI-BLM-ORS060-2014-0005-EA
August 2015

Salem District, Tillamook Resource Area
Columbia County, Oregon

T. 4 N., R. 3 W., Secs. 5, 17, & 21; T. 5 N., R. 3 W., Secs. 31 & 33, (W.M.)

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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-15/047+1792

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EAST FORK NEHALEM TIMBER MANAGEMENT PROJECT ENVIRONMENTAL ASSESSMENT

1. INTRODUCTION

The EA will provide the decision maker, the Tillamook Resource Area Field Manager, with current information to aid in the decision-making process for a forest management project that includes the sale of timber within the Matrix (General Forest Management Area [GFMA] and Connectivity [CON]) and Riparian Reserve (RR) land use allocations (LUA) located within the East Fork Nehalem River 6th-field subwatershed. It will also disclose whether the project would result in significant impacts not already analyzed in the Environmental Impact Statement for the Salem District's Resource Management Plan (FEIS/RMP, 1994). Section 1 of this EA for the proposed East Fork Nehalem Timber Management Project (hereafter also known as the EF Nehalem 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 Purpose and Need for Action

The purpose of the action is twofold:

1) Contribute to the Salem District's 1995 Resource Management Plan (RMP) requirement (developed to meet the O&C Lands Act of 1937) to produce a sustainable supply of timber to provide jobs and contribute to community stability while balancing cost effectiveness with other required objectives of the RMP. A sustainable supply of timber is predicated on maintaining a well distributed pattern of early, mid-, and late-successional forest across the Matrix Land Use Allocation (LUA) and applying silvicultural systems that are planned to provide, over time, forests which have desired species composition, structural characteristics, and distribution of age classes (1995 RMP, P. 46).

2) Maintain and improve the development and function of forests within the Riparian Reserve land use allocation to meet the needs of aquatic species and terrestrial species associated with riparian forests while meeting the RMP's Aquatic Conservation Strategy Objectives.

Stand exam data has shown that a number of forest stands in the East Fork Nehalem subwatershed are underproductive due to disease, poor stocking or they are stocked with less desirable commercial species. Other stands are at or above the age which produces maximum average annual growth over the lifetime of the stand, and some are overly dense and in need of thinning to continue healthy growth rates and structural development. The RMP objectives for these Matrix lands require them to be managed on a rotation basis to maintain a well distributed pattern of early, mid and late successional forest, as well as prevent undesirable stand characteristics; provide for valuable ecological function and structural features; and provide habitat for a variety of organisms associated with both late-successional and younger forests. The RMP requires regeneration harvest to assure that over time, harvest in the Matrix will occur in stands at or above the age which produces maximum average annual growth over the lifetime of a timber stand (1995 RMP, P. 48).

Many of the forest stands in Riparian Reserves were found to be either overstocked with a single aged Douglas-fir overstory that lacks the structural layering characteristic of older stands, or to be stocked with hardwoods that are beginning to reach mortality and reduce canopy cover.

In order to meet the requirements for providing a supply of timber, and improve riparian forest development and function, the BLM needs to determine where, when, and under what circumstances the harvest of timber should occur, and where and what types of treatments in Riparian Reserve forests should occur. The Tillamook Resource Area has completed an internal Activity Planning effort in the East Fork Nehalem River 6th field subwatershed on over 2000 acres of forest land that has helped identify stands that could be considered for treatment to meet the purpose of the action. This EA will analyze and disclose the environmental consequences of forest management activities, including timber harvest and associated actions that are designed to meet the purpose of the action.

1.2 Decisions to be Made

The following findings and decisions will be made by the Tillamook Field Manager using information from this analysis:

Finding of No Significant Impact (FONSI):

- To determine if an Environmental Impact Statement (EIS) 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.

- To determine that, if there are significant impacts to the human environment, whether the proposed action could be modified, or mitigation measures could be implemented that would make preparation of an SEIS unnecessary. If we determine there is no need to prepare an EIS, we will document this determination in a Finding of No Significant Impacts (FONSI).

Decision:

- Decisions that are made based on the analysis contained herein would document the selected alternative and the rationale for its selection.

1.3 Scoping

Internal Scoping:

In December 2011 an Interdisciplinary Team (IDT) evaluated the East Fork Nehalem 6th field subwatershed (planning area) and developed an Activity Planning Report (*Activity Planning Report - East Fork Nehalem Activity Planning Unit, 12/30/2011*) which outlined the potential for project work on BLM lands in the planning area. Potential projects included fish habitat enhancement, wildlife habitat enhancement, road decommissioning, fire and fuels management, commercial timber harvest, precommercial thinning, and Riparian Reserve treatments. Previous Activity Planning had been done for portions of the planning area associated with the East Fork Nehalem Restoration Project (Dec 2008) and the Gunners Lakes Project (July 2010). The 2011 effort incorporated results from the 2008 and 2010 plans.

The IDT reviewed the results of these planning efforts, along with data derived from stand exam surveys, wildlife and botany surveys, and field reconnaissance to determine if the planning area had the potential to meet the Purpose and Need for the East Fork Nehalem Timber Management Project described in section 1.1 of this document.

The results of stand exams on over 2,000 acres found that:

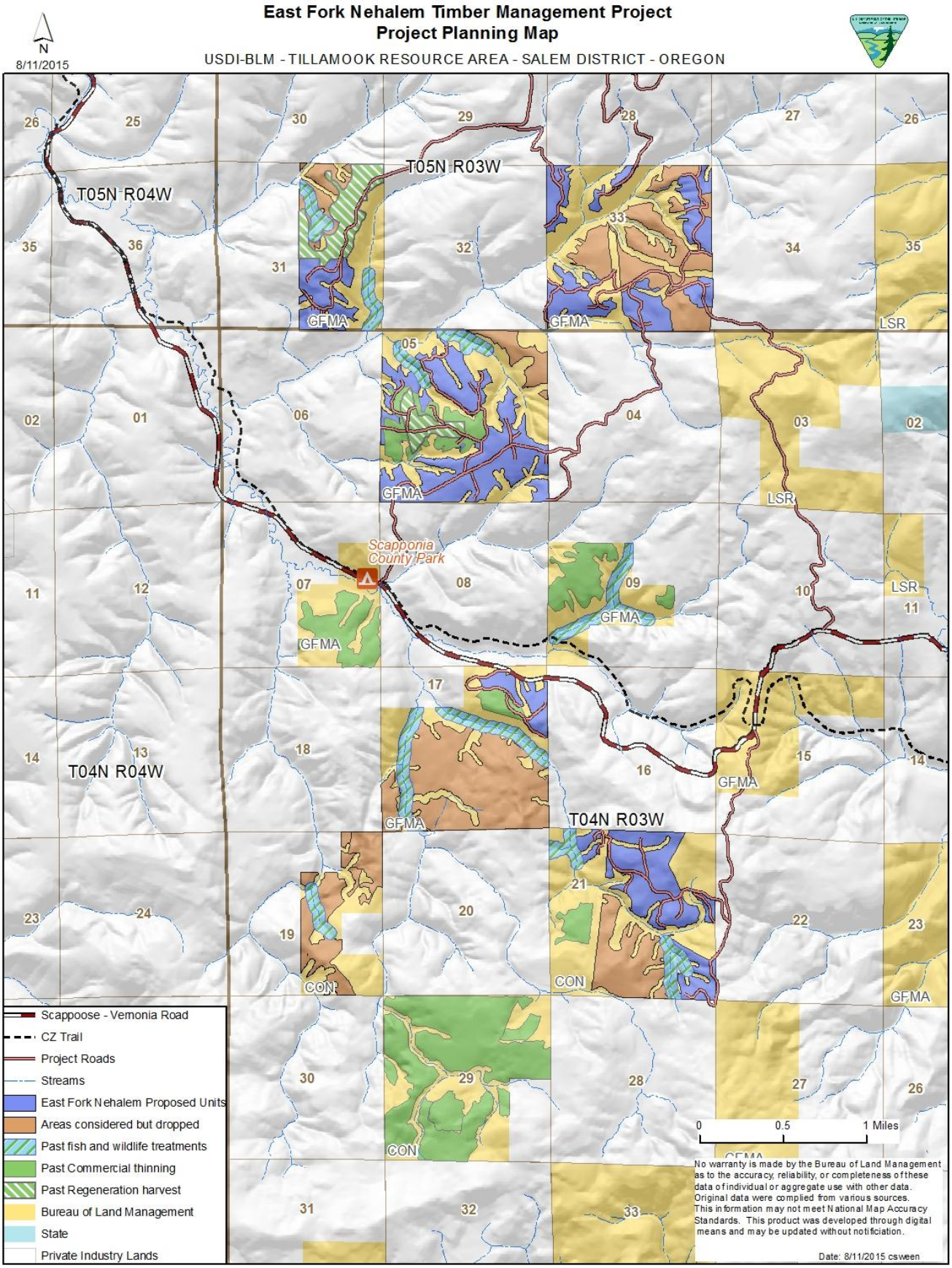
- Some of the stands are at or above the age which produces maximum average annual growth over the lifetime of a timber stand (Matrix lands).
- Some stands are 10 – 20 years away from attaining the age at which maximum annual growth would be reached.
- Some of the stands have low stocking due to disease, or are understocked with conifers because of the prevalence of hardwoods on conifer sites. These stands are in need of management to return the land to productive capacity.
- Some stands have slowed growth but have not reached the maximum productive capacity and are in need of thinning.
- There is a lack of age class distribution on BLM lands in the subwatershed which has a negative impact on future regulated forest management.
- Some of the riparian forest stands are densely stocked with little potential to develop additional canopy layers within the next several decades.

The IDT preliminarily determined that the planning area had about 1,647 acres of forestland that have the potential at this time to contribute to meeting the Purpose and Need described above. Forest stand growth and yield modelling has found that approximately 640 acres of forestland are about one to two decades away from reaching the state of maximum average annual growth. These stands will be deferred to a future planning effort. Also, there are approximately 150 acres of Riparian Reserve stands that could benefit from treatment now but that logically would be treated in conjunction with the deferred upland stands. These riparian stands would also be deferred. And lastly, about 130 acres are Riparian Reserve stands that do not need treatment or are stands deferred because they currently have access problems.

The remaining acres are the proposed project going forward which includes 719 acres of forest that range in age from about 29 to 79 years (as of 2014) and are in such a condition that the following treatments tentatively would be recommended:

• Commercial Thinning	114 acres (includes 2 acres of road construction)
• Riparian Reserve Density Management	304 acres (includes 3 acres of road construction)
• Regeneration Harvest	299 acres (includes 3 acres of road construction)
• Total Harvest Acres	717 acres
• Road Construction not within harvest units	2 acres (includes 1.5 acres in plantations less than 20 years old, and 0.5 acres through 60-70 year old stands)
• Total Project Acres	719 acres

Figure 1: East Fork Nehalem Project Planning Map



Ea:

External Scoping:

External scoping (seeking input from people and organizations outside of the BLM) was conducted by means of sending out a scoping letter on May 28, 2014 for the East Fork Nehalem Timber Management Project to 19 government agencies, nearby landowners, and interested parties on the Tillamook Resource Area mailing list. The letter described the Purpose and Need for Action and the preliminary findings of Activity Planning as outlined in the Internal Scoping section above. In addition, a description of the proposal was included in the Salem District Bureau of Land Management Spring/Summer 2014 Project Update, which was mailed to more than 250 individuals and organizations, and was also posted on the Salem District Planning web page on May 30, 2014.

We received three comment letters; from Doug Heiken representing Oregon Wild, Andy Geissler representing American Forest Resources Council, and David Hill, Public Works Director for Columbia County. A summary of the comments and the BLM responses are in Section 11 of this document. The scoping comment letters are available for review at the Tillamook Resource Area Office, 4610 Third Street, Tillamook, Oregon.

2. ISSUES

Based on the location, nature and scope of the project, and comments received during scoping, as well as information contained in the RMP and East Fork Nehalem Watershed Analysis (1996), the IDT considered the potential for the project to impact the following resources: Vegetation and Forest Resources; Hydrology; Fisheries Resources; Wildlife Resources; Botany and Invasive Plants; Soils; Air Quality, Fire and Fuels Management; Carbon Storage, Carbon Emissions, and Climate Change; Recreation and Visual Resources; and Cultural Resources.

The Code of Federal Regulation that governs the National Environmental Policy Act instructs that: "NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken. The information must be of high quality. Accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA. Most important, NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail." (40 CFR 1500.1 (b))

The issues considered here provide a basis for comparing the environmental effects of the proposed project with the current condition, inform alternative development, and will aid in the decision-making process. The issues are presented in the form of questions regarding the relationship between the proposed action and specific pertinent elements of potentially affected resources. Some of the issues raised will not be considered in detail because the project would have no possibility of significantly affecting the identified resource, are not amenable to scientific analysis, or are not useful to the decision maker in choosing between the alternatives. For those issues not analyzed in detail a brief explanation is included as to why further analysis is not included. Specialist reports covering Silviculture (Vegetation and Forest Resources); Hydrology; Fisheries Resources; Wildlife Resources; Botany and Invasive Plants; Soils; Air Quality, Fire and Fuels; Carbon Storage; Recreation; Visual Resources; and Cultural Resources have been written and are part of the project record for this EA. The specialist reports are incorporated into the EA by reference and contain informational data and/or analysis for both those issues analyzed in detail and those that were not analyzed in detail. Acres or figures within these reports may be similar to, but not necessarily identical to, those in this EA. These differences are often due to rounding or inclusion or exclusion of portions of projects which may overlap. These differences are minor and do not affect the results of the analyses. The figures utilized in this EA are based on the best available information at the time of publishing.

Some issues that may be relevant to this project proposal were analyzed at a broader scale in association with the 1994 *Salem District Proposed Resource Management Plan/ Final Environmental Impact Statement*. This EA will focus on addressing those issues appropriate for analysis at the site specific level of environmental review, and will tier and incorporate by reference broader level NEPA analysis where appropriate.

2.1 Issues Analyzed in Detail

Vegetation and Forest Resources

- ***Issue 1**: What effect would timber harvest treatments, including regeneration harvest and harvest in stands older than 80 years, have on the development of BLM forest stand structure in the East Fork Nehalem subwatershed?*
- ***Issue 2**: What effect will treatments have on the availability of snags and down wood?*

Hydrology

- ***Issue 3**: How would sediment generated by proposed road maintenance and renovation affect the physical integrity, water quality and sediment regime of streams in the project area (Aquatic Conservation Strategy Objectives (ACSO's) 3, 4 and 5)?*

Wildlife Resources - (Includes ESA listed species, BLM Special Status Species, Survey and Manage Species, Migratory Bird Treaty Act species, and certain RMP species requiring coarse wood habitat)

- ***Issue 4**: What effect would the proposed timber management treatments have on Northern Spotted Owls and their habitats?*
- ***Issue 5**: What effect would the proposed forest management treatments have on cavity nesting birds present in the project area?*
- ***Issue 6**: What effect would the proposed timber management treatments have on migratory birds and their habitats?*

Botany and Invasive Plants - (Includes BLM Special Status Species and Survey and Manage Species)

- ***Issue 7**: What effect would the proposed action including road construction, harvesting and hauling have on the potential spread or new infestation of noxious and/or invasive weed species?*

Soils

- ***Issue 8**: What effect would the proposed action, which includes timber harvest and road building, have on soil erosion and soil productivity?*
- ***Issue 9**: What effect would the proposed action have on soil organic matter?*

2.2 Issues Not Analyzed In Detail

Vegetation and Forest Resources

- *What effect will the East Fork Nehalem project have on the commercial forest age class distribution on matrix LUA lands in the Tillamook Resource Area as it relates to producing a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability* (RMP p.20)*?*

Matrix lands are those that are allocated primarily to timber production. The Tillamook Resource Area includes 15,994 acres of Matrix lands. Ideally, a forest regulated for commodity production would have an even distribution of decadal age classes from 0 years old to the age at which the average annual growth is at its maximum (culmination of mean annual increment - about 75 – 100 years for Douglas-fir forests, depending on

site productivity) meaning that the ideal condition for the Tillamook Resource Area would be to have about 1,600 – 2,000 acres in every 10 year age class. Currently the age classes on matrix lands are heavily skewed to the 60 – 80 year age classes with 9,140 acres in this age class (57%) and only 360 acres 10 years old or less and 430 acres between 10 and 20 years old. This indicates that in the future there would be decades where there would be a deficit of appropriately aged timber available for harvest thus negatively affecting sustained yield output required under the O&C Act.

The conditions for conducting regeneration harvest as directed by the RMP are based on conditions of specific forest stands and not age class distribution. Consequently, the East Fork Nehalem project has limited capacity to contribute to alleviating the age class distribution problem. Following RMP standards and guidelines, the project proposes to regeneration harvest approximately 299 acres which would contribute to a partial balancing of age classes.

Further analysis would not provide greater insight to address this issue and RMP management direction regarding stand conditions suitable for regeneration harvest preclude additional alternatives that could address the issue, so no further analysis will be conducted.

<u>Hydrology</u>

- *How would sediment potentially generated by proposed new road construction in Riparian Reserves affect the physical integrity, water quality and sediment regime of streams (ACSO 3, 4 and 5)?*

Roads can produce sediment by instigating mass hillslope failures and from erosion of the road prism and the transport of that material to streams. This project includes one new temporary road segment which would cross a small, very low gradient, intermittent stream in the northeast quarter of sec. 21. Those characteristics result in very low sediment transport capability and would therefore not erode or transport sediment from the crossing site. Other new road segments (2,900 feet in 11 segments) within the first site-potential tree height distance (240 ft. – the width of Riparian Reserves on BLM land within the East Fork Nehalem subwatershed) of streams would be on stable benches above streams. Because no other new road construction would cross streams, there are no obvious pathways for mobilized sediment to contribute to streams. Road layout, design guidance, and implementation inspections by the BLM would minimize risk of hillslope failures related to new roads. New roads would be decommissioned after use reducing the risk of their presence to contribute sediment to streams.

Because no effects to stream sediment conditions would be expected as a result of new road construction, relative to the No Action Alternative, this issue will not be analyzed further in the EA.

- *How would Riparian Reserve timber harvest affect water temperatures and the ability of Riparian Reserves to support aquatic ecosystems (ACSO 4)?*

Proposed Riparian Reserve thinning would treat only about 3% of the subwatershed area within one site – potential tree height of streams (the distance from the stream edge beyond which the forest has little possibility to affect streams), spread out over 5 sections. All of the Riparian Reserve treatments are outside of the no-harvest buffers and will only entail thinning and underplanting. No-harvest buffers of at least 60 feet on intermittent streams and 100 feet on perennial streams would be maintained in all treatment areas to protect the existing primary shade zone along perennial streams (intermittent streams are dry during the times of the year when water temperature is a potential issue). Primary shade zone widths are positively related to hillslope and vary from 70 to 85 feet; (USDA Forest Service and USDI Bureau of Land Management 2010); also, 57% of the proposed treatment acres are on the north side of streams where daily solar radiation has far less impact. The no-harvest buffers are well-stocked and the proposed unit boundaries are set outside of the inner stream gorges. In addition, the 3% area within one site-potential tree height would maintain a weighted average (by acres) canopy closure of 64% which would maintain nearly all of the secondary shade. When considering all of these factors, there is little likelihood of raising water temperatures at the local stream reach scale, and therefore be unlikely to have any effect at the subwatershed scale so this issue will not be analyzed further.

- *Would Riparian Reserve timber harvest affect the physical integrity and sediment regime of streams by changing the availability of instream large wood (ASCO 3, 4 and 5)?*

The presence of large wood in streams greatly influences stream hydrology in the analysis area and because the proposed action would remove trees from Riparian Reserve stands, it could have the potential to affect the supply of instream large wood. Preliminary analysis and the relevant literature (McDade et al. 1990) indicate that the proposed harvest unit boundaries and no harvest buffers (100' on all perennial and 60' on all intermittent streams) would maintain more than 90% of the likely future wood recruitment that would be available under the No Action alternative. Also, the proposed Riparian Reserve thinning would treat only about 3% of the area within 240 feet (width of first site-potential tree height RR for EF Nehalem streams) of streams throughout the 6th field analysis area, spread out over 5 sections, and therefore be unlikely to have any effect at that scale. Proposed Riparian Reserve treatments would reintroduce shade tolerant tree species and spur the growth of retained trees, actions that would maintain riparian functions that contribute instream wood into the future.

The proposed action would therefore not be expected to reduce instream wood recruitment potential relative to the No Action and therefore will not be analyzed further.

- *How would proposed dry season timber haul affect sediment as it relates to the physical integrity, water quality, and sediment regime of streams (ACSO 3, 4 and 5)?*

Timber haul contributes sediment to streams by creating and accumulating fine material in the road prism in the vicinity of stream crossings which, during rain events, can be washed into streams that have direct road connection, such as ditchlines draining directly to the stream. Most of the project road-stream crossings are very high in the drainage network, on small, generally intermittent streams with little discharge or transport capacity. Of the estimated 344 stream crossings in the analysis area, about 47 are expected to be used by this project of which only about 6 would be over perennial streams; all of the others are intermittent streams which would not be running water while dry season haul was occurring. After initial fall rain events there would be and initial flush of sediment entering the stream network from all sources. Sand and larger sized material washed into the stream network tends to deposit in those highest reaches while the very finest material would carry on downstream and may be deposited in the larger tributaries creeks, the East Fork Nehalem River itself or flushed from the watershed. Project Design Features include using sediment control devices on roads with ditchlines and steeper gradients near stream crossings which would greatly reduce the amount of sediment that may enter the stream channel. If any road related sediment does enter the stream network, it would be so high in the network and mixed with natural sources as to be undetectable well before it reached the larger tributaries. Mainly because of the geologic morphology of the East Fork Nehalem River drainage, there are currently high concentrations of fine sediment present in the lower river system. Any sediment generated as a result of the Proposed Action would not result in a measurable increase in sediment load in the system.

Therefore, dry season haul-related sediment would not be expected to alter stream morphology, water quality, or sediment characteristics relative to the No Action, and thus will not be analyzed further.

- *How would proposed extended or wet season timber haul affect sediment as it relates to the physical integrity, water quality and sediment regime of streams (ACSO 3, 4 and 5)?*

Extended- and wet season haul would only be permitted on a few specific road segments (See Project Design Features for Road Use/Haul – section 4.4). Based on the design features, extended season haul would only be allowed under "dry season-like" conditions and therefore result in impacts comparable to those associated with dry season hauling. Wet season haul would only occur on specific roads that have few stream crossings (2) and that also are maintained with enough rock surfacing as to preclude measureable sediment delivery to the stream network (Bilby et al. 1989).

Ordinarily, compared to dry season-only hauling, heavy hauling during the rainy season could have the potential to route a greater volume of sediment to streams and postpone the armoring effect normally expected on a road and ditch network during the rainy season. However, because the roads where extended and wet season haul would occur cross only a few streams (which are at least 1,350 feet from where fish occur) and design features requiring increased road maintenance (including sufficient rock surfacing) and administration during those periods would minimize the potential for sediment delivery, no effects to the physical integrity, water quality or the sediment regime in the analysis area would be expected. For these reasons this issue will not be analyzed further.

- *How would timber harvest activities including felling trees and yarding logs affect sediment delivery to streams?*

The boundaries of the proposed timber harvest units were drawn using site-specific information in the interest of protecting streams and subwatershed-scale processes (such as large wood recruitment) related to hydrologic issues. Potential timber harvest areas identified as having high risk of slope instability were removed from the project because of the risk of sedimentation that logging those areas posed to streams. In addition several Project Design Features would be incorporated to minimize erosion and sediment delivery to streams such as: incorporating no-harvest buffers, limiting ground-based harvesting to dry periods, operating harvesting equipment on slash mats, waterbarring and blocking temporary roads and skid trails prior to the wet season, preventing equipment from operating in the no-harvest buffers, and waterbarring and placing slash on cable yarding corridors in the Riparian Reserve that are oriented toward streams.

By incorporating these PDF's, the proposed action would not be expected to contribute measurable sediment to the stream network above levels that would occur if the action were not implemented because: limiting ground based yarding to the dry season only and operating on slash mats would minimize erosion which in turn would reduce the amount of material that could be transported toward the stream buffer during the rainy season; no harvest buffers would keep felling and yarding operations away from direct impact to streams (by at least 60 ft. (intermittent) or 100 ft.(perennial)) and also provide a buffer strip of intact forest floor and vegetation to slow, dissipate, and filter surface runoff (Rashin *et al.* 2006); and waterbarring temporary roads, skid trails, and Riparian Reserve cable yarding corridors would divert any sediment off the disturbed soil and away from stream channels. Based on implementing the proposed action with design features specifically directed toward eliminating sediment delivery to streams there is little possibility that the action would deliver sediment above background levels therefore this issue will not be analyzed further.

- *How would timber harvest affect stream discharge in terms of peak flow and volume (via rain-on-snow events and reduced evapotranspiration), by removing trees from stands?*

The BLM used an Oregon Watershed Enhancement Board (OWEB) analysis tool for preliminary analysis. Results indicated that under current conditions there is a low risk of forest openings (as a consequence of timber harvest) in the rain-on-snow zone contributing to increases in peak stream discharge in the 6th field East Fork Nehalem analysis area. According to the assumptions of that analysis (more area in the "rain-on-snow" zone with crown closure less than 30% equates to higher risk of increased peak flows), the proposed timber harvest would not increase that risk relative to the No Action alternative. A second preliminary GIS analysis examined possible effects to stream discharge as a result of harvest at the 7th field watershed scale in the Kenusky Creek, Gunner's Lake Fork, and Floeter Pond subwatersheds. The 7th field scale was used in the interest of identifying effects that might be missed at the larger 6th field scale. Grant *et al.* (2008) found that beyond a threshold of about 30% of a rain dominated watershed being harvested, applicable at any scale, a measurable discharge effect (>10% change) would be expected. Only low gradient streams (< 2% slope) with small substrates are susceptible to physical modification from this effect because those relatively small substrates are able to be mobilized by the elevated autumn flows. This was considered a potential issue because there are reaches of Kenusky, Gunner's Lake, and Floeter Creeks that have low gradients downstream of proposed harvest units.

We found, however, that harvest levels in each 7th field subwatershed would not exceed the 30% threshold as a result of the proposed action; therefore the issue will not be analyzed further.

Fisheries Resources - (Includes ESA listed fish species, BLM Special Status Species, and Magnuson-Stevens Essential Fish Habitat)

- *How would sediment generated by proposed road maintenance and renovation affect Coho or their habitat[2]?*

Locations where renovated or maintained roads would cross streams would be at least 481 feet upstream of Coho habitat (median distance from Coho habitat = 2,228 feet). Duncan et al. (1987) found that about half of sediment generated from roads that enter small streams such as those associated with the proposed action stayed in the stream within about 330 feet of the point of entry and that sediment <0.063mm in size transported efficiently through the system. Bilby et al. (1989) found that the majority of sediment produced by gravel roads was finer than 0.004mm and that the movement of this sized material through the stream system had little discernable effect on the composition of streambed gravel. Given the distance from Coho habitat, the relatively small volume of sediment each crossing is estimated to produce per year under the proposed action (between 0.22 yrd^3 and 0.35 yrd^3 on average; Hydro Specialist Report), and that any sediment transported beyond about 330 feet would be of such small granular size as to stay suspended and not become embedded into the graveled spawning habitat, Coho habitat would not be affected, and thus not analyzed further in this EA.

- *How would sediment potentially generated by proposed new, temporary road construction in Riparian Reserves affect Coho or Coho habitat (ACSO 3, 4 and 5)?*

The hydrology analysis concluded that new, temporary road construction in Riparian Reserves would not affect stream sediment conditions and therefore Coho habitat would not be affected either. Sediment generated by new road construction in Riparian Reserves was thus not considered an issue to be analyzed further in the EA.

- *How would Riparian Reserve timber harvest affect water temperatures in Coho habitat?*

No temperature effects to Coho or Coho habitat would be expected based on the hydrology analysis that concluded that the proposed action would be unlikely to change stream temperatures. Secondly, the proposed action would treat only 0.13% of the analysis area within 240 feet of Coho habitat (width of first site-potential RR in East Fork Nehalem subwatershed), all of it above a small dam on the east side of a small pond. The Proposed Action would still maintain a 100 foot no-harvest buffer along the pond and would maintain over 50% canopy closure outside of the no-harvest buffer therefore eliminating the possibility that the proposed treatment would contribute to additional warming of the already completely exposed pond.

Because there would not be increases to water temperature in Coho habitat resulting from Riparian Reserve timber harvest, this issue will not be analyzed further in the EA.

- *How would sediment generated by proposed dry season timber haul affect Coho or Coho habitat?*

The hydrology analysis determined that dry season haul would not alter stream morphology or water quality in streams and therefore Coho or Coho habitat would not be affected either. Sediment generated by dry season haul was thus not considered an issue to be analyzed further in the EA.

[2] Coho are the primary focus of analysis due to their Threatened status under the Endangered Species Act, their inclusion under the provisions of the Magnuson Stevens Act, and because in this context, Coho habitat can serve as an umbrella that encompasses the habitat used by the other anadromous fish. When "Coho habitat" is referred to, it is implied to include Coho Critical Habitat, Essential Fish Habitat for Coho and Chinook, and accounts for habitat in the analysis area used by steelhead.

- *How would sediment generated by proposed extended or wet season timber haul affect Coho or Coho habitat?*

Extended season haul would cross streams no closer than 750 feet from Coho habitat, with a median distance of 2,539 feet. Extended season haul would be managed to limit impacts to those within the range of dry season haul. Together with the design and maintenance standards of the roads to be used and intensive management of extended season activities, no affects to Coho or Coho habitat would be expected.

Wet season haul would cross two streams on well rocked roads. The closest crossing would be about 6,300 feet upstream of Coho habitat; far enough from Coho or Coho habitat as to preclude any impacts.

Sediment generated by extended or wet season haul was thus not considered an issue to be analyzed further in the EA.

Wildlife Resources - (Includes ESA listed species, BLM Special Status Species, Survey and Manage Species, Migratory Bird Treaty Act species, and certain RMP species requiring coarse wood habitat)

- *Would the proposed timber management treatments affect Red Tree Voles or their habitat? If so, how?*

The red tree vole is an arboreal rodent that is listed as a Bureau Sensitive[3] and Survey and Manage Species. USFWS has determined the North Coast Range Distinct Population Segment (DPS) of red tree voles to be warranted but currently precluded from listing under the Endangered Species Act (ESA) by higher priority actions (USDI-USFWS, 2011b). As such the North Oregon Coast DPS of the red tree vole was added to the USFWS list of candidate species. The range of the North Coast Range DPS includes the East Fork Nehalem project areas. Red tree voles are primarily found in late successional (older, structurally complex) conifer forests with multi-layered canopies and branching capable of supporting nests. Conifer or conifer dominated mixed conifer-hardwood forests with at least 60% canopy closure and 2 super-dominant conifer trees per acre is also potential habitat for red tree voles (Huff et. al. 2012). Field reviews find that none of the stands proposed for treatment, or stands adjacent to proposed treatment stands have the structural characteristics to be red tree vole habitat or able to support tree vole populations. Consequently, protocol surveys were not triggered by any of the stands proposed for treatment and therefore none were conducted.

In 2006, approximately 90 acres of purposive red tree vole surveys were conducted in an effort to detect any remnant populations of red tree voles on federal land in the northern coast range. The surveys were done in stands ranging from 100 to 130 years old (T4N, R3W section 3) that also contain several remnant old-growth trees. This is by far the best habitat in the East Fork Nehalem analysis area. The survey areas were within the only section that contains stands over 100 years old, which are included in the Late Successional Reserve (LSR) LUA, within the analysis area. Surveys included climbing and searching the largest and oldest trees within the survey areas, and resulted in no detections of red tree voles or their nests. The fact that no tree voles were found in these areas, that there is no other habitat that red tree voles could migrate from (based on the complete elimination of old and structurally complex forest in the last century by fires and logging), as well as the fact that voles have low fertility rates and are poor dispersers, makes it very improbable that any red tree voles inhabit the area. With no red tree vole habitat in the proposed treatment areas currently, and negative results of previous surveys of the best habitat in the analysis area, it is unlikely that any red tree voles would be impacted by the proposed action; therefore, this issue will not be analyzed further.

[3] Bureau Sensitive: Management of Oregon/Washington Bureau of Land Management (BLM) Special Status Species follows agency policy documented in the BLM Manual Section 6840. Under BLM policy, BLM Districts are responsible to assess, review and document the effects of a proposed action on Bureau Sensitive species. The effects of Bureau proposed actions are documented through a systematic, interdisciplinary evaluation following the decision making process as described in the National Environmental Policy Act of 1969. BLM Districts will also determine and document that District decisions would not contribute to the need to list Bureau Sensitive and Assessment species under the Endangered Species Act.

- *Would the proposed timber management treatments affect Marbled Murrelets or their habitat? If so, how?*

Marbled Murrelet habitat is characterized by large diameter conifer trees with large branches, platforms about 4 inches in diameter, usually with a moss substrate, within 50 miles of the ocean. The platforms generally have overhead cover with suitable access for birds to land. Because murrelets generally use the same nest areas from year to year, but not necessarily the same nest tree, suitable habitat is also characterized as being composed of multiple trees with suitable structures. To differentiate between individual trees with suitable structures and habitat composed of groups of trees with suitable structure, the USFWS defines habitat as: *Potential Habitat* - individual trees with nesting structure, and *Suitable Habitat* - a group of trees with nesting structure, at least six per five acre area (USFWS, 2011).

The East Fork Nehalem Project area ranges from 40 to 45 miles from the ocean, which is in the outer portion of marbled murrelet Zone 2. In Oregon, Zone 1 is located in a band of land extending to 35 miles inland from the ocean and Zone 2 is located 35 to 50 miles from the sea (USDA, USDI, C-10); Zone 1 holds a much higher likelihood for murrelet occupancy than Zone 2. In fact as of 2007, there are no recorded occupied murrelet sites in Oregon Zone 2 (Raphael et al. 2011). No Critical Habitat has been designated by the USFWS for the marbled murrelet within the East Fork Nehalem analysis area.

There are few trees within the East Fork Nehalem subwatershed analysis area that have structures potentially suitable for use by murrelets. In T4N, R3W section 3 there are about 91 acres of forest 100 years old or older, which represents the oldest forest in the analysis area. None of these acres of older forest are included in any proposed harvest units, nor would there be any forest altering activities that would affect them. In the northwestern portion of these stands there are several remnant old-growth trees (estimate 7 – 15); these are the same stands and trees that were surveyed for red tree voles in 2006. It is unclear if these trees with suitable structures are spaced close enough to be considered "suitable habitat" or simply "potential habitat". The nearest proposed treatment unit is approximately 0.3 miles from these trees. One of the haul routes identified in the proposed action would pass by these trees. It is an alternate haul route that could be used for up to 150 acres of harvest area (50 acres of regeneration and 100 acres of thinning), but may not be used at all. Marbled murrelet surveys were done in the stands where these trees reside in 1991, '92, and '93 in association with a past project proposal that was never implemented. There were no detections therefore there are no known occupied marbled murrelet sites within the vicinity of any of the proposed treatment units or haul routes.

Review of historical and current aerial photos, recent LiDAR imagery and extensive field reconnaissance of the analysis area was completed in order to ensure that trees potentially suitable for use by marbled murrelets were identified and managed appropriately. This effort discovered four individual trees (in addition to those discussed in the paragraph above) in two separate locations with potentially suitable nesting platforms in the vicinity of the proposed treatment units. These trees would be excluded from timber sale units by at least 330 feet in order to assure that no disruption would occur in the extremely unlikely case that murrelets may be nesting within any of these potential habitat trees and would preclude the need for daily timing restrictions (USFWS 2014) (See paragraph below).

The USFWS considers disturbance that could affect murrelets during the breeding season to be certain types of noise-generating activities, some of which that could adversely affect murrelets and others that may not adversely affect murrelets. Noise generated within 0.25 mile of murrelet habitat (either potential or suitable) caused by harvesting activities, log hauling on open roads, and road construction, repairs and maintenance may affect, but would not adversely affect murrelets. In addition, harvesting (including chainsaw use) and road construction activities that would occur within 330 feet of suitable habitat and nesting structure (known as the "disruption distance") that has not been surveyed would require the activities to be limited to the time period between two hours after sunrise and two hours before sunset ("daily time restrictions"). Log hauling on open roads and regular road maintenance activities do not require daily time restrictions regardless of the distance from suitable habitat or nesting structure.

Given that only a handful of trees in the 20,000+ acre analysis area are capable of supporting murrelets , all of which are excluded from treatment units by at least 330 feet; that the proposed treatment areas are located approximately 40 to 45 miles from the ocean where there are no known occupied murrelet sites; and that the historical surveys were negative; it is highly unlikely there are any unknown murrelets currently inhabiting the project area or would be expected to occupy the area within the foreseeable future. Therefore, the chances are immeasurably small that the proposed action would affect marbled murrelets through either disturbance or habitat modification. The BLM cooperates with the USFWS and USFS in ESA Section 7 consultation through a streamlined process that includes batched programmatic consultation. These batched consultations describe project types by their potential impact to listed species. Even though there is little possibility that the proposed action could affect murrelets, activities such as timber harvesting, log hauling, and road maintenance in the vicinity of unsurveyed potential or suitable habitat fall into the *May Affect-Not Likely to Adversely Affect* category (See Consultation Section) and therefore timber sales, log hauling or road maintenance that occur within 0.25 miles of these trees during the breeding season would be included in the consultation batch for the year of timber sale. Because there is little possibility murrelets could be affected by the proposed action and that ESA consultation would occur regardless, this issue will not be analyzed further in the EA.

- *Would the proposed timber management treatments affect Bureau Sensitive roosting bats as well as bats identified within the 1995 Salem District ROD/RMP and their habitat? If so, how?*

The fringed myotis *(Myotis thysanodes),* long-eared myotis *(Myotis evotis),* long-legged myotis *(Myotis Volans),* silver-haired bat *(Lasionycteris noctivagans)* and the Townsend's big-eared bat *(Corynorhinus townsendii)* are bat species that are given special consideration in the 1995 Salem District ROD/RMP, two of these species (fringed myotis and Townsend's big-eared bat) are also listed as Bureau Sensitive on the State Director's 2012 Special Status Species list as required under the Bureau's Special Status Species policy. The ROD/RMP requires the protection of caves, mines, and abandoned wooden bridges and buildings that can be used as roost sites for bats.

Distribution of the Townsend's big-eared bat is closely associated with the availability of roosting habitat such as caves and cave like structures, such as mines. They have also been reported to utilize old buildings, bridges, rock crevices and hollow trees as roost sites (Piaggio and Sherwin, 2005). The fringed myotis roosts in buildings, underground mines, rocks, cliff faces, and bridges but also has been documented using decadent trees and snags of larger sizes as roost sites (Weller, 2005). Through extensive field observation and institutional knowledge we know that there are no caves, mines, abandoned buildings or bridges in the proposed treatment areas; nor are there any known bat hibernacula (hibernation sites) or maternity sites; consequently the proposed treatment areas are not likely to provide any breeding habitat (USDI, 1995).

Although the treatment areas do not contain caves and cave-like structures, they do contain a small amount of roosting habitat in the form of larger snags with various types of crevices such as loose bark. According to snag sampling within the East Fork Nehalem subwatershed, there are approximately 2.41 snags per acre. Within proposed treatment units there are approximately 5.4 snags per acre of which approximately 1.5 are of the type that could have features useful as roosting habitat. These larger snags would provide better roosting habitat than small snags because they can act as thermal banks that can maintain fairly constant temperature between day and night which bats favor due to their temperature sensitivity. While there is some suitable bat roosting habitat, the project area would still be considered low quality bat habitat because there are no features other than snags that would attract bats, and that very few of the snags that are there are of the really large sound type that are most desirable to bats.

Within all proposed treatment areas, project design features would be incorporated to protect existing snags to the extent practicable, especially larger snags (20"+ DBH and > 20 feet in height) which have a better chance of being used by roosting bats. Specific trees would be reserved around large snags which would provide increased protection of the snags during logging operations (See Project Design Features section 4.4). The project design features for snag protection and green tree retention, (including those trees with features desirable to species such as bats) would protect almost all of the desirable bat habitat structure for roosting or resting bats. Because bats

forage where insects, especially moths, are more abundant, regeneration harvest and *Phellinus* treatment areas may increase bat foraging opportunity by increasing complex early seral habitat which is richer in deciduous shrub habitat and tends to contain higher diversity and numbers of insects (Hammond and Miller, 1998).

Considering the low quality of the existing bat habitat, incorporation of design features to protect that habitat, and the potential improvement of bat foraging habitat, there is little possibility of measureable adverse impacts to bats which may result from the proposed action, therefore this issue will not be analyzed further.

- *Would the proposed harvest treatments affect Special Status mollusk species? If so how?*

There are currently three species of mollusks identified on the BLM's Special Status Species list as Bureau Sensitive with the potential of being located within the Tillamook Resource Area (Puget Oregonian *(Cryptomastix devia),* evening fieldslug *(Deroceras hesperium)* and crowned tightcoil *(Pristiloma pilsbryi)*). The evening fieldslug and Puget Oregonian are also Survey and Manage Species (SEIS Special Attention Species) as identified within the 2001 S&M ROD (including Annual Species Reviews). All of the proposed treatment units contain and/or are near potential habitat for these Special Status and/or Survey and Manage mollusk species. 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, woody shrub species and for some species, hardwood trees, especially big-leafed maple. The evening fieldslug is associated with perennially wet meadows in forested habitats. It appears to have high moisture requirements and is almost always found in or near herbaceous vegetation at the interface between soil and water, or under litter and other cover in wet environments where the soil and vegetation remain constantly saturated.

Mollusks surveys for these species were conducted in two separate efforts covering all of proposed treatment units (fall and spring 2011-2012 and 2014-2015) using the *Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan Version 3.0, 2003.* No Special Status or Survey Manage mollusk species were identified during any of the survey efforts. Past survey efforts, covering approximately 12,000 acres of BLM land within the Tillamook Resource Area have resulted in only one site of the evening fieldslug (S&M and BS), four sites of the Puget Oregonian (S&M and BS), and one site of the crowned tightcoil (BS). All of these sites are located about 40 miles southwest of the proposed treatment areas in the Nestucca River drainage. Given the amount of surveys which have not produced any additional sites of these species, and the fact that the only known sites are located 40 miles away, we believe that it is very unlikely that any of the special status species currently inhabit the East Fork Nehalem Project area. For these reasons this issue will not be analyzed further.

<u>Botany and Invasive Plants</u> - (Includes BLM Special Status Species and Survey and Manage Species)

- *Would the proposed timber management treatments, including road construction, harvesting and hauling cause negative effects to any Bureau Sensitive or Survey and Manage botany species?*

All of the proposed treatment areas have been surveyed for Bureau Sensitive or S&M botany species. Only one species of concern, *Cetralia cetrariodes* (designated S&M category E lichen under both 2001 and 2003 ASR, manage all known sites) was found and it occurs in section 33 on the edge between an area proposed for density management and a no-harvest area. The site would be protected through a Project Design Feature that would either include the site in a reserve clump of trees or would be left out of the unit during layout. Because the only site of concern would be protected from impacts, this issue will not be analyzed further.

<u>Soils</u>

- *How would timber harvest and road building affect slope stability within the project area?*

Mass movement is a natural process in which the mechanics and rates of slope movement are controlled by many factors: slope gradients, depth to bedrock, structural bedrock properties and moisture content in the soil profile are

some of the many factors that determine the potential for slope movement risk and slope failures. Timber management and road building can greatly increase the probability of slope failure if conducted without proper planning and done in high risk areas. Using LiDAR technology, TPCC data, aerial photos and on-the-ground reconnaissance, all areas showing signs of slope instability have been excluded from the project. Project design features that limit ground based harvesting to gentler slopes (≤ 35%) and require at least one-end suspension of logs during yarding have been incorporated into the project plans and have the effect of further minimizing the risk of slope failure resulting from the proposed project. Because project design features and project planning have reduced slope stability risk to an inconsequential level, this issue will not be analyzed further.

Air Quality, Fire and Fuels Management

- *How would smoke from pile burning affect air quality?*

Burning piles produces smoke that affects air quality. The effect on air quality comes from the amount, location and the duration of the smoke produced. Hand piles and machine piles are small in size and usually burn for just a few hours. Landing piles usually are larger and may sometimes burn for a day or more. The amount of smoke produced is based on the number of tons of fuel that is burned. The proposed action would burn an estimated 5,230 tons of the estimated 18,736 tons of fuel generated by the proposed action and include all three kinds of pile construction. Only woody material less than 6" in diameter would be burned. This total would be burned under cool damp conditions over the course of 4-7 years as the various timber sales are completed and fuel reduction and site preparation occurs (estimate 1,500 – 2,500 tons in any given year). The State of Oregon manages air quality effects associated with forest management fuels reduction and has enforcement authority over when and how much forest fuels can be burned in any given area on any given day. Burning associated with the proposed action would only occur in accordance with the Oregon State Implementation Plan and Oregon Smoke Management Plan, which is a plan developed between Oregon Department of Forestry (ODF) and Department of Environmental Quality (DEQ) that enforces the Clean Air Act. The objectives of the smoke management plan are, among other things, to prevent smoke resulting from prescribed burning on forestlands from being carried to or accumulating in smoke sensitive receptor areas or other areas sensitive to smoke, and to provide maximum opportunity for essential forestland burning while minimizing emissions. The city of Vernonia, approximately 5 air miles from the nearest unit, is the nearest smoke sensitive area. We expect that prescribed burning would cause short term impacts to air quality in the immediate vicinity (approximately ¼ mile) of the burn area that would persist for one to three days. None of the harvest units are sufficiently close to any major highways where motorist safety would be affected. The overall effects of smoke on air quality is predicted to be local and of short duration. Because the proposed project would only burn a relatively small amount of fuel in any given year in compliance with the Oregon Smoke Management Plan and, that the impacts would be short term and local with no intrusions into smoke sensitive areas, we expect that the effects to air quality would be inconsequential, therefore this issue will not be analyzed further.

- *What affects will slash piles from fuels treatments have on fire risk?*

Fire risk will increase immediately following harvest activities due to the increase in available fuel (slash – branches, tops, damaged brush) and sun light on the forest floor. Slash created during harvest activities in areas proposed for planting, at landings, and along some roads would be piled and burned upon the conclusion of harvest activities. Slash along roads open to the public where piles aren't created is proposed to be pulled back from the road edge to reduce the possibility of ignition from passing motorists. The piling, burning, and slash pullback would minimize the risk of fire once they are completed. Additionally, many of the roads that would be used for the action are behind locked private industry gates where the public does not have access, thus further reducing fire ignition possibility. Project Design Features requiring logging contractors to have State of Oregon required fire equipment on site during operations would minimize the risk of fire caused by operational activities prior to the completion of the piling, burning and slash pull back. Because project design and planning have reduced fire risk to an inconsequential level, this issue will not be analyzed further.

Carbon Storage, Carbon Emissions, and Climate Change

- *How would the proposed timber harvest project affect carbon storage, emissions, and by extension, climate change?*

Growing trees sequester and store carbon; machines harvesting trees emit carbon, as does decaying dead trees and wood, and the burning of forest products. We calculated carbon sequestration, storage and emissions at the project scale to assess the temporal impacts of carbon cycling due to the proposed action. Our modeled calculations showed immediately after harvest there would be a reduction in stored carbon of about 71,808 tonnes, or 0.000072 gigatonnes (about 0.000024% of global forest carbon stores). We also found that after about 35 years the growth of the residual and planted trees, coupled with the carbon stored in products developed from the proposed action that the level of carbon sequestered and stored would be at a level similar to the No Action alternative after 35 years. While recognizing carbon's role in climate change, we nonetheless don't have the ability to determine what, if any, affect that the East Fork Nehalem Projects' 35 years of released carbon would have on global climate change. Because climate change is inherently a global issue and our temporary, relatively tiny, contribution is not practically measurable on the global scale.

Recreation

- *How will recreational activities be affected by the proposed project?*

Recreational activities in the vicinity of the proposed harvest units generally entail hunting, fishing, and special forest product gathering. The introduction of additional complex early seral habitat associated with regeneration harvest may improve hunting of deer and elk but is not expected to result in enough change to significantly increase hunting opportunity. No other activities are expected to be affected by the proposed action. This issue will not be analyzed further.

Visual Resources

- *How would timber harvest, including regeneration harvest and thinning, affect visual resources within the project area?*

Visual resources consist of the land, water, vegetation, structures and other features that make up the scenery and physical features visible on a landscape. All Salem District BLM-administered lands have been classified under a Visual Resource Management (VRM) class system that was established by BLM during the last planning effort in the early 1990s. In 2013 the BLM Salem District re-inventoried for current scenic values and categorized BLM lands into Visual Resource Inventory (VRI) classes derived from individual visual resource components. A VRI class is determined by overlaying the ratings of scenic quality (A, B, or C), public sensitivity to changes in visual character (H, M, or L), and distance zones as seen from major viewing platforms or travel routes (foreground-middle ground, background, or seldom seen). The foreground-middle ground zone includes areas seen from less than 3 miles away. Visible areas beyond 3 miles but usually less than 15 miles away are in the background zone. Areas either hidden from view or beyond 15 miles are in the seldom-seen zone (BLM Handbook H-8410).

Lands within the project area fall under VRM Class IV, as assigned in the existing RMP and were recently re-inventoried as VRI Class IV as well. VRM Class IV objectives provide for management activities which could cause moderate modification of the existing character of the landscape. These management activities may dominate the view and be the major focus of viewer attention but attempts should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements of line, form, color, and texture (RMP p. 37). Regeneration harvest is an example of an allowable management activity in VRM Class IV that may dominate the landscape. These objectives do not apply on private residential lands or commercial timber land.

Only a portion of one proposed harvest unit (17-2) may be visible in the direct foreground from the paved Scappoose-Vernonia county road, which is the most traveled (and only paved) road in the analysis area. A small portion of the regeneration harvest area would be viewable from a vehicle for brief period of time as the vehicle travels past the unit's access road junction. There are no pull-outs along the road where travelers could stop. An unharvested buffer above a cutbank along the road, as well as riparian no-harvest buffers on a stream that crosses the road would occlude nearly the entire regeneration harvest unit above the road, rendering the harvest nearly unnoticeable from a travelling vehicle. Many of the other harvest units are only accessible through locked private landowner gates making the units inaccessible and unviewable to the public. A few units are accessible from graveled timber haul roads one to three miles off of the Scappoose–Vernonia Road, but would only be viewable if the traveler drove directly to the units. These roads are typically only used for timber management and by the public for hunting and special forest products gathering such as firewood and mushrooms. One graveled county haul road, Pittsburg Road, on the northern edge of the watershed affords occasional views of a portion of the subwatershed along private clearcut harvest units. The nearest BLM land is approximately ¾ of a mile away at the nearest point to the road, but it is not visible from the road due to topographic features. Because of the nature of the viewshed as one having a high degree of high contrast edges and a great variation of colored vegetative patterns due to high intensity timber management, any changes to the BLM lands would be nearly imperceptible and certainly would not dominate the view as allowed by the VRM IV classification. Because the proposed action would likely only result in very low noticeable change to the visible landscape in an area where high intensity visual changes are normal and expected, this issue will not be analyzed further.

Cultural Resources

- *What effects would the proposed project have on cultural or archeological resources, if they are present?*

Background research including reviewing GIS data and District Cultural Resources files did not show any documented cultural properties in the East Fork Nehalem project area. No cultural properties were located during field surveys, which concentrated on recorded historic railroad grades that over-lapped with proposed forest treatments and road building. As expected, most of the historic railroad grades had been re-used as logging roads. In areas where the roads had not been maintained, survey was accomplished by clearing away vegetative matter to mineral soil, in a 1m x 1m sample and at an interval of 25m along the graded area and along alternating sides, embankments and ditches. Each cleared area was observed for artifacts or indications of cultural properties. Because of the dense vegetation and accumulation of decomposing vegetative matter, if cultural properties were present they likely would have been destroyed or obscured by vegetation and/or decomposition. Remnant railroad ties were observed but were decayed to a consistency of fine grade bark dust and thus do not retain integrity as an artifact for inclusion on the National Register of Historic Places as described in the National Historic Preservation Act of 1966 (as amended) (NHPA). Because the proposed action would not likely impact any cultural properties with significant relationship to the NHPA, this issue will not be analyzed further.

3. PROPOSED ACTION

3.1 Project Area Location and Vicinity

The East Fork Nehalem Timber Management Project area is approximately 5 miles east of the town of Vernonia, Oregon, in the East Fork Nehalem River 6th field subwatershed of the Nehalem River watershed. The project area includes BLM-managed lands within sections 31 and 33 of Township 5 North, Range 3 West, and sections 5, 17, and 21 of Township 4 North, Range 3 West, Willamette Meridian (WM), in Columbia County, Oregon, (Table 1).

The proposed project area is located on revested Oregon and California Railroad Lands (O & C Lands) within the Matrix (which includes General Forest Management Area (GFMA) and Connectivity (CON)) and Riparian Reserve (RR) land-use allocations (LUAs). BLM-administered land is intermixed with private industrial forest land in an alternating section ownership pattern where the BLM lands are located within the odd numbered sections. (Table 2). With the exception of a few private residences along the East Fork Nehalem River, essentially all of the project area is forested and used for timber management.

Table 1: Watershed, Subwatershed and Proposed Treatment Acres

5th Field Watershed Name	5th Field Watershed Acres	6th Field Subwatershed Name	Total 6th Field Subwatershed Acres	Proposed Treatment Acres (est)*	Percent of 6th Field Subwatershed Area Treated
Headwaters Nehalem River	142,665	East Fork Nehalem	20,608	717	3.5

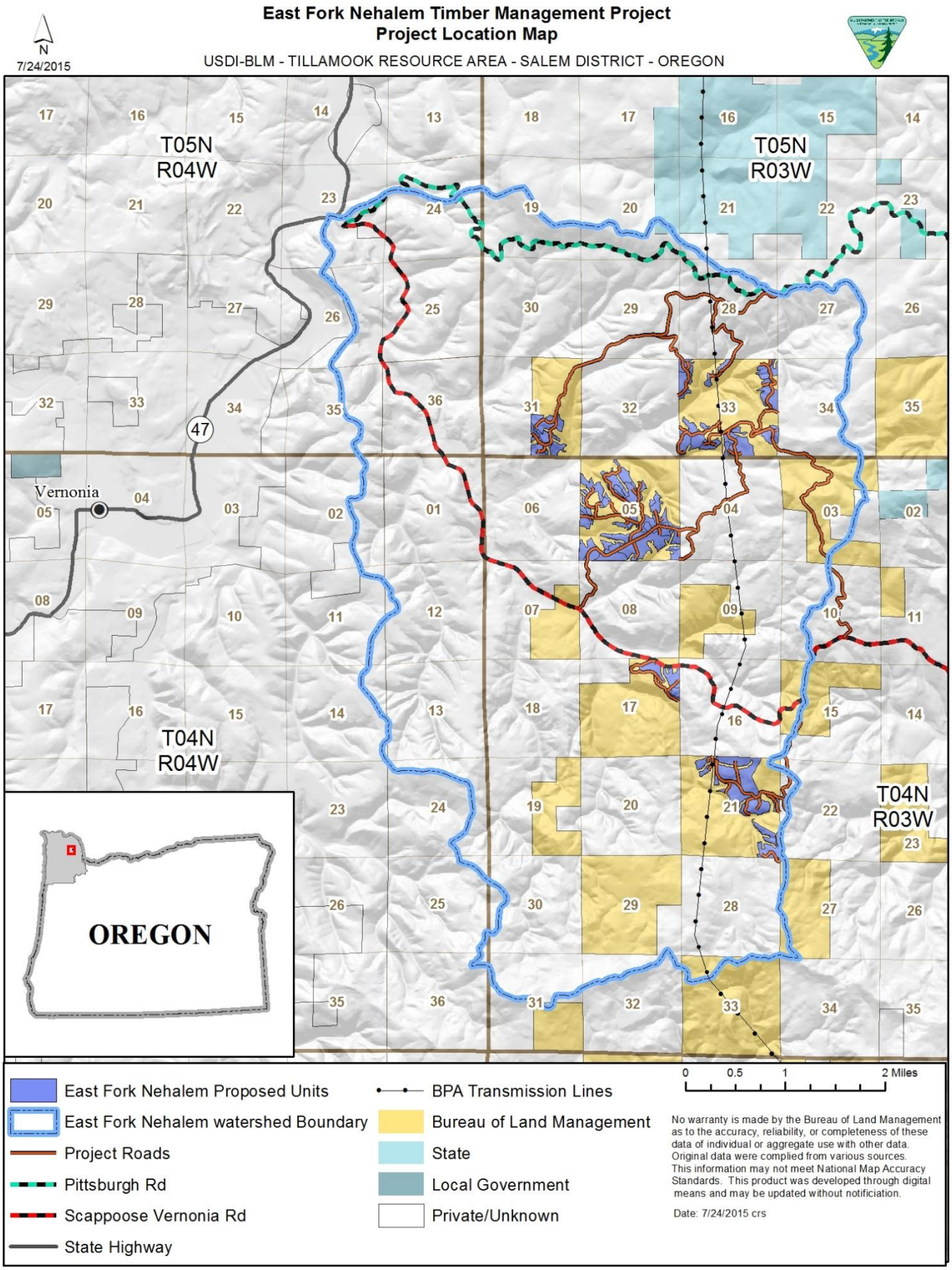
*The treatment acres include approximately 10 acres of new road construction. Three acres would be within regeneration harvest units, 5 acres would be within thinning or density management units and 2 acres would occur outside of the boundaries of any of the proposed treatment units.

Table 2: Land Ownership within the East Fork Nehalem River 6th Field Subwatershed*

Owner	Acres	Percent of Subwatershed
BLM	4,572	22
State**	12	0.006
Private	16,024	78

*The East Fork Nehalem subwatershed is the analysis area for cumulative effects and most landscape level analyses within this document.
**Because the East Fork Nehalem 6th Field subwatershed contains so few acres of State lands, they will not be included in analysis estimates.

Figure 2: Project Location Map



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

The following documents direct and provide the 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 (ROD/RMP): The ROD/RMP has been reviewed and it has been determined that the proposed timber and riparain management 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 ROD/RMP is the reason for doing these activities (ROD/RMP p.1-3).

2. The Salem 1995 RMP is the plan of record for the Salem District. The 1995 RMP incorporated land use allocations and standards and guidelines from the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl*, April 1994 (the Northwest Forest Plan, or NWFP).

3. *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines, January 2001.* Consistency with this Record of Decision includes the incorporation of the Annual Species Reviews from 2001 – 2003, except where they pertain to the red tree vole, which maintain its status as of 2001.

4. *Revised Recovery Plan for the Northern Spotted Owl,* (Strix occidentalis caurina). *U. S. Fish and Wildlife Service,* 2011

The analysis in the East Fork Nehalem Project EA is site-specific, and tiers to analyses found in the *Salem District Final Environmental Impact Statement*, September 1994 (RMP/FEIS).

Information from the "Current Conditions" (pp. 10 – 32), "Synthesis and Interpretation" (pp. 42 – 50) and "Recommendations" (pp. 52-58) found in the *East Fork Nehalem Watershed Analysis*, December 1996, has been incorporated into the development of the proposed management activities and into the description of the East Fork Nehalem EA's affected environment and environmental effects (EA section 5) and is incorporated by reference.

The documents listed above are available for review in the Tillamook Resource Area Office.

3.2.1 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. FLPMA requires the BLM to develop, maintain, and revise land use plans.
- *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 conserve endangered species and threatened 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 of 1918* (MBTA), Executive Order 13186, and Migratory Bird Treaty Reform Act of 2004.
- *The National Historic Preservation Act* (NHPA) 1966 - Requires Federal agencies to take into account the effects of their undertakings on historic properties.

3.2.2 RMP Objectives

This project has been designed to implement and 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. The following information about the RMP provides context for understanding the Purpose and Need for this project as well as for how the project has been designed.

The East Fork Nehalem Timber Management Project would occur within the Matrix and Riparian Reserve (RR) land use allocations (RMP p. 5). Portions of the stream network within the East Fork Nehalem 6th field subwatershed analysis area are critical habitat for Oregon coast coho salmon, listed as threatened under the Endangered Species Act. The following RMP and NWFP objectives would apply to this project.

<u>Within the Matrix land use allocation (RMP p. 20)</u>

- Produce a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability.
- Provide connectivity (along with other allocations such as Riparian Reserves) between Late-Successional Reserves.
- Provide habitat for a variety of organisms associated with both late-successional and younger forests.
- Provide for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees.
- Provide early successional habitat.

Management Action/Direction (pertinent to EF Nehalem Project) (RMP p. 21)

- In a regeneration harvest area, leave a minimum of 240 linear feet of logs per acre, averaged over the area and reflecting the species mix of the original stand. All logs will be at least 20 inches in diameter at the large end, and be at least 20 feet in length. Logs will be distributed throughout a cutting area, and not piled or concentrated in a few areas. Decay class 1 and 2 logs will be credited toward the total. Where this management action/direction cannot be met with existing coarse woody debris, merchantable material will be used to make up the deficit.
- In areas of partial harvest, apply the same basic management actions/direction, but they can be modified to reflect the timing of stand development cycles where partial harvest is practiced.
- Retain coarse woody debris already on the ground and protect it to the greatest extent possible from disturbance during treatment (e.g., slash burning and yarding) which might otherwise destroy the integrity of the substrate.

- Retain snags within a timber harvest unit at levels sufficient to support species of cavity nesting birds at 40 percent of potential population levels. Meet the 40 percent minimum throughout the Matrix with per acre requirements met on average areas no larger than 40 acres.
- In addition to the previous green tree retention management action/direction, retain green trees for snag recruitment in timber harvest units where there is an identified, near-term (less than three decades) snag deficit. These trees do not count toward green-tree retention requirements.

General Forest Management Area (GFMA) subset of Matrix LUA

- Retain six to eight green conifer trees per acre in regeneration harvest units.

Connectivity/Diversity Blocks (CON) subset of Matrix LUA

- Maintain 25 to 30 percent of each block in late-successional forest at any point in time. Riparian Reserves and other allocations with late-successional forest count toward this percentage.
- Manage available forest land on a 150-year rotation.
- When an area is regeneration harvested, retain 12 to 18 green trees per acre.

<u>Within the Riparian Reserve land use allocation (RMP pp. 9-11)</u>

For the EF Nehalem Project, the RR LUA includes the stream and the area extending from the edges of the stream channel (each side) to a distance equal to:

- For fish-bearing streams – 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 - 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.

As a general rule, management action/direction for Riparian Reserves prohibit or regulate activities that retard or prevent the attainment of Aquatic Conservation Strategy Objectives (RMP p. 10). Timber management within Riparian Reserves is only permitted in order to address certain circumstances; one of which is:

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. (RMP p. 11)

Riparian Reserves are portions of watersheds where riparian –dependent resources receive primary emphasis and where special standards and guidelines apply. Riparian Reserves are used to maintain and restore riparian structures and functions of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants, and provide for greater connectivity of the watershed (NWFP ROD/S&G's p. B-13).

In BARK v. U.S. Bureau of Land Management, 643 F.Supp.2d 1214 (D. Or. 2009), Bark argued that BLM was prohibited from thinning in Riparian Reserves "unless needed" to meet Aquatic Conservation Strategy (ACS) objectives. The Court rejected Bark's reading of the RMP as requiring the BLM to show thinning was "needed" as a condition precedent to Riparian Reserve treatments, and accepted BLM's interpretation of its RMP as authorizing timber harvest in Riparian Reserve areas to apply silvicultural practices to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics. BLM does not interpret this provision as requiring a showing that treatment is absolutely "needed" to achieve ACS objectives when compared to taking no action. BLM has consistently interpreted this provision of the RMP since its adoption and has

implemented numerous similar treatments [on 4,400 acres as of 2012, out of over 200,000 acres] of Riparian Reserve stands across the Salem District (Salem District Annual Program Summary 2005 and 2012).

This project addresses stand management and road management objectives as they pertain to Riparian Reserve management. Relevant RMP management objectives include:

- Providing habitat for special status, SEIS special attention and other terrestrial species (RMP p. 9);
- Minimizing sediment delivery to streams from roads(RMP p. 11);
- preparing operation and maintenance criteria that govern road operation, maintenance, and management; minimizing disruption of natural hydrologic flow paths, including diversion of stream flow and interception of surface and subsurface flow (RMP p. 11);
- Maintaining effective shade for streams pursuant to ODEQ's TMDL for temperature;
- Meeting all Aquatic Conservation Strategy (ACS) Objectives (RMP pp. 5-6).

These RMP objectives would be accomplished by applying density management treatments within the portion of the RR LUA outside of no-harvest buffers (60' on intermittent and 100' on perennial streams) concurrently with treatments in the adjacent Matrix LUA. The removal of merchantable material would be consistent with the RMP Riparian Objectives since removing a portion of the canopy cover to allow for underplanting and establishment and/or release of existing shade tolerant conifers would improve diversity of species composition and stand structure complexity. The treatments, including removal of the felled trees, would minimize the potential deleterious effects from bark beetle infestation by metering the amount of coarse wood created at the site over time. The treatment would also accelerate the growth of the stagnated overstory conifers which would produce very large trees in a shortened time frame (RMP pp. 9-15, Appendix D-6, NWFP p. B-32). The road objectives would be accomplished by replacing undersized and failing culverts with those that will accommodate a 100 year flood event and by managing maintenance and hauling near streams to minimize the possibility of sediment delivery to streams.

<u>Within all land use allocations</u>

The following RMP objectives would apply across all land use allocations:

- 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 (ROD/RMP p. 28).

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.

Improve and/or maintain soil productivity (RMP pp. 22- 23), by:

- Minimizing disturbance of identified fragile sites;
- Applying best management practices during all ground- and vegetation-disturbing activities (see table 31 for list of BMP's).

Manage timber stands to reduce the risk of loss from fires, animals, insects and diseases (ROD/RMP p. 46).

3.3 Survey and Manage Species Review

The East Fork Nehalem Timber Management Project is consistent with the 2001 ROD and *Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*, as incorporated into the District Resource Management Plan.

This project utilizes the December 2003 species list. This list incorporates species changes and removals made as a result of the 2001, 2002, and 2003 Annual Species Reviews (ASR) with the exception of the red tree vole. For the red tree vole, the Ninth Circuit Court of Appeals in *KSWC et al. v. Boody et a*l., 468 F3d 549 (9th Cir. 2006) vacated the category change and removal of the red tree vole in the mesic zone, and returned the red tree vole to its status as defined in the 2001 ROD Standards and Guidelines, which makes the species Category C throughout its range.

All acres proposed for harvest were surveyed for S&M and Bureau Sensitive terrestrial mollusks including the two species that are on the Survey and Manage (S&M) species list as of December 2003 that have the potential to occur within the proposed project area (*Derocerus Hesperium* and *Cryptomastix devia*). Neither species were found. The entire project area was also surveyed for S&M botanical species. One individual of the S&M lichen *Cetralia cetrariodes* (designated S&M category E lichen under both 2001 and 2003 ASR, manage all known sites) was found. The site is in Section 33 on the edge of a proposed harvest area. The site would be protected through a Project Design Feature that would either include the site in a reserve clump of trees or exclude the site from the unit during unit layout. None of the proposed harvest units include forest stands that could be defined as red tree vole habitat per the "Survey Protocol for the Red Tree Vole *Arborimus longicaudus,* Version 3.0 (November 2012). The proposed harvest stands are neither mature nor old-growth, nor are they younger forests with at least two "super-dominant" trees per acre with characteristics that provide foundations for vole nests. Because the proposed action stands are not red tree vole habitat, no surveys were conducted for that species.

4. ALTERNATIVES

4.1 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". The IDT developed Project Design Features (section 4.4 below) that would minimize or eliminate the potential adverse effects of the Proposed Action.

4.2 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 action would occur at this time. There would be no regeneration harvest, commercial thinning or riparian forest density management. No roads would be renovated or constructed; no culverts would be installed or replaced. 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 non-BLM lands in and around the project area, forest management and related activities would continue to occur. Timber harvest would occur on a 35-50 year rotation following Oregon State Forest Practices Act rules (FPA).

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.

4.3 Alternative 2: Proposed Action

The proposed action would apply commercial thinning and Riparian Reserve density management to approximately 418 acres and regeneration harvest to approximately 299 acres. These harvest acres include 8 acres of road construction that would occur inside of harvest unit boundaries. An additional 2 acres of forest would be removed by road construction outside of any of the harvest units. Nine of the acres of road construction would be decommissioned and replanted after harvest. Seventy-seven percent of the proposed action area would be harvested using ground-based harvest systems.

Table 3: Estimated Treatment Acres by Land Use Allocations.

General Forest Management Area – Treatment Acres = 327		**Riparian Reserve adj. GFMA = 218**	
Regeneration Harvest	Commercial Thinning	Riparian Reserve Density Management	
228	99	1st Site Potential* 193	2nd Site Potential 25
Connectivity – Treatment Acres = 86		**Riparian Reserve adj. Connectivity = 86**	
Regeneration Harvest	Commercial Thinning	Riparian Reserve Density Management	
71	15	1st Site Potential 72	2nd Site Potential 14

Road Construction outside of harvest units - Matrix = 1.5ac	Road Construction outside of harvest units – RR = 0.5ac

* Site Potential Tree Height in the East Fork Nehalem Analysis Area is 240 feet

Table 4: Estimated Treatment Acres by Logging Systems

Ground-Based	Cable
558	159

Figure 3: Harvest Method & Seasonal Skyline Harvest Map

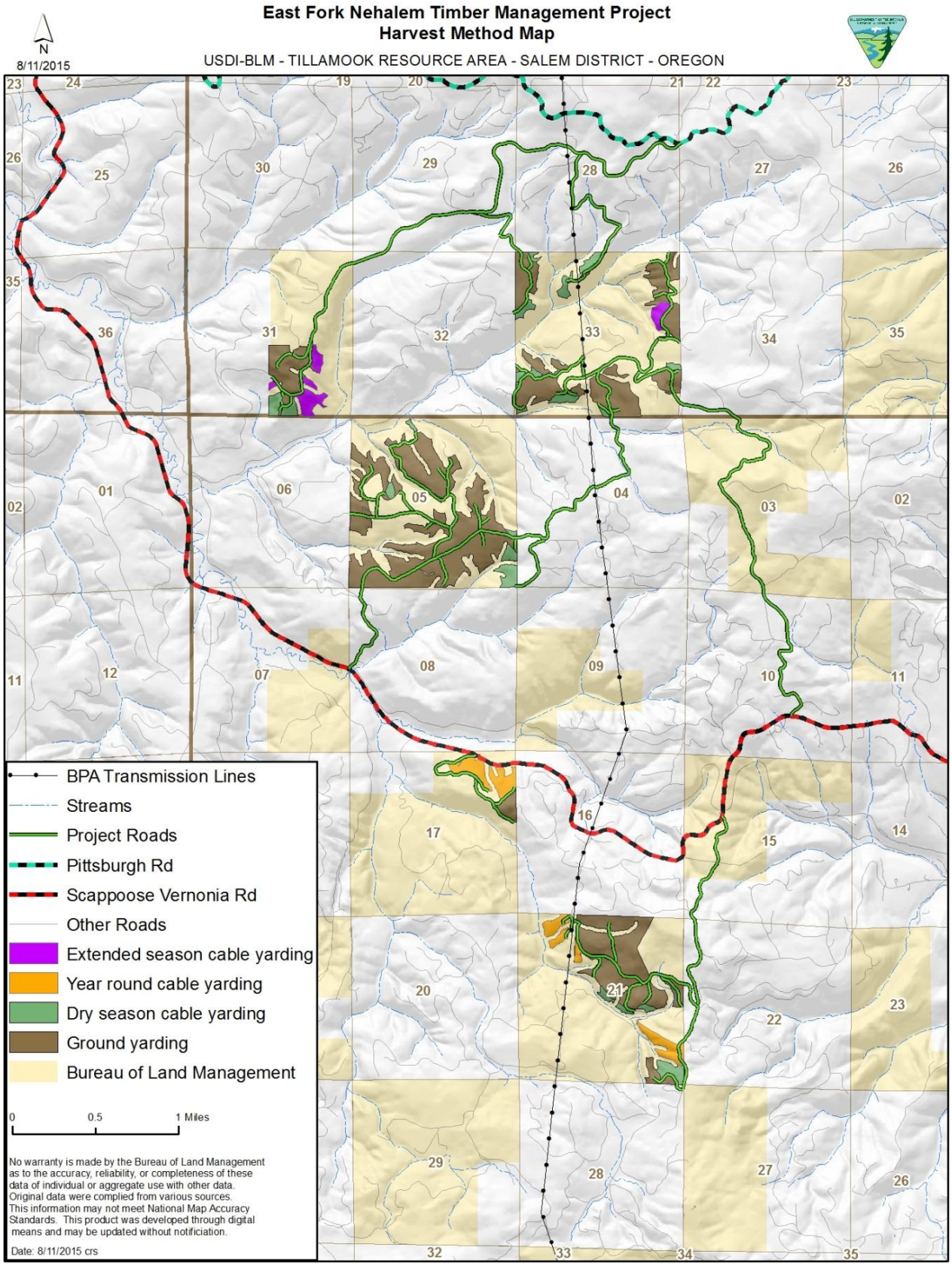


Table 5: Treatment Acres by Harvest Type

Unit	Total Acres	Age*	Trees per Acre	Commercial Thinning (ct) Acres	Regeneration Harvest(r) Acres	RR Density Management – Understory Release (ur) Acres	RR Density Management with Underplanting (up) Acres
5-3	53	74	220	14	0	24	15
5-6	44	69	179	7	27	7	3
5-7	116	67	224	0	66	48	2
5-9	6	75	139	0	3	3	0
5-10-11	25	68	158	17	0	8	0
5-12	19	71	197	0	15	4	0
5-13	6	69	174	0	4	0	2
17-2	33	74	107	0	21	12	0
17-4	4	73	195	0	4	0	0
21-1	128	73	78	0	71	0	57
21-3	11	69	87	0	0	0	11
21-10	33	75	105	15	0	0	18
31-2	39	73	151	0	24	15	0
31-3	17	76	213	0	9	8	0
31-4	10	79	102	0	3	7	0
33-2.1	14	72	131	0	12	2	0
33-2.3	23	74	167	0	14	6	3
33-2.4	16	77	132	8	0	4	4
33-5	5	78	175	0	0	0	5
33-9	15	74	164	8	0	0	7
33-10	17	79	90	0	14	0	3
33-11.1	14	72	142	9	0	4	1
33-11.2	12	71	196	2	0	0	10
33-11.3	11	71	122	7	0	4	0
33-12	8	70	145	2	0	0	6
33-19	10	76	181	0	10	0	0
33-24	2	71	207	0	2	0	0
33-25	26	29	339	25	0	1	0
Total				114	299	157	147

* Age is calculated from EcoSurvey Stand Exam data from 2014

The treatment units are based on the BLM's Forest Operation Inventory (FOI) units which define stand characteristics. Many of the FOI units are large and are covered by both Matrix and RR LUA's. Some of these FOI units have also been dissected by previous timber sales resulting in disconnected portions of the same unit. For these reasons most of the treatment units would have multiple treatment types. In order to track treatment units through analysis we have assigned treatment type designators to the various subunits. The unit numbers from the table above would be followed by: (r) for regeneration harvest, (ct) for commercial thinning, (ur) for Riparian Reserve density management – understory release, and (up) for Riparian Reserve density management with underplanting.

Regeneration Harvest (r)

The proposal includes a total of 299 acres of regeneration harvest. Areas proposed for regeneration harvest are 67- to 79-year-old stands (as of 2014) comprised variously of hardwood-dominated stands, mixed hardwood/conifer stands, and dense single-story Douglas-fir stands. Some of the stands selected for regeneration harvest have reached the age in the growth cycle at which the mean annual increment for volume is at its maximum (Helms 1998); this is also referred to as culmination of mean annual increment (CMAI). Other stands proposed for regeneration harvest have a substantial level of infection from *Phellinus weirii* (laminated root rot), which reduces wood production on the site by causing reduced growth and mortality in infected trees. Lastly, a number of stands are generally poorly stocked or dominated by hardwoods which cause the sites to be under-producing desirable wood volumes. These stands resulted from natural regeneration (or possibly some level of aerial seeding) following harvesting of old-growth or fire salvaged stands in the 1930's and 1940's.

In the stands proposed for regeneration harvest approximately 16-24 trees per acre on average in GFMA, and 25 trees per acre on average in CON (Section 21 stands) would be reserved from harvest to provide for a variety of ecological functions including providing structural and biological legacies that bridge one stand to the next; a source for larger down logs that the new stand won't be able to provide for many years; large trees that can be converted to snags, either naturally or by future management action, to support populations of cavity nesting birds as well as supplement a potential future snag deficit ((RMP p. 21) see Project Design Features section for details). The trees to be reserved would be predominantly conifer trees but occasionally a few large hardwoods would also be reserved, especially those with existing cavities. The retained trees would generally be larger than the stand average and include large western redcedar when available and trees with characteristics desirable to wildlife such as broken or forked tops and existing cavities or platforms. The trees would be distributed both in clumped aggregate patches (75%) and as dispersed single trees or small groups of two or four trees (25%). Since large reserve patches can have more ecological benefit than small ones (interiors where inter-tree competition and mechanical contact are still occurring, as well as more variety of micro-climatic conditions), the proposed action would include aggregating trees into clumps of approximately 40 – 100+ trees depending on size of unit and existing trees per acre (generally about ½ acre in size with a few approximately an acre). These aggregations would occur at an average rate of one per every 2-6 acres depending on the size of the units and be well distributed throughout the regeneration harvest units. Fewer than 25% of the aggregations would be placed adjacent to similarly aged reserved BLM stands. Aggregations may be placed adjacent to BLM plantations or along property lines adjacent to private timber of any age. No harvesting would occur in the reserve tree clumps. Since pre-work logging plans would be required prior to harvesting, the expectation is that harvesting operations, including skid trails and yarding corridors, would avoid impacting these clumps. Any request by the logging contractor to cut trees in reserve tree clumps for operational purposes would be considered on a case-by-case basis and trees that are required to be felled would be retained on site for down woody debris habitat.

Table 6: Regeneration Harvest Reserve Tree Estimates

Unit	Acres	Est. Total Reserve Trees/Acre*	Est. Total Reserve Trees	Est. Total Reserve Trees in Clumps (75%)	Est. Total Reserve Clumps (range)	Est. Total Reserve Trees Outside of Clumps 25% (per acre)
5-6r	27	19	513	385	5-7	128 (4.7)
5-7r	65	22	1430	1073	11-18	357 (5.5)
5-9r	3	20	60	45	1-2	15 (5)
5-12r	15	19	285	214	3-5	71 (4.7)
5-13r	4	22	88	66	1-2	22 (5.5)
17-2r	21	16	336	252	4-6	84 (4)
17-4r	4	18	72	54	1-2	18 (4.5)
21-1r	70	25	1750	1312	11-20	438 (6.3)
31-2r	23	16	368	276	4-6	92 (4)

31-3r	9	24	216	162	2-4	54 (6)
31-4r	3	20	60	45	1-2	15 (5)
33-2.1r	12	18	216	162	2-5	54 (4.5)
33-2.3r	14	18	252	189	3-5	63 (4.5)
33-10r	14	16	224	168	3-5	56 (4)
33-19r	10	20	200	150	2-3	50 (5)
33-24r	2	20	40	30	1-2	10 (5)

*Some of the reserved trees are intended to account for an identified down wood deficit. Larger trees make up more of the deficit than smaller trees. If larger trees are selected, fewer trees would be needed, the opposite is also true, smaller trees require more. We expect that the required trees/ac. would only vary by 1 or 2 trees +/-.

Commercial Thinning (ct)

Commercial thinning would occur on approximately 114 acres of Matrix lands in stands that range in age from 29 – 79 years old (2014 data). The stands proposed for thinning are relatively dense, single-storied, even-aged, Douglas-fir-dominated stands. The proposed treatments would generally thin the Douglas-fir component while retaining the other conifer species present (western hemlock, western redcedar, and an occasional grand fir). Some trees with structural features desirable to wildlife would be reserved, especially in the CON LUA (section 21), at a percentage similar to their current occurrence.

The treatment would be a "thinning from below" to a pre-determined basal area[4] where generally the smallest to medium sized trees are removed leaving the largest best trees to continue to grow. In order to maximize site occupancy and provide the most growing space to the reserved trees the thinning would be relatively evenly spaced. Basal area targets would be developed to reduce current inter-tree competition to a level where the reserved trees would be relatively free of competition for the next 15-30 years before the site is fully stocked again and tree growth begins to slow from competition for site resources.

After harvest, relatively open areas around landings, skid trails and other less dense areas would be evaluated for planting with shade-tolerant conifers.

Phellinus weirii (Laminated Root Rot) Treatments

Within the commercial thinning areas there are about 29 acres where laminated root rot is especially prevalent in discrete disease centers causing trees to die and fall. These disease patches range in size from less than an acre to about seven acres. Because the disease is transmitted from tree to tree by root contact between healthy trees and infected trees, including dead trees and stumps, a heavy thinning treatment would be used to attempt to halt the continued spread of the disease to the healthy stand around it. The treatment would include thinning to a wide spacing that would leave approximately 20 large overstory trees per acre. The treatment would target the removal of the highly susceptible species (Douglas-fir and and grand fir) while retaining redcedar, hemlock and larger hardwoods. All Douglas-fir and grand fir, not otherwise reserved, inside the defined area and within 30 feet of the identified boundary would be harvested to reduce the potential for disease to spread through root contact. If 20 large overstory trees other than Douglas-fir or grand fir are not available, then larger Douglas-firs that appear to be healthy would be retained. These root rot treatment areas would not be placed within 240 feet of streams or any old-growth legacy trees if any unknown ones are found during layout of the treatment areas. Underplanting with disease-resistant western redcedar, western hemlock, and possibly western white pine would occur after site preparation (piling and burning of small slash).

[4] The cross-sectional area of all stems of a species or all stems in a stand measured at breast height (4.5 ft. above the ground) and expressed per unit of the land area, e.g. square feet per acre.

Riparian Reserve Density Management (ur – understory release) and (up - underplanting)

Density management treatments would occur on 304 acres of dense single story primarily Douglas-fir stands in the Riparian Reserve. The East Fork Nehalem Watershed Analysis identified a number of actions that could be taken to improve hydrologic and stream channel conditions including; thinning and underplanting hardwood dominated and overstocked conifer stands in order to increase the size of trees that could eventually be recruited to the stream channel, and to release existing young conifers in riparian areas as the first priority for re-establishing large conifers in alder dominated riparian areas (EFN Watershed Analysis pp. 53-54). Considering these recommendations, the objectives of the treatments are twofold; increase overstory tree size sooner and promote the development of additional canopy layers that would be similar to those found in late-successional stands. The treatments would also be "thinnings from below". The post-harvest target would be based on prescribed basal area's (other parameters such as canopy closure, Curtis Relative Density's[5] (RD), and average height shown in the tables in section 6.1 are estimated outcomes generated from the ORGANON model which are not prescribed targets). These density management "thinning from below" would remove trees from the smaller diameter classes but would differ from the commercial thinning treatments in that there would be less emphasis placed on assuring even spacing. There are two categories of density management treatment proposed; density management with underplanting of shade tolerant conifers (147 acres), and density management to release existing shade tolerant understory conifers (157 acres). Both treatments would be moderate thinnings. The treatments where underplanting would occur would be a heavier thinning than where understory release would occur. In density management with underplanting the expected modeled RD's would vary from the low 30's to the high 40's. In density management for understory release, the modeled RD's would be from about 40 to the high 50's. According to the ORGANON model, the expected canopy closure in the proposed treatments with understory planting would vary in percentage from the low 50's to the low 60's immediately after harvest. In the proposed density management for understory release the expected modeled canopy closure percentage would vary from about the low 60's to the low 70's after harvest. The reason for the variation in prescriptions is that it will require more light (and active post-planting maintenance) for the underplanted trees to become established relative to understory trees that are already established and awaiting release.

Coarse Woody Debris

In all harvest areas, all existing snags would be reserved from harvest. Only those snags that pose a safety hazard would be cut, but they would be left on site to augment down wood levels. All current down woody debris would also be reserved from harvest and protected from damage to the extent practicable. The treatment prescriptions would also contain provisions for reserving green trees to augment identified snag and down wood deficits (RMP p. 21).

Site Preparation and Fuels Treatments

Site preparation and fuels treatments would occur in all areas where tree planting is planned (regeneration harvest units, density management with underplanting, and *Phellinus* treatment patches). The objectives would be to improve plantability and reduce fire hazard associated with harvest activities. Site preparation would entail the piling of material smaller than 6 inches in diameter by either hand or with a machine. Hand piling includes lopping of slash and piling the material. Machine piling would only occur from skid trails on ground-based harvested units and roads, using a machine equipped with a boom capable of reaching 30 feet or more. We estimate that, depending on the size of the unit and layout of the skid trails that 45 -55 % of the area on ground-based harvested units would be piled with machines. We expect that in total the project would use 200-220 landings. Slash and non-merchantable material would be piled at these landings using machines. Depending on

[5] 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. Although not expressed as a percentage, Curtis Relative Density can be interpreted approximately as the percentage of the maximum possible Curtis Relative Density (RD 100).Curtis Relative Densities of 50-60 indicate stands are beginning to experience increaing competition. Other common ways of communicating density in a forest stand include trees/acre, basal area/acre, average spacing and crown or canopy closure.

the quantity, type, and location, the material may be burned, hauled off for pulp or biomass use, or made available as firewood. Biomass material would only include material that is reachable from existing roads and landings and is less than 6 inches in diameter. Burning of piles would occur during moist periods to reduce the possibility of damaging soils around the piles and the chance of fire escaping into unwanted areas. We expect that about 470 treatment acres would be piled and burned. For analysis purposes we assumed that all regeneration harvest, density management with underplanting, and commercial thinning with *Phellinus weirii* treatments, that would be harvested with ground-based equipment, would also have machine piling done on as much of the acreage as possible, which is estimated to be approximately 200 acres. The remaining 270 acres would be hand piled.

Tree Planting and Maintenance

After harvest and site preparation, the regeneration harvest treatment units would be planted with a mix of site adapted native tree species which consist of Douglas-fir, western hemlock, western redcedar, grand fir and possibly western white pine. Within the laminated root rot treatment areas (both regeneration harvest and commercial thinning units) planting stock would include western redcedar, western hemlock, and possibly western white pine; Douglas-fir and grand fir would not be planted. Within those portions of the Riparian Reserve density management treatments where underplanting would be prescribed, western redcedar and western hemlock would be the species underplanted due to their shade tolerant characteristics. For several years after these trees are planted, maintenance activities would occur that would consist of clearing competing vegetation from the immediate vicinity around the planted trees (not the whole area between the trees), in order to provide the best chance for survival while maintaining a substantial portion of the native shrubs undisturbed.

Road Related Work

Table 7: Summary of Road Work for the Proposed Action

NEW CONSTRUCTION†	
New Natural Surfaced Road Construction (Full Decommission, permanent)	*2.7 miles*
New Rocked Surface Road Construction (Decommission, long-term storage)	*0.2 miles*
IMPROVEMENT	
Road Improvement, Rocked Surface (Decommission, long-term storage)	*0.3 miles*
RENOVATION	
Road Renovation Natural Surfaced (Decommission, long-term storage)	*2.2 miles*
Road Renovation Rocked Surface (Decommission, long-term storage)	*0.3 miles*
Road Renovation Rocked Surface (Keep open, permanent)	*20.8 miles*

†Road mileages are approximate based on GIS estimates and have not been measured on the ground. Regarding new road construction, experience indicates that actual mileages after layout are usually longer by 10-20% depending on topography.

Road Construction

Approximately 2.7 miles of new natural-surface temporary road construction would be constructed over 24 separate segments (widely distributed in 5 different Sections) averaging approximately 600 feet, with the longest being approximately 1,700 feet long. Approximately 250 acres of the proposed action area would be accessed by this new road construction. All of these new natural-surfaced temporary roads and landings would be fully decommissioned (remove culverts, de-compact surface, waterbar and seed or plant surface) and blocked following timber harvest and site preparation activities. The new construction includes approximately 3700 feet of construction within Riparian Reserves. Approximately one-half mile (2,700 feet) of the construction, in ten segments, is within the first site potential tree height (240') of streams. The remaining 1,000 feet of new construction is within the second site potential tree height distance from streams and are located on or very near ridge top locations.

Approximately 1,100 feet of new road construction, in four separate segments would be permanent rocked road. These roads would be decommissioned and put into long term storage by waterbarring (if necessary) and blocking to traffic. About 500 feet of these roads, in two segments, would be constructed to connect existing roads that would be improved for use. These roads would access approximately 32 acres, in three separate pieces, of the proposed action.

Two new spurs (Figure 5, spurs 15 and 16, approximate length total 1975 feet) to be constructed to access the western portions of unit 5-3 and the northern portion of unit 5-10-11 would be constructed, used and decommissioned in one season.

Road Improvement

Approximately 1,700 feet of existing, currently non-drivable road, in two segments, would be improved to access approximately 21 acres in section 17. These two segments would be connected by about 500 feet of new permanent road construction mentioned in the paragraph above.

Road Renovation

Approximately 23 miles of existing roads would be renovated as necessary. This would include some clearing and grubbing, brushing, blading, culvert installation or replacement, and rocking where needed. Of the roads to be renovated, approximately 2.5 miles would be decommissioned and put into long-term storage after use by removing culverts and cross drains, waterbarring, and blocking to all vehicle traffic, including OHV's. The remaining approximately 20.5 miles of road to be renovated are permanent rocked roads that would be maintained in a usable state.

Temporary Road and Skid Trail De-compaction

All natural-surfaced temporary roads (2.7 miles), temporary landings, truck turn-arounds, and skid trails (those used in regeneration harvest and *Phellinus* treatment units) would be subsoiled. Main skid trails in commercial thinning and density management treatment units would also be subsoiled if it can be done without damaging adjacent reserve trees. Subsoiling would be completed during dry soil conditions and, to the extent practicable, within the same season the use concludes on the roads or skid trails. Subsoiling would consist of de-compacting the surface to a depth of 16-24 inches using equipment approved by the BLM, such as excavator attachments, log loader tongs, winged subsoiler, or other approved equipment. Subsoiling equipment would not operate on slopes steeper than 35%. Where available, slash and other organic debris would be covered over the subsoiled surface to cover at least 50% of the de-compacted surface.

Culvert Installation and Replacement

Culvert work includes installing 17 new culverts, including two that would be temporary, and replacing 10 existing culverts. Four of the culverts (three replacement and one new) are in live 1st order streams (stream with running water), 11 are in intermittent streams (five replacement and six new) and the other 12 are cross drains whose purpose is to drain roadside ditch lines during wet weather and disconnect the ditchlines from the stream network. The roadside ditch lines would not be routed to stream channels but would rather be routed to dense forest vegetation where the water would dissipate.

Table 8: Culvert Work for the Proposed Action

Section	Road Number	Culvert Number	Crossing Type	Proposed Activity
31	5N-3-31	1	Intermittent Stream	Install New Culvert
31	5N-3-31	2	Intermittent Stream	Install New Culvert

Section	Road Number	Culvert Number	Crossing Type	Proposed Activity
31	5N-3-31	3	Cross Drain	Install New Culvert
31	5N-3-31	4	Intermittent Stream	Install New Culvert
31	5N-3-31	5	Intermittent Stream	Install New Culvert
29	5N-3-29	6	Intermittent Stream	Replace Existing Culvert
28	5N-3-28.1	7	Intermittent Stream	Replace Existing Culvert
28	5N-3-28.1	8	Intermittent Stream	Replace Existing Culvert
28	5N-3-28.1	9	Intermittent Stream	Replace Existing Culvert
8	4N-3-7	10	Cross Drain	Install New Culvert
8	4N-3-7	11	Cross Drain	Install New Culvert
8	4N-3-7	12	Cross Drain	Install New Culvert
8	4N-3-7	13	Cross Drain	Install New Culvert
3	4N-3-3	14	Cross Drain	Install New Culvert
3	4N-3-3	15	Cross Drain	Install New Culvert
3	4N-3-3	16	Cross Drain	Install New Culvert
3	4N-3-3	17	Cross Drain	Install New Culvert
3	4N-3-3	18	Perennial Stream	Replace Existing Culvert
34	4N-3-3	19	Intermittent Stream	Replace Existing Culvert
33	4N-3-3	20	Perennial Stream	Replace Existing Culvert
33	4N-3-3	21	Cross Drain	Replace Existing Culvert
5	4N-3-5.2	22	Intermittent Stream	Install New Culvert - Temporary
17	4N-3-17	23	Perennial Stream	Install New Culvert
17	4N-3-17	24	Perennial Stream	Replace Existing Culvert
17	4N-3-17	25	Cross Drain	Replace Existing Culvert
17	spur 23	26	Cross Drain	Install New Culvert
21	spur 26	27	Intermittent Stream	Install New Culvert - Temporary

Timber Sales

The Proposed Action would be implemented through the sale of timber according to 43 CFR Subpart 5401. The BLM estimates that there would be three to six sales resulting from the Proposed Action. The earliest sale could be as soon as fiscal year 2016 and the latest could be as late as 2018 depending on numerous factors such as workload, coordination with Salem District timber volume offerings, market conditions, etc. Individual timber sales are usually sold as three year contracts for the cutting and removal of the timber.

4.4 Project Design Features

The following is a summary of the project design features (PDF) that reduce the risk of adverse effects to the affected elements of the environment. The proposed action would be implemented using Best Management Practices (BMPs) contained in Table 31.

The design features are organized below by benefiting resource.

<u>Desirable Stand Features, Diversity, and Protection</u>

- Within the CON LUA commercial thinning units as well as Riparian Reserve density management units, retain a portion of the hardwood component within units. This would reflect the proportion of hardwoods in the current stand.
- In all density management and commercial thinning units, green trees greater than 18" dbh that have defects which are desirable to wildlife, such as cavities or dead, forked or broken tops, etc. would be favored for retention.
- To the extent practicable, retain and protect from damage non-merchantable understory trees, especially shade tolerant conifer species during logging and site preparation.
- The 2-4 large trees (approximately 40" dbh) within the northeast quarter of Section 17 that would need to be cut for road construction would remain on site for coarse woody debris and protected from theft by blocking access.
- Thinning in the Matrix LUA would use the "thinning from below" technique, favoring the largest healthiest trees for retention while also providing for generally uniform spacing. Leave trees would primarily consist of those in the dominant and co-dominant classes. Harvest would primarily be from the Douglas-fir, western hemlock, and red alder stand component. All other species would generally be reserved to preserve species diversity
- Density management in the RR LUA would also use the "thinning from below" technique but would prioritize retention of larger trees over spacing which would result in more varied tree spacing than the commercial thinning prescription. All tree species except Douglas-fir and red alder would be reserved, which would also contribute to stand variability due to retention of some smaller non-target trees (western hemlock and western redcedar).
- All proposed harvest units have been examined for presence of old-growth legacy trees and none were found. If any undetected legacy trees are found during implementation of the project they would be retained and protected from damage by reserving a cluster of trees around them sufficient to ensure that no harvest-related damage occurs.
- In commercial thinning units approximately 29 acres of heavy thinning treatment would be implemented in defined *Phellinus weirii* root rot areas. The size of these patches would vary from approximately <1 to 7 acres. These treatments would not occur in the RR. Treatment of the designated *Phellinus weirii* areas would be as follows:
    - An average of 20 large overstory trees per acre would be retained favoring western redcedar, western hemlock, and hardwoods. If 20 are not available, then larger Douglas-firs that appear to be healthy would be retained to reach 20 trees per acre.
    - All Douglas-fir and grand fir, not otherwise reserved, inside the defined area and within 30 feet of the flagged boundary would be harvested to reduce the potential for disease to spread through root contact.
    - These designated *Phellinus weirii* areas would not be placed within 240 feet of streams or marbled murrelet potential habitat if any is found during unit layout.
    - The treatment areas would be planted with disease-resistant tree species, primarily western redcedar, western hemlock, and possibly western white pine.
    - Douglas-fir and grand fir would be removed 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.

- When small *Phellinus weirii* areas are encountered outside of designated areas, disease tolerant trees (western redcedar, western hemlock and hardwoods) would be reserved, even if they are smaller in diameter than the Douglas-fir.
- All regeneration harvest units, totaling 299 acres, would be planted with a mix of Douglas-fir, western hemlock, western redcedar, grand fir and possibly western white pine.
- 147 acres of RR density management treatment areas will be underplanted with a mix of western hemlock and western redcedar at a rate of approximately 200 trees per acre.
- Where appropriate, black cottonwood, a native, rapidly growing hardwood tree with the potential of growing very large would be planted in suitable (relatively open) riparian areas in conjunction with other riparian underplanting. Cottonwood is important to wildlife, including cavity dependent species and has the ability to provide shade rapidly and can be a source of future large trees and coarse wood.
- Survival and growth of planted seedlings would be promoted by protecting them, as appropriate, with tubes and manual (usually chainsaw) brush release.
- Following harvest, the units would be examined to determine if there are other planting opportunities in brushy areas with relatively few trees in the overstory, generally over 2 acres in size, where site preparation for planting could be accomplished without cutting any additional trees. Site preparation and subsequent planting and maintenance would be the same as described for the *Phellinus weirii* areas.
- Harvest prescriptions for stands within one site-potential tree height (240 ft.) of streams would assure a Curtis Relative Density (RD) of 30 or higher.

<u>Green Tree Retention – Regeneration Harvest Only (RMP p.21)</u>

In regeneration harvest units green trees would be reserved in order to provide structural and biological legacies that bridge one stand to the next; a source for larger down logs that the new stand won't be able to provide for many years; large trees that can be converted to snags, either naturally or by future management action, to support populations of cavity nesting birds as well as supplement a potential future snag deficit (RMP p. 21). The range of trees reserved would vary between approximately 16 – 24 per acre on average in GFMA and 25 trees per acre on average in CON, depending on current snag levels, silvicultural *Phellinus weirii* treatments, proximity to potential snag recruitment areas (untreated stands), and the current down wood deficit for meeting the Salem ROD/RMP requirement to retain 240 linear feet of wood at least 20" in diameter (at the large end) and 20' long and in decay class 1 or 2. None of the proposed regeneration harvest units currently meet the requirement and most are well short and require 5-12 additional trees per acre be reserved for this purpose (only the portions of the reserved trees that meet the minimum size requirement count [IB No. OR-97-064]). The trees would be reserved as follows:

For green tree retention only:

- In GFMA units 5-12r, 5-13r, 17-2r, 17-4r, 31-2r, 33-2.1r and 33-10r (totaling approximately 93 acres) 6 trees per acre on average would be retained.
- The remaining GFMA regeneration harvest units (totaling approximately 133 acres) would retain 8 green trees per acre on average.
- Within the CON regeneration harvest unit 21-1r (totaling approximately 70 acres), 16 green trees per acre on average would be retained.

For future snag recruitment where a near term (next three decades) deficit exists:

- In addition to green trees reserved as noted above, another 2 green trees per acre on average would be retained in all regeneration harvest units.

To provide for cavity nesting birds at the 40% potential population level:

- An additional 2 trees per acre on average would be reserved to support populations of cavity nesting birds. Reserved trees would be monitored for a few years after harvest to determine if any become snags. If no, or only a few, green trees become snags, then measures may be taken to convert them to snags based on available funding.

To provide 240 linear feet per acre of down wood – decay class 1 or 2:

- Depending on unit specific deficits (the deficit varies between 122 and 240 linear feet); an estimated 5–12 trees per acre on average would be reserved to meet the down wood deficit. These numbers are estimates based on minimum tree sizes required to provide a piece of wood at least 20" at the large end and 20' long. If larger trees are reserved then fewer would be needed. For example – a 20" diameter tree would only count for 20 feet of deficit because beyond 20 feet, the log would not be large enough to meet requirements; whereas a 28" tree would count for 60 feet (three 20' logs). Reserved trees would be monitored for a few years after harvest to determine how many, if any, have fallen. If most remain standing then trees would be felled to contribute down wood, focusing on trees generally 20 to 30 inches dbh.

- Retained green trees would be distributed throughout the units, with 75% left in well distributed large clumps and 25% left as dispersed trees and small clumps of 2-4 trees (see table 6 above). Retention trees would generally be the largest healthiest trees in the stand while allowing for trees with features desirable to wildlife or botanical species such as dead, broken, or forked tops; cavities, leaning orientation, or complex crown architecture to be reserved.

Criteria for selecting dispersed reserve trees would include:

- 80% of all dispersed trees should be the largest conifer trees within the stand; where present, up to 20% of these conifers should be hemlock, redcedar and grand fir (above 16" dbh)
- Defective conifers at least 16" dbh
- Large (at least 18" dbh), big leaf maples – up to 1 or 2 per acre where present.
- Trees surrounding an existing large snags (greater than 20" dbh and 20' in height)

Since large clumps can have more ecological benefit than small ones, trees would be aggregated into clumps of approximately 40 – 100 trees depending on size of unit and existing trees per acre (generally about ½ acre in size with a few an acre or more, range approximately ¼ to 1 acre).

- These aggregations would occur at a rate of one per every 2-6 acres depending on the size of the unit and be well distributed throughout the units.
- Fewer than 25% of the aggregations would be placed adjacent to similarly aged reserved BLM stands. Aggregations may be placed adjacent to young BLM plantations or along property lines adjacent to private timber of any age.
- No harvesting would occur in the clumps. Every effort would be made to avoid impacting the clumps with skid trails or yarding corridors. Request to cut trees in the clumps for operational purposes would be considered on a case-by-case basis. Any trees cut would be retained on site to augment down wood resources.

Candidate areas for clumps would include but are not limited to the following:

- Forest patches that are more structurally complex, than the surrounding stand, i.e. contains understory trees, large down wood or snags, diverse species composition.
- Trees with unique characteristics (e.g., deformed boles, cavities, broken tops etc.).

- Concentrations of large down wood or snags.
- Topographic features such as small swales or low moist areas.

Coarse Woody Debris (Snags and Down Wood)

All treatments:

- During harvest, all existing down woody debris and snags would be retained and protected to the extent practicable. Where necessary for safety or operational reasons, snags may be felled, but must be left on site. Snags that are greater than 20" DBH and 20' in height, or snags being actively used by wildlife would be protected from damage by reserving the nearest four surrounding trees. In designated *Phellinus* root rot treatment areas reserve trees for snag protection would be species other than Douglas-fir or grand fir, if available.
- Treatment units would be monitored for 2 to 4 years following harvest to evaluate the amount of blow down and mortality post-harvest to determine if additional treatments are needed to meet CWD habitat objectives.

Commercial Thinning:

Within commercial thinning treatments, down wood conditions should reflect the timing of stand development (RMP p. 21). The stands proposed for commercial thinning are entering, or are in, the phase of development when the least amount of coarse wood is naturally expected (Spies and Franklin 1991). Natural unharvested stands similar in age to the proposed treatment stands have about 2,500 – 3,000 ft^3 per acre of down wood. The proposed treatment stands have only about 800 ft^3 spread over about 1,150 linear feet of down wood per acre, of which only 56 linear feet are at least 20" in diameter and 20 feet long. This indicates that almost all of the linear footage is in small pieces of which 60% is in the later decay stages. In order to provide a small boost to down wood levels in the larger size classes and earlier decay stages the proposed action would include:

- In GFMA, an average of 1 reserve tree per acre at least 20" in diameter that are cut for operational purposes would be retained.
- In CON, an average of 2 reserve trees per acre at least 20" in diameter that are cut for operational purposes would be retained.

Riparian Reserve Density Management:

- Within Riparian Reserve density management treatment areas, all reserve trees cut for operational purposes (skid trails, corridors, lift or tail trees, etc.) would be left on site to augment downed woody debris resources unless specific safety concerns require removal of the tree. Removal would be considered on a tree-by-tree basis.

Water, Fisheries and Soil Resources

- Maintain a minimum 100 foot no-harvest buffer on either side of all perennial streams and 60 foot wide no-harvest buffer on intermittent streams.
- 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.

Road Work:

- New roads, landings, and excavated disposal material would be located on stable slopes that minimize sediment delivery to streams. Landings generally would not be located within 240 feet of streams (BMPs R1, R6, and R7).

- All road construction, renovation, and decommissioning would occur during the dry season (generally June 1 through October 15) unless specifically allowed by other provisions. (BMPs R61, R65).
- Road maintenance would generally be done during the dry season except minor maintenance, such as spot rocking, associated with all season and "extended season"[6] (dry season-like conditions any time of the year) use roads
- All work required in live streams (culvert replacement or removal) would be limited to the Oregon Department of Fish and Wildlife's in-stream work window (July 1 to September 15) unless a specific waiver is received from ODFW.
- Ditch cleaning would be limited to those that are no longer functional. If ditch cleaning is necessary within the vicinity of any stream crossings, sediment control measures (rock, waddles, sediment traps) would be used to minimize the potential for sediment delivery to streams.
- Where feasible, use sediment control devices in ditch lines on steeper road segments (greater than 10%) near streams crossings.
- Sediment control structures would receive frequent maintenance and be removed when no longer needed.

Road Use/Haul

- Use of natural surface roads would be limited to the dry season (approximately June 1 – October 15).
- Heavy hauling would be permitted year round on roads (See Figure 4: Proposed Haul Routes and Roads Available for Extended and All Season Use Map):
  - 4N-3-17 to Scappoose-Vernonia Highway (unit 17-2(r and ur))
  - 4N-3-22.1, to Gunner's Mainline – 4N-3-14.1 (unit 21-3(up) and portions of units 21-1(r and up) and 21-10(ct and up) that can be reached by gravel roads).
- Heavy hauling would be permitted during "extended seasons" on roads (See Figure 4: Proposed Haul Routes and Roads Available for Extended and All Season Use Map):
  - 5N-3-31 (Camp Nine Rd.) – northeast toward Pittsburg Road (portions of 31-2 [r and ur] and 31-3ur)
  - 5N-3-33 to 4N-3-3 (Tunnel Road) - from sec. 33 south to Scappoose-Vernonia Highway (portions of unit 33-2.3[r and ur])
- Haul on all other roads from all other units is restricted to the dry season only.
- Prior to the wet season, all roads designated for wet season or extended season use would receive maintenance, including spreading of additional gravel as needed, to assure that the surface is able to support hauling without infrastructure or resource damage (BMPs R71, R72).
- If during wet weather hauling, road conditions deteriorate to a point where road run-off has the possibility of delivering sediment to streams above current conditions, then hauling would be suspended. Hauling may resume when ditch flow subsides, or when conditions allow turbidity levels to return to normal wet weather background levels. (BMP R73)

Harvesting Operations: Criteria Common to All

- All yarding, skidding and mechanized falling operations would be limited to the dry season (generally June 1 – October 15) *Except* (See Figure 3: Harvest Method & Seasonal Skyline Harvest Map):
  - Unit 17-2(r and ur) , 21-3(up), and the cable yarding portions of units 21-1(r and up) and 21-10(ct and up) that can be reached by gravel roads, can be operated on year round, provided resource damage is not occurring.

[6] Extended Season conditions are those that can occur at any time of the year but during times of extended dry weather as determined by the BLM. Conditions considered in evaluating approval for road use during the wet season include, but are not limited to: amount, duration and timing of rainfall; current soil saturation level; and condition of the road surface and current level of maintenance. A higher level of BLM contract administration would occur to closely monitor road and weather conditions. The approval to use a road during the extended season can be revoked at any time at the BLM's discretion.

    - Cable yarding portions of 31-2 (r and ur) and 31-3ur that are directly accessible from the 5N-3-31 road, and cable yarding portions of unit 33-2.3(r and ur) can be operated during the dry season and during the "extended season" (dry season-like conditions any time of year – see footnote below).
- Hand falling would be permitted during all seasons provided excessive damage to reserve timber is not occurring.
- The Purchaser must submit a detailed operations plan for BLM approval prior to commencing any work. Details would include but are not limited to such items as: logging method, skyline corridor location, skid trail locations, felling method, harvest schedule, road construction schedule, and strategy for closing, decommissioning and overwintering of natural surfaced roads and trails prior to the beginning of the wet season.
- Ground based harvesting and skidding equipment would generally be limited to slopes averaging 35% or less (BMP TH 14).
- Cable yarding systems would be used on slopes greater than 35% or on flatter areas where logistically beneficial.
- One end suspension of yarded logs would be required at all times.
- The use of all ground based equipment would be limited to dry conditions only when soils are most resistant to compaction (BMP TH 12).
- Yarding logs or construction of skid trails through low areas with moist, poorly drained soils would be avoided where practical. These areas may or may not be identified on the ground prior to logging operations (BMP TH 8).
- Whole tree yarding (yarding with tops and limbs attached) would be permitted as long as it can be done without causing unacceptable damage to the reserve timber and other resources. If it is found that unacceptable damage is occurring, trees would be required to be bucked and limbed as directed by the BLM. At least 25% of top and limb material would be required to be left on site for small coarse wood and soil nutrient purposes. The Purchaser would not be required to yard tops or slash that are not attached to logs (we expect that during Douglas-fir felling and yarding that considerably more than 25% would become detached through normal operations and left on site).
- All equipment would be excluded from operating in all riparian no-harvest buffers except where necessary for road construction over an intermittent stream in section 21 (BMP TH 7).
- Temporary logging roads and skid trails and harvester/forwarder trails would be waterbarred and blocked before the fall wet season begins. Arrangements would be made to anticipate the beginning of significant rainfall so that the Purchaser can accomplish the required work before wet conditions preclude operations (BMPs TH18, TH21, R29, R91).

<u>Ground Based Felling/Harvesting</u>

Trees may be felled by hand and moved to skid trails by specialized equipment such as log loaders. Trees may also be felled and piled by self-propelled mechanical harvester. If a harvester or other specialized equipment is used the equipment would be:

- Boom mounted with a minimum reach of 20 feet using a single grip rotating harvester head or grapple.
- Have static ground pressure rating of 8 psi or less
- Operate on existing disturbed trails to the extent possible, and where not possible, proceed only on slash mats with a minimum number of passes necessary to process the timber in order to keep soil compaction to a minimum (BMPs TH 9, TH 13).
- Specialized equipment trails would generally not exceed 15 feet in width, nor be spaced less than 50 feet apart.

<u>Ground Based Yarding</u>

Ground based yarding is the process of moving processed and/or decked logs from the woods to a loading point at a landing. This process is also known as skidding.

- Existing skid trails would be used to the extent feasible. LiDAR technology would be used where possible to locate existing skid trails prior to approving Purchaser logging plans (BMP TH13).
- *Skid trail widths would be limited to what is operationally necessary (BMP TH10).*
- Ground based skidding equipment would be limited to the extent of the approved skid trail. Skidding equipment would not be permitted to leave skid trails to retrieve logs, but must either pull a winch line to the logs or work in conjunction with specialized harvester equipment (see above).
- Compaction impacts associated with skid trails and newly constructed landings within harvest units would be limited to 12% of the ground based harvest unit. Measurement would be accomplished by dividing the unit acreage by the length and width of the skid trails and landings. Skid trail length would be measured either through GIS analysis of the Purchasers approved unit specific logging plans or manually in the field using GPS or other measuring device (BMP TH 9).
- Units accessed by road 4N-3-5.7, and the new spurs 15 and 16 constructed from this road, would have all operations completed in one season (western portions of unit 5-3, northern portion of unit 5-10-11).

Forwarders:

Forwarders are all-wheel-drive self-loading and unloading machines used for moving decked logs from the woods to the loading point at a landing. Forwarders carry logs in a bunk similar to how a log truck carries logs. Forwarders are generally used in conjunction with mechanical harvesters in lieu of skidders. Forwarders would be allowed with the following restrictions.

- Forwarders would have a static ground pressure of 8 psi or less.
- Forwarder trail locations would be approved by the BLM prior to any operations and would generally not exceed 15 feet in width.
- Trails that are expected to be used multiple times would be considered skid trails subject to the same 12% area of impact as for ground based yarding above (BMP TH9).
- When the forwarder leaves multi-pass trails to retrieve logs the machine would proceed over a mat of slash and be limited to two passes over the same ground in order to reduce the potential for soil compaction.

<u>Cable Yarding</u>

Cable yarding would be done with a skyline type system with the ability to maintain the cable stationary above or within reserve timber during the yarding process when necessary.

- Skyline corridors would generally not exceed 12 feet in width and would be located at least 150 feet apart at one end. In the case where the skyline is strung more than 1500 feet to the tailhold then corridors may be 20 feet wide to better accommodate the skyline side pull when lateral yarding thus reducing potential damage to the reserve timber.
- In the few small areas where slopes approach or exceed 65% (all units have average slope less than 65%), full suspension of logs would be required during yarding (BMP TH 5).
- Yarding through no-harvest buffers is not anticipated. If the skyline must pass through a riparian no-harvest buffer in order to secure a tailhold, then the skyline would remain stationary after initial elevation in order to minimize the potential for canopy damage associated with line whip.
- If for any reason trees need to be cut within the no-harvest buffers, the number cut would be kept to the minimum necessary, would be left on site to augment coarse woody debris levels, and every effort would be made to protect the trees from theft.
- Implement erosion control measures such as waterbars, slash placement and seeding in cable yarding corridors where the potential for erosion and delivery to water bodies exists (BMP TH 6).

Landings

For analysis purposes landings are viewed in two ways – those that are newly constructed with associated impacts and those that are located on previously disturbed landing sites or haul roads where use would have little additional impact. The proposed action would use approximately 195 existing landings and construct approximately 25 new landings.

- Newly constructed landings would have clearing limits and impact areas kept to the smallest size necessary to reasonably conduct harvest operations, generally a 50 foot diameter ground disturbance area. These types of landings would count toward the 12% ground compaction limit criteria.
- Use of landings on existing landings and roads would not count toward the 12% compaction limit criteria because they would be restricted to the road right-of-way clearing limits and stay within the limits of the road prism or existing landing limits. In most cases these landings would require the removal of a few extra trees for safety purposes to allow for swinging of logs onto the road from the yarding corridor.
- Any landings that are used during wet weather operations would require management of sediment with control devices such as wattles in ditch lines, silt fences, or any other measures that may be necessary to prevent sediment runoff from occurring (BMP R16, R29, TH 18).

Road, Skid Trail and Landing Construction, Reconstruction and Decommissioning

- New roads and landings would be located on stable locations and on areas outside of wetlands. Where practical, they would avoid Riparian Reserves and depressions with poorly drained soils. Landings generally would not be located within 240 feet of streams (BMPs R1, R2, R3, and R4).
- With the exception of new construction in the NE ¼ of section 17, where 2-4 large trees would unavoidably be cut, all other new road construction and renovation would avoid larger, complex structured trees to the extent practicable.
- All newly constructed natural surface roads, landings, and primary skid trails within regeneration harvest and *Phellinus weirii* treatment units used during harvesting activities would be fully decommissioned and left in an erosion-resistant condition. Full decommissioning would consist of removing culverts, de-compacting, water barring, seeding or planting with native species, and restricting OHV use (BMPs R89, R91, R93, R94, R96, R97, R98, and R100).
- Prior to the wet season, all decommissioned roads and all natural surfaced roads retained over winter for the next operating season would be blocked to prevent vehicle use. Blocking would include the strategic placement of boulders, logs, root wads, other various types of earthen barriers, or gates. 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 (BMPs R91, TH21).
- Erosion and sediment control measures would be employed at stream crossings and other hydrologically connected areas to reduce erosion and sediment transport to water bodies, floodplains, and wetlands. Measures may include seeding and mulching bare soil surfaces such as stream banks and stream-adjacent side slopes after culvert work is completed or ditches cleaned; placing sediment trapping materials such as straw bales, wattles and/or bark filters in ditches or other places where sediment could be transported (BMPs R38, R51, R57, R87, R88, and R97)
- All new culverts or culvert replacements would be designed for 100-year flood events including allowance for bed load and anticipated floatable debris. They would be located on straight reaches of the streams and installed at the natural stream grade (BMPs R44, R45, R48, and R49).

Special Status Species

- Known potential marbled murrelet habitat trees (T4N R3W sections 5 and 17) would be excluded from timber sale units by at least 330 feet (USFWS 1997).
- Although unlikely due to extensive examination of the area, any newly discovered potential marbled murrelet habitat trees, adjacent to thinning units would be managed according to the Revised Policy for

the Management of Marbled Murrelet nesting Structure within Younger Stands Issued by the Level 2 Team for the north Coast Planning Province (USDI -USFWS et al. 2011c). Any newly discovered potential marbled murrelet habitat trees would be excluded from regeneration harvest unit boundaries by at least 330 feet (USFWS 1997).

- In the unlikely case that any marbled murrelet sites are discovered during operations, operations would be suspended until such time that a plan can be developed to manage the site according to appropriate BLM policy.
- The only Survey and Manage or Special Status botanical species located during surveys, *Cetrelia cetrariodes* (designated category E lichen under both 2001 and 2003 ASR, manage all known sites), would either be excluded from any harvest unit or have a buffer placed around it to protect its habitat.
- In the case that an active raptor nest is encountered during logging operations, operations would cease and BLM personnel would be notified. Wildlife staff would evaluate the situation and recommend solutions to assure compliance with BLM policy.

Invasive / Non-Native Plants

- All logging and construction equipment that would be used off of existing roads, and any roadside brushing equipment, would be cleaned of dirt, grease, vegetation or any other material that may spread noxious weed seeds or vegetative material onto BLM lands. Cleaning would be done with a high pressure hose prior to entering BLM controlled lands. Cleaned equipment would be inspected by the BLM at an agreed upon location prior to move-in. All subsequent move-ins of equipment as described above would be treated the same as the initial move-in (BMP R75).
- Pretreat known roadside populations of moderate or high priority invasive non-native plant species within the project area.
- Post-harvest monitoring of treatment areas would be completed for a minimum of three years to identify new populations of invasive non/native plant species. Treatments to reduce or eradicate new populations would be evaluated based on NEPA compliance, best management practices, and available funding.
- Post-treatment ground disturbance (i.e. yarding corridors', decommissioned roads, landing margins, etc.), would be evaluated to determine the need to seed or plant native vegetation to mitigate invasive/non-native plant introduction.
- Use gravel for road construction and renovation from sources that have been inspected to be free of noxious weeds identified for Early Detection, Rapid Response (EDRR) treatments. These species are typically species found on Oregon Department of Agriculture noxious weeds lists "A" and "T". EDRR does not include those common weed species that are well established in the project area.

Cultural Resources

- Survey techniques for cultural resources are based on those described in the Protocol for Managing Cultural Resources on Lands Administered by the Bureau of Land Management in Oregon (BLM – Oregon SHPO, 2015). The 2015 protocol requires a post-project survey on all harvest areas where slopes are less than 15% and on 5% of the areas where slopes exceed 20%. Professional judgment would be used to determine if surveys are needed on areas with slopes between 15 – 25%.
- *If any cultural and/or paleontological resource (historic or prehistoric site or object) is discovered during project activities all operations in the immediate area of such discovery shall be suspended until an evaluation of the discovery can be made by a professional archaeologist to determine appropriate actions to prevent the loss of significant cultural or scientific values.*

Visual Resources

- Maintain a visual buffer along the cut-bank between unit 17-2 and the Scappoose-Vernonia Road. The buffer would not be between the 4N-3-17 road and unit 17-2.

Site Preparation, Air Quality, Fire Risk, and Fuels Management

- Site preparation, and slash and fire hazard reduction would be done by piling and burning in those areas targeted for tree planting (regeneration harvest, density management with underplanting, and laminated root rot treatment areas within commercial thinning units) where fuel loading is heavy, the fire risk is determined to be high, or site preparation is required to help facilitate tree planting. Piles would be constructed by hand or by machines operated from skid trails or roads only. Not all areas would be piled and burned (BMP F6).
- All operations conducted during fire season declared by the State of Oregon would follow State law requiring operational firefighting equipment on site and available for use.
- Woody material larger than 6" diameter would not be piled.
- Constructed hand piles would be disbursed to the extent possible and not exceed 12 feet in diameter and 6 feet high, constructed machine piles would also be disbursed to the extent possible and not exceed 25 feet in diameter and 12 feet high, to limit the duration of burning.
- Slash piles would be located at least ten (10) feet from green trees to minimize damage. Piling of slash on top of bigleaf maple stumps would be encouraged to help prevent re-sprouting.
- Landing piles would be located as far as possible from reserved trees to minimize damage.
- Slash piles would be covered with polyethylene plastic to help facilitate the consumption of fuels during the high moisture fall/winter burning periods.
- A Prescribed Fire Burn Plan would be initiated and signed by the Authorized Officer prior to any prescribed burning activity.
- Burning would be conducted in accordance with the ROD/ RMP, *Oregon State Implementation Plan* and *Oregon Smoke Management Plan* as administered by the Oregon Department of Forestry, and would comply with the provisions of the Clean Air Act. It would be conducted under good atmospheric mixing conditions to lessen the impact on air quality in Smoke Sensitive Receptor Areas.
- Burning would be done during the wetter seasons when soil and duff are moist to maximize retention of the duff layer, soil organic matter, and to prevent the consumption of the coarser woody debris.
- 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 that are open to the public) yet not heavy enough to warrant burning.
- Where appropriate, post-harvest material may be made available for firewood sales.

Table 9: Seasonal Restrictions Incorporated into the East Fork Nehalem Timber Management Project

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
All yarding, hauling and mechanized falling operations; EXCEPT: Unit 17-2(r and ur) , 21-3(up), and the cable yarding portions of units 21-1(r and up) and 21-10(ct and up) that can be reached by gravel roads; AND: Northern portion of unit 31-2r (cable yarding north of creek) and cable yarding portions of unit 33-2.3(r and ur)											Season of Operation													
Hand Falling (Does not include mechanized falling).	Season of Operation - Provided excessive damage to reserve timber is not occurring.																							

Unit 17-2(r and ur) , 21-3(up), and the cable yarding portions of units 21-1(r and up) and 21-10(ct and up) that can be reached by gravel roads	Subject to BLM approval*, all falling, yarding, and hauling operations would be permitted year round as long as environmental and infrastructure degradation is not occurring (does not include road work)		
Northern portion of unit 31-2r (cable yarding north of creek) and cable yarding portions of unit 33-2.3(r and ur)	Subject to BLM approval, all harvesting operations would be permitted year round, under "dry season" like conditions (see definition in Design Features above), as long as environmental and infrastructure degradation is not occurring (does not include road work)		
Road Construction, Renovation & Decommissioning		Season of Operation	

Dates are approximate – Restrictions would be dependent on actual weather conditions
Shaded Areas are restricted periods
*The BLM would closely monitor water quality and infrastructure conditions during these periods and suspend operations before degradation occurs.

Figure 4: Proposed Haul Routes and Roads Available for Extended and All Season Use

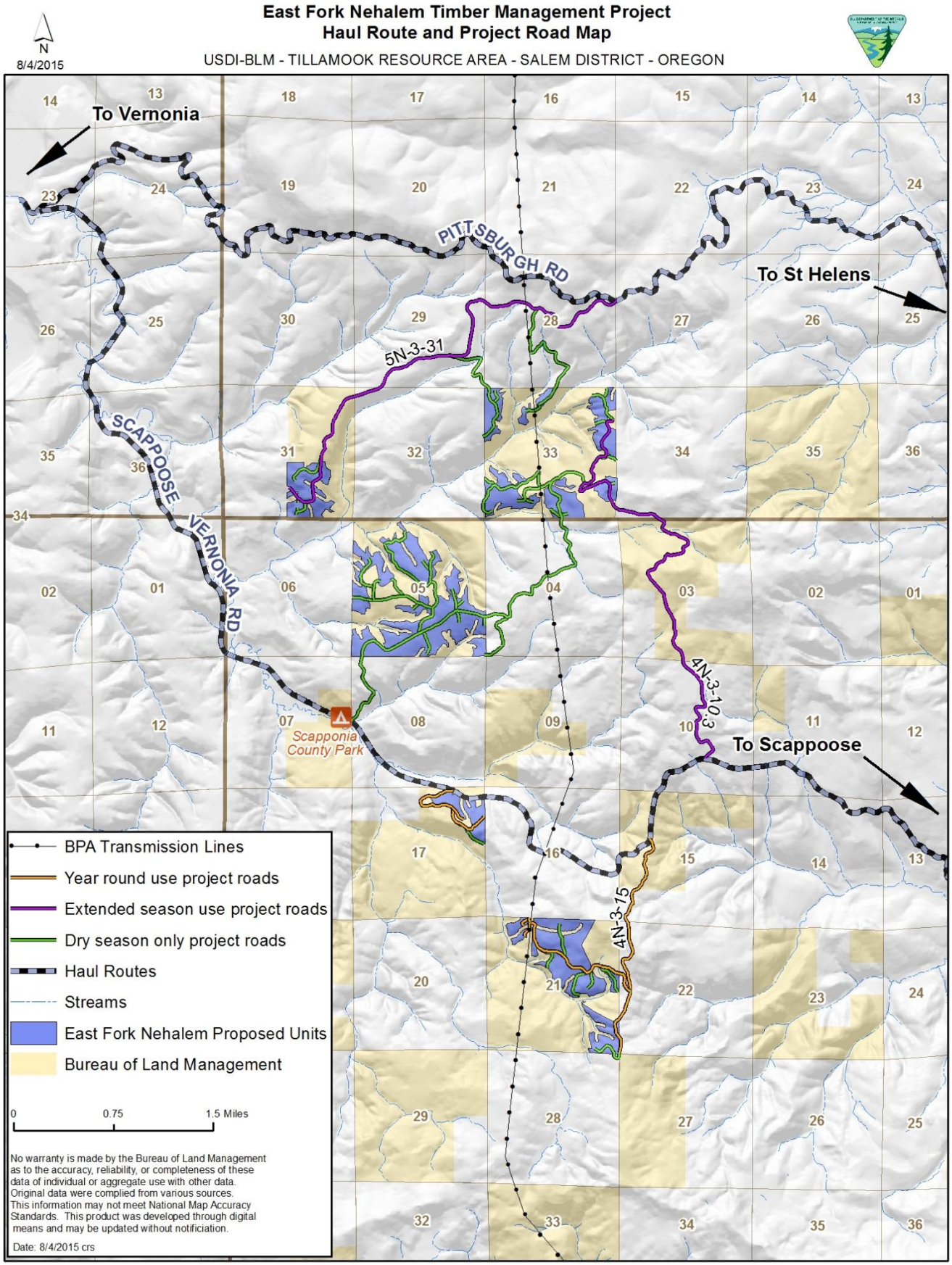


Figure 5: Proposed Treatment Area Map – Section 5

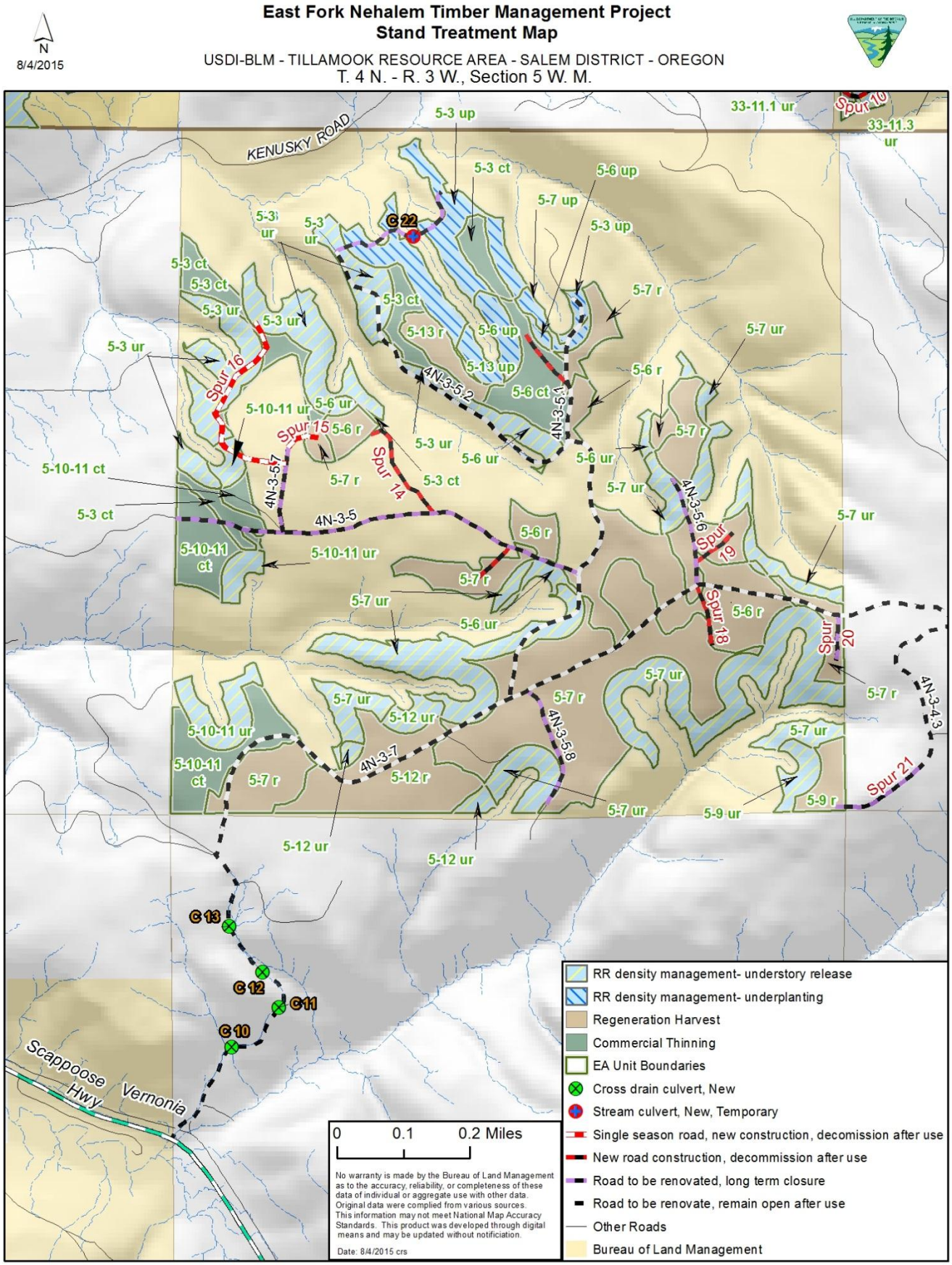


Figure 6: Proposed Treatment Area Map – Section 17

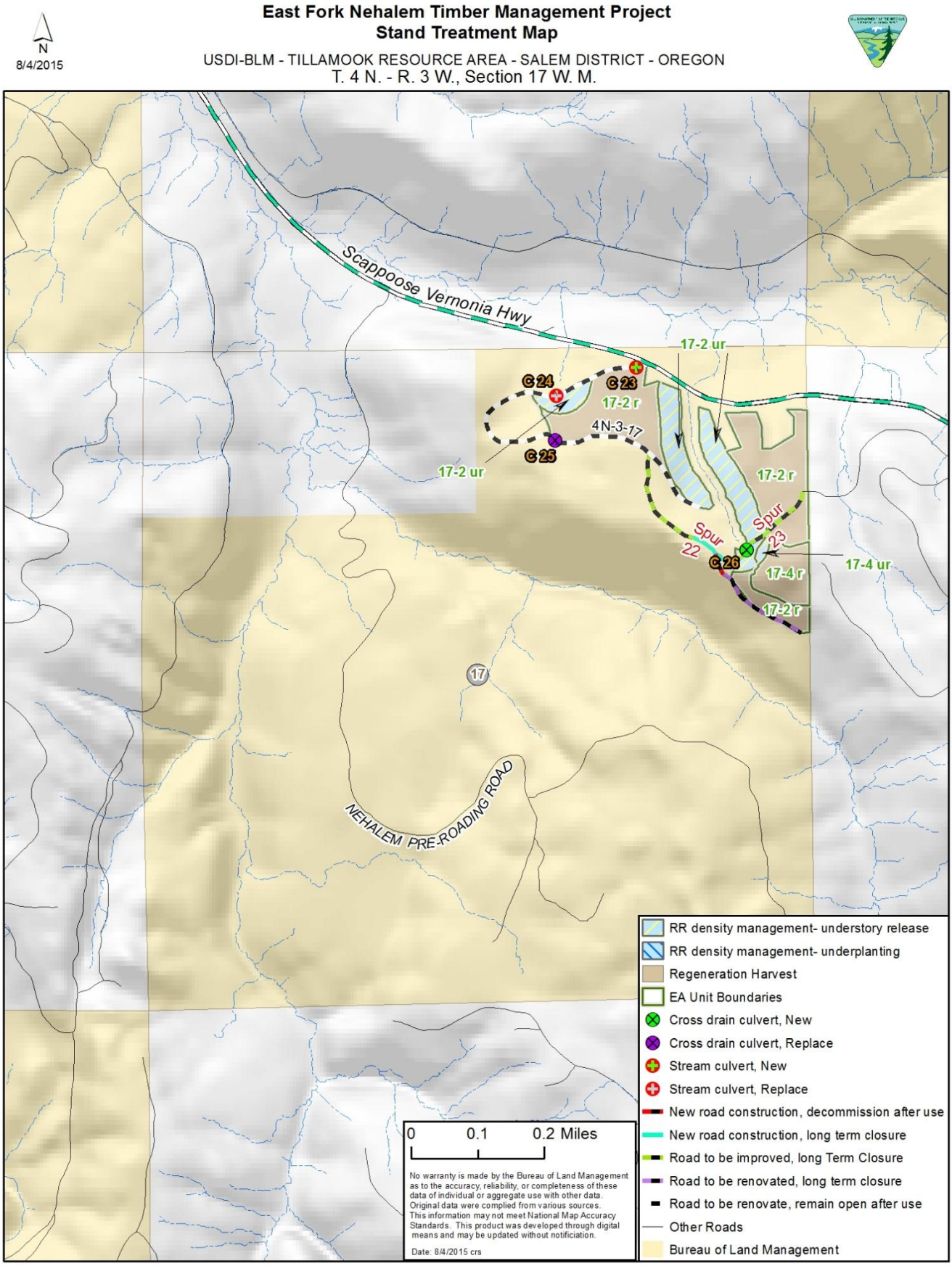


Figure 7: Proposed Treatment Area Map – Section 21

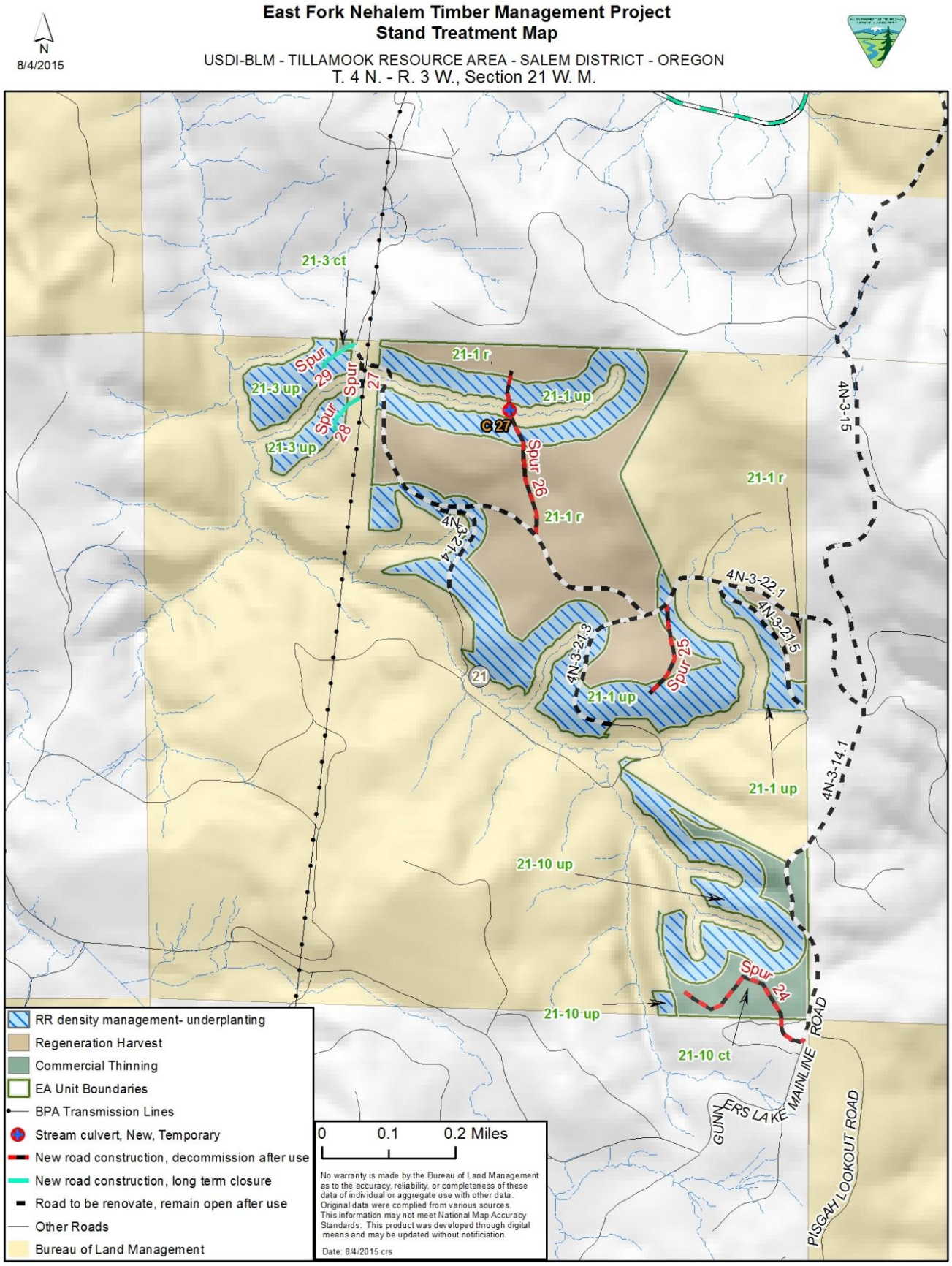


Figure 8: Proposed Treatment Area Map – Section 31

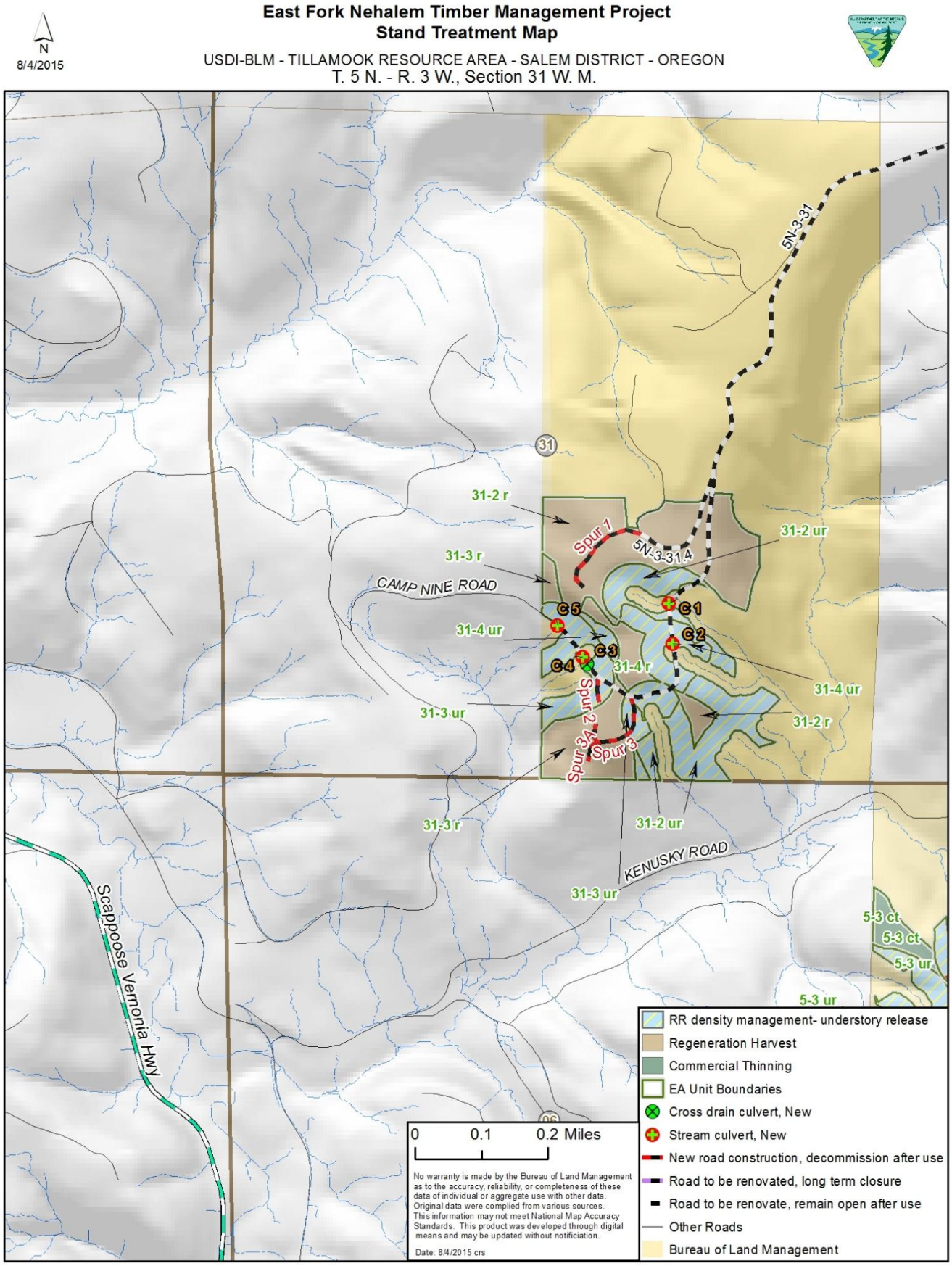
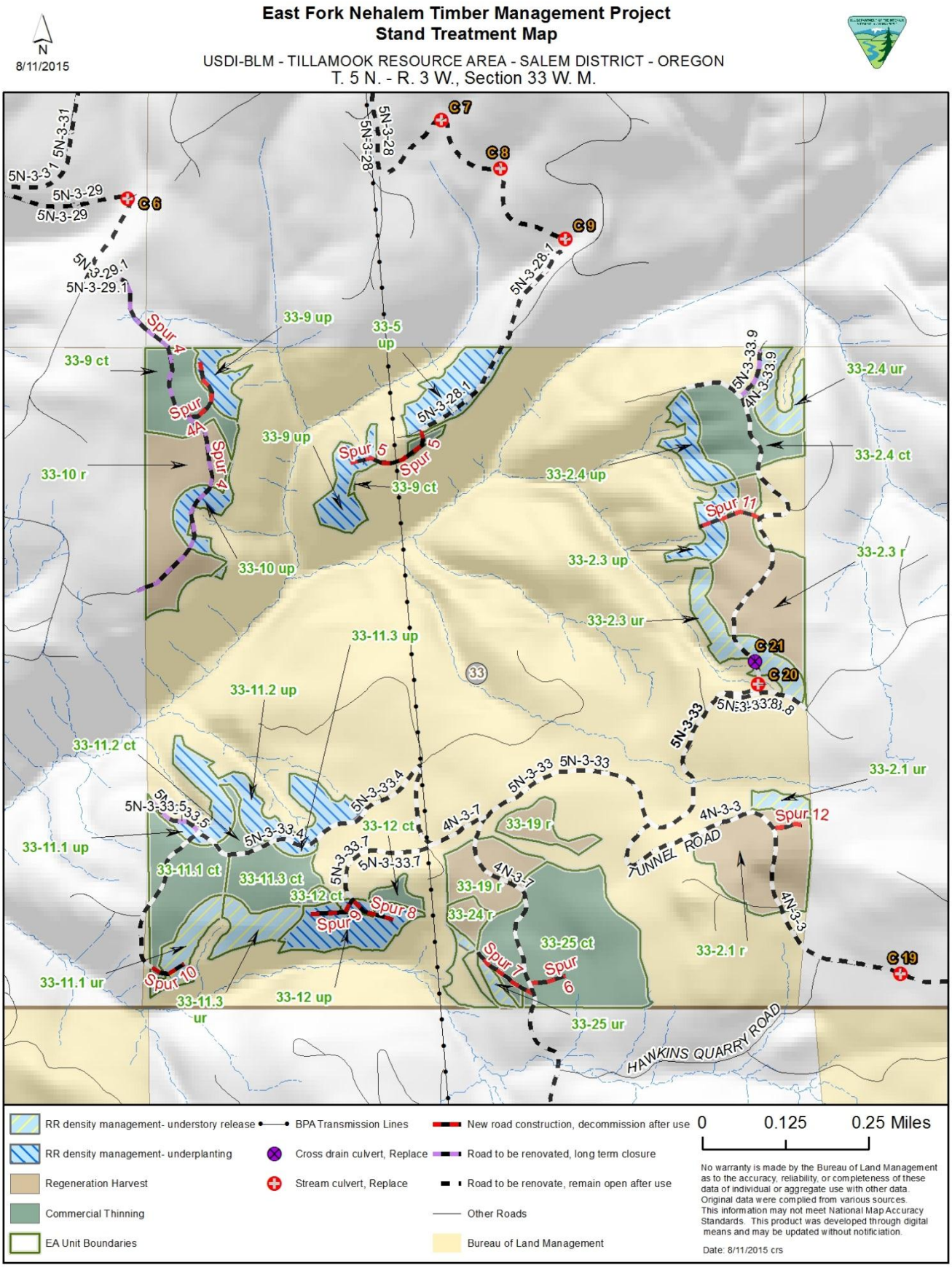


Figure 9: Proposed Treatment Area Map – Section 33



4.5 Alternatives Considered But Not Analyzed In Detail

The BLM is required to include a discussion of a range of reasonable alternatives to the proposed action, alternatives which are technically and economically feasible and which meet the purpose and need, and which have a lesser environmental impact.

The IDT considered several other actions for analysis during the interdisciplinary process. The original proposal, which has been substantially modified, included about 1,647 acres of harvest of various types, including actions in suitable stands in Section 19 and portions of the SW ¼ of Section 17 of the project area. Additionally, based on comments received during scoping, the IDT considered if the Purpose and Need of the project could be met by only considering thinning and density management treatments; or if harvest in stands over 80 years old should be restricted. A brief explanation of why these options or potential alternatives were not carried forward into analysis follows.

Larger Project with More Harvest Acres

The original East Fork Nehalem Timber Management Project proposal included 478 acres of regeneration harvest, 281 acres of commercial thinning, and 888 acres of Riparian Reserve density management harvest. After preliminary harvest model runs we determined that about 182 acres that were proposed for regeneration harvest were in fact more than one to two decades away from culmination of mean annual increment, the time when the rate of growth for the stand begins to decline. Most of these stands are still well stocked with desirable commercial species, relatively disease free and growing at an acceptable rate, therefore harvesting at this time would not be supported by our planning guidance (RMP p. 48). We also deferred about 250 acres of Riparian Reserve density management thinning and about 70 acres of commercial thinning in stands that could benefit from treatment, but due to their logistical proximity to the deferred regeneration harvest stands are not operationally or economically feasible at this time. In many cases roads would need to be renovated and yarding would have to occur through deferred stands if the Riparian Reserve or commercial thinning were to still be included in the proposed action. Due to workload and staffing constraints, another 99 acres proposed for commercial thinning and Riparian Reserve density management in the vicinity of Oregon Coast coho Critical Habitat were deferred due to access problems and logging logistics associated with road repair and maintenance that would require ESA consultation. We don't currently have the administrative capacity to conduct ESA consultation in a timeframe that fits our timber sale schedule so these acres were deferred until such time that we will be able to conduct ESA fisheries consultation to determine if the project could be implemented without jeopardizing or delaying recovery of Oregon Coast coho salmon. And finally, we found that about 275 acres of Riparian Reserve stands did not need treatment, as they were already developing in such a way that intervention would not be beneficial. The remaining Riparian Reserve acres are composed of small isolated parcels that are not operationally feasible at this time. While this larger harvest alternative would meet the Purpose and Need quite well, substantial portions of it would not be consistent with our planning guidance and therefore is not carried forward.

Thinning and Density Management Only, No Regeneration Harvest

One scoping commenter recommended against any regeneration harvesting. The proposed action would include 299 acres of regeneration harvesting which would reserve between 16 and 25 trees per acre depending on land use allocation, location, and relative need for ecological structure (additional down wood). In considering an alternative that included only thinning, and density management in Riparian Reserves, we found that the Purpose and Need would mostly not be met. The acres proposed for regeneration harvest are in the Matrix land use allocation where providing a sustainable supply of timber and other forest commodities to contribute to community stability is a primary objective (RMP p. 20). The stands selected for harvest meet the criteria that makes them suitable for regeneration harvest because they either have reached an age where the stand growth rate has peaked; or they are infected with disease, causing declines in productivity of the site and loss of harvest volume; or they contain appreciable amounts of hardwoods on sites suitable for growing conifers which would produce more harvest volume per acre. We also looked at those stands that we determined to be a decade or two

away from reaching maximum growth rate and found that they are either too old to thin economically for future production, or they had already been thinned in the past and further thinning would leave the stand seriously understocked. Lastly, in order to supply timber on a sustained yield basis over time, harvest lands need to have stands in all age class groups as noted on page 46 of the RMP and identified in the Purpose and Need for this project. Currently, the Tillamook Resource Area harvest base is heavily skewed to mid-seral stands that are 60-80 years old with very few acres in the younger age classes which means that availability of mid-aged timber that is most economically desirable will be in short supply on BLM lands in the future (see section 2.2 – Issues not Analyzed in Detail – for more detail). For these reasons this alternative was not analyzed further.

No Harvest in Stands Over 80 Years Old

One commenter recommended during scoping that the BLM not harvest any forest stands over 80 years old inferring that forest of that age are mature forests. The proposed action includes the potential harvest of 73 acres of forest that would be 80 years old or older by the time we expect the last timber sale would be sold in 2018. As of 2015, 27 acres are exactly 80 years old based on stand exams. The remaining acres would become 80 over the next three years. These stands originated after the same fire (1930) and subsequent salvage (circa 1932 - 40) that occurred on lands proposed for harvest that are currently approximately 72 -78 years old. Some stands seeded in (or were aerially seeded – we're not sure) and became established a few years before others. In the northern Coast Range, 80 year old forest with fire and harvest histories like the proposed action stands, are not synonymous with "mature" forest (NWFP ROD pg. B-2, B-3). None of the stands proposed for harvest have attained the structural features and character of mature stands such as slowed height growth and crown expansion, heavy limb formation, expanding stable gaps, and saplings developing in the understory, regardless of whether they are 80 years old or younger than 80. Because these stands are clearly not functionally mature forest, and that the year 80 is only a minimum estimate of when forest stands may enter the mature forest stage, we determined that there would not be any distinct effects difference between harvesting an 81 or 82 year old stand versus one that is a few years younger than 80 years old, considering both have a shared origin. Restricting harvest to only those stands that are younger than 80 years would still meet the Purpose and Need for the project, but would not result in any different impacts to mature forests, or their relative abundance, in the analysis area than the proposed action would, therefore we did not carry this potential alternative forward into analysis.

5. 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)].

Affects analysis was done at various scales depending on resource issues analyzed. Direct and indirect effects have been analyzed at the unit scale and the 6th field subwatershed scale. Cumulative effects were analyzed at the 6th field subwatershed scale, unless noted otherwise. Reference to the "analysis area" means the East Fork Nehalem 6th field subwatershed unless clearly stated otherwise.

General Setting

The East Fork Nehalem River subwatershed is a 20,608 acre watershed located in the upper reaches of the mainstem Nehalem river basin. The East Fork Nehalem River drainage is generally composed of broad benches with narrower ridges that are highly dissected by many draws and creeks. Slopes are generally short and steep. Little or no naturally occurring open, non-forested land occurs within the drainage. The open land that does exist tends to be associated with human habitations near the river. The watershed is forested mostly with conifers, and some hardwoods, of various age classes with most timber younger than 80 years. Elevations vary from 600 feet at the confluence with the mainstem of the Nehalem River to 2,268 feet on Long Mountain at the southern edge of the watershed. There are several distinct subwatersheds (Elk Creek, Jim-George Creek, Kenusky Creek, Dog Creek, and the stream draining Gunners Lakes) and many smaller unnamed subwatersheds within the drainage totaling approximately 218 miles of stream course. The average annual precipitation is approximately 60 inches and mainly falls as rain, although at times significant snowfall does occur. Soils are quite fertile, capable of supporting high vegetative production. On steeper slopes these soils are prone to mass wasting and, where disturbance has occurred, surface erosion.

Sixty eight percent of the watershed is owned by private industrial wood product companies, 22% is administered by the Bureau of Land Management (BLM), with the remaining 10% of land being owned by private individuals, many of them managing their land for timber production. There are few residences within the watershed and those that are there are generally near the river. The primary land use within the watershed is timber production, and has been for nearly a century. Past logging of these highly dissected lands has resulted in a network of access roads with an average density of about 4.5 miles per square mile of land. The industrial forest lands are managed almost exclusively for timber production, whereas the BLM lands are managed for multiple uses in addition to timber production, such as wildlife habitat, water quality, fisheries and recreation. The BLM lands within the watershed are generally distributed in an alternating section, checkerboard-like pattern and the private lands are more contiguously blocked. The Salem District Record of Decision and Resource Management Plan has allocated the BLM lands into four main categories; they are: General Forest Management Area (GFMA) (subcategory of Matrix) - managed primarily for timber production (29% of the analysis area), Connectivity/Diversity (subcategory of Matrix) - managed on longer forest rotations to provide some level of older forest diversity and to provide linkages over the landscape for the dispersal of those species requiring older forest habitats (14% of the analysis area), Late Successional Reserve - managed primarily for old forest habitats (4% of the analysis area), and Riparian Reserve - those lands adjacent to watercourses managed for water quality, fisheries and wildlife habitat (53% of the analysis area).

Table 10: Estimated Acres by Forest Age in East Fork Nehalem 6th Field Subwatershed*

Stand Age	BLM (ac)	Non-BLM (ac)	Total
0-20 years	240	3,215	3,455
21-30 years	174	3,741	3,915
31-40 years	87	4,555	4,642

41-60 years	54	3,268	3,322
61-80 years†	3198	1,123	4,321
80+ years	745	0	745
Non-forest	74	134	208
Total	**4,572**	**16,036**	**20,608**

***** Estimated using LiDAR (2013), aerial photography (2012) and BLM Stand Exam data.

† Includes riparian corridors within regeneration harvest units on private lands.

Assumption Regarding Non-Federal Land Management

In order to adequately analyze the potential effects of the alternatives, especially cumulative effects, several key assumptions have been made regarding activities on private lands in the vicinity of the action area that could affect the analysis. All of the non-federal lands are managed for forest production with the exception of some small rural residential inclusions generally near the river. We expect forest management and related activities would continue to occur on non-federal lands. Timber harvest would continue to occur on a 40-50 year rotation following Oregon State Forest Practices Act rules (FPA) at an average rate of 350 – 450 acres per year (based on observed age class distribution in the watershed). Recent aerial photography indicates that there are about 4,400 acres of forest stands 40 years old or older (21% of the subwatershed) remaining on private lands within the East Fork Nehalem subwatershed. The remainder of the lands are either young plantations or non-forested (roads, quarries, facilities, or water features such as small ponds). Logging debris piling and burning may occur in recently harvested units, control of competing vegetation would occur, possibly through the use of herbicides and harvested areas would be replanted with commercial conifer species. After harvest and reforestation there would be several decades of inactivity as forests grow back to merchantable condition. Riparian management areas would conform to FPA standards varying from 100' on large fish bearing streams to no buffer at all on small non-fish bearing streams. Timber harvest to a targeted basal area, depending on stream-side conditions, may occur within the riparian management areas. Road maintenance, rock quarrying and hauling of logs and rock would also occur on private lands in and near the project area.

Other BLM Projects Within the East Fork Nehalem 6th Field Watershed That May Have Bearing on the East Fork Nehalem Timber Management Project

- *The Gunners Lakes Project*: The Gunners Lakes Project is located in T. 4 N., R. 3 W, sections 7, 9, 21 and 29 in the East Fork Nehalem subwatershed and includes two timber sales, Baked Tater, and Trigger Finger.
    - Baked Tater included a 356 acre thinning project that was harvested between 2012 and 2014. 306 acres were ground-based harvested and 50 acres were harvest with a cable system.
    - The Trigger Finger sale was a 147 acre thinning project also harvested between 2012 and 2014. 137 acres were done by ground harvest with the remaining 10 by cable.

- *New Dogma, Gidget, Firry Goon Timber Sales*: These sales were harvested in the mid to late 1990's and included:
    - New Dogma: 73 ac. regeneration harvest in 1996, 50 acres ground harvest and 23 acres cable, planted in 1997.
    - Firry Goon: 65 ac. thinning, 12 ac. regeneration harvest, harvested 1997, 30 acres cable and 47 acres ground harvest, planted 1998.
    - Gidget: 57 ac. thinning, 40 ac. regeneration harvest, harvested 1998, 68 acres cable and 29 acres ground harvest, planted 1999 and 2000.

- *East Fork Nehalem Fish and Wildlife Habitat Enhancement, Fish Passage and Riparian Planting Project*:
    - The project includes fish habitat enhancement (in-stream log and boulder placement) on a total of approximately 7.8 miles of stream,
    - wildlife habitat enhancement (snag and down wood development) on approximately 216 acres,
    - riparian planting on approximately 10 acres,
    - Replace two culverts for fish passage.

    To date approximately 6.3 miles of stream enhancement, 8 acres of riparian planting and 210 acres of wildlife habitat enhancement work has been completed. One of the two fish passage culverts has been replaced. No other work related to this project is currently planned or funded.

- *Sediment Trap Construction Sec 17*:
    - In 2014 sediment traps were constructed on BLM road 4N-3-8 (open to the public) where it crosses a large fish bearing stream one-half mile upstream from the confluence with the East Fork Nehalem River. This stream also contains habitat for coho salmon. The traps effectively eliminate the transport of road sediment from road ditchlines along a steeper grade into the stream.

There are no other projects the BLM has planned in the subwatershed that would have bearing on the effects analysis for the EF Nehalem Project.

The resources potentially affected by the East Fork Nehalem Timber Management Project are described under the following topics in separate section below: Vegetation and Forest Resources; Hydrology; Fisheries Resources; Wildlife Resources; Botany and Invasive Plants; Soils; Air Quality, Fire and Fuels Management; Carbon Storage, Carbon Emissions, and Climate Change; Recreation and Visual Resources; and Cultural Resources. The general extent of the analysis area for each resource and related issue is described in the Affected Environment section for the topic.

6. ISSUE ANALYSIS

During Scoping a number of resource issues were raised and evaluated. Most of the potential issues have been resolved by developing Project Design Features that effectively eliminate the potential for effects caused by the Proposed Action. A summary of those issues that were not analyzed in detail along with a brief rationale is included in the *Issues Not Analyzed in Detail* section earlier in this document (section 2.2). Full evaluations of these potential issues are included in Specialist Reports pertaining to the resources analyzed which are part of the Project Record for the East Fork Nehalem Timber Management Project and are incorporated here by reference.

The issues that could not be eliminated through development of Project Design Features are analyzed below under the various resource topics. The issues are stated in the form of questions to be considered and analyzed.

6.1 Vegetation and Forest Resources Issues

Affected Environment

The majority of the BLM lands in the East Fork Nehalem analysis area are forested with 60- to 80-year old stands; only about 613 acres are forested with stands 80 years old or older (as of 2014). The uplands are primarily forested with Douglas-fir and western hemlock, with scattered areas of hardwood and western redcedar. The riparian areas vary by stream but tend to be intermixed conifers and hardwoods. The majority of the stands within the area were naturally regenerated, aerially seeded and/or planted after logging and fires that occurred from the 1920s to 1950's. Thinning and clearcut harvesting of second-growth stands has been occurring regularly since the 1960's. In the last twenty years we estimate that approximately 3,500 acres have been regeneration harvested in the watershed with about 93% occurring on private lands.

Of the 4,572 acres of BLM managed land in the analysis area, 3,847 acres are forested with conifer dominated stands, 411 acres are comprised of mixed hardwood and conifer stands, and 234 acres are hardwood dominated stands, with the remaining 80 acres non-forested. Approximately 13% of the Federal land within the East Fork Nehalem 6th field watershed is 80-years-old or older. Ninety-one acres are older than 100 with the oldest stand being 125 years old. As of 2015, 27 acres proposed for treatment by the East Fork Nehalem Project are 80 years old or older. By 2018, the estimated year that the last timber sale associated with the East Fork Nehalem Project would be sold, approximately 73 acres would be a year or two older than 80. The stands proposed for treatment have not yet reached the mature seral stage characterized by slowed height growth and crown expansion, heavy limb formation, expanding gaps becoming more stable, and saplings developing in the understory (NWFP S&G's pp. B-2 – B3).

<u>Current Forest Stand Conditions – Proposed Action (2014 vintage data)</u>

Units planned for management range in age from about 29 to 79 years and from 4 to 126 acres in size. The next youngest stand after the 29 year old stand is 67 years old. The majority of stands (~ 550 acres) are dominated by conifers, mostly Douglas fir, with some stands also exhibiting a component of western hemlock, western redcedar, and an occasional grand fir. About 42 acres are mixed conifer - hardwood stands containing a noticeable component of bigleaf maple and red alder. The remaining approximately 120 acres are hardwood dominated stands, some with a moderate element of conifers mixed in (table 11). Understory saplings occur in many units but are generally suppressed by the overstory. Western hemlock is the second most common conifer after Douglas-fir. Red alder is the most common hardwood species in these stands.

The portions of stands proposed for commercial thinning outside of Riparian Reserves are currently overstocked or close to being overstocked as indicated by Curtis Relative Densities above 55 (the approximate density level where growth slows appreciably and some competition-related mortality begins to occur in young and mid-seral Douglas-fir stands). The Riparian Reserve stands proposed for density management thinning consist primarily of Douglas-fir, some with a suppressed sapling layer of shade tolerant conifers and others that are devoid of understory conifers.

Table 11: Current Stand Parameters

Unit	Acres	Age	Trees per acre	Basal Area (ft^2)	Quadratic Mean Diameter[1] (QMD) (in.)	Curtis RD[2]	Ave. Ht. (ft.)	Crown Cover %	Species Composition by Basal Area[3]
5-3	52	74	220	289	15.5	73	134	87	DF-87% RA-6% WH-4% WRC-2% BLM-1% GF-trace
5-6	44	69	179	274	16.7	67	126	86	DF-70% WRC-10% RA-9% BLM-6% WH-4% GF-1%
5-7	115	67	224	250	14.3	66	105	88	DF-35% RA-31% BLM-20% WRC-12% WH-2% GF-trace
5-9	6	75	139	280	17.1	64	146	82	DF-89% WH-5% BLM-3% RA-3%
5-10-11	25	68	158	246	16.9	60	123	87	DF-69% WH-9% WRC-11% RA-8% BLM-3%
5-12	19	71	197	255	15.4	65	119	86	DF-84% WH-12% RA-2% WRC-2%
5-13	6	69	174	250	16.2	62	110	81	RA-84% DF-16%
17-2	32	74	107	209	18.9	48	144	75	DF-72% RA-15% BLM-10% WRC-2%
17-4	5	73	195	354	18.2	83	143	87	DF-100%
21-1	126	73	78	232	22.5	45	150	71	DF-99% RA-1%
21-3	11	69	87	268	23.7	55	155	76	DF-99% RA-1%
21-10	32	75	105	259	21.2	56	153	77	DF-93% RA-5% WH-1% WRC-1%
31-2	38	73	151	259	17.7	61	141	83	DF-85% BLM-12% WRC-2% RA-1%
31-3	17	76	213	273	15.3	70	125	86	DF-98% BLM-2%
31-4	10	79	102	257	21.5	56	145	76	DF-96% BLM-4%
33-2.1	14	72	131	269	19.4	61	148	79	DF-98% RA-2%
33-2.3	23	74	167	298	18.1	70	158	82	DF-100%
33-2.4	16	77	132	287	20	64	150	82	DF-98% BLM-2%
33-5	5	78	175	280	17.1	68	152	84	DF-89% BLM-11%
33-9	15	74	164	261	17.1	63	142	83	DF-97% BLM-2% WRC-1% RA-trace
33-10	17	79	90	250	22.6	53	158	77	DF-90% BLM-10%
33-11.1	14	72	142	250	18	59	134	80	DF-100%
33-11.2	11	71	196	267	15.8	67	137	83	DF-97% WH-3%

33-11.3	11	71	122	264	20	59	150	80	DF-97% BLM-3%
33-12	8	70	145	251	20.1	47	134	83	DF-84% BLM-14% RA-2%
33-19	10	76	181	295	17.3	71	146	84	DF-68% RA-16% BLM-9% GF-7%
33-24	4	71	207	327	17	79	147	87	DF-100%
33-25	26	29	339	253	11.7	74	93	91	DF-98% RA-2%

[1] Diameter of the tree with average basal area at breast height.
[2] Curtis Relative Density (Curtis 1982) A measure of absolute stand density to a reference level defined by a standard level of competition.
[3] DF= Douglas-fir, WH = western hemlock, RA=red alder, BLM= bigleaf maple, WRC=western redcedar, GF = grand fir

Shrub Layer

The most abundant understory species are sword fern, dwarf Oregon grape, salal and vine maple. Understory density varies inversely with the amount of overstory canopy closure. The shrub layer is often well developed where openings occur. Openings related to *Phellinus weirii* are typically dominated by vine maple. Where the dense overstory canopy consists of relatively young, short trees as in unit 33-25, the understory is rather sparse due to the lack of sunlight. Western Hemlock and western redcedar seedlings occur to some degree in several of the units.

Forest Health

Phellinus weirii , a fungus that causes laminated root rot, is present in many of the proposed treatment units. The *Phellinus weirii* fungus is a native root pathogen that is a natural part of forest ecosystems (Thies 1984). This disease is the most common pathogen that affects conifer forests in the northern Oregon Coast Range. The disease occurs as areas of well-defined discrete pockets as well as in a diffuse pattern where groups of one to several trees are affected throughout the infested area. Douglas-fir and grand fir are highly susceptible to *Phellinus weirii*, (they are 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). Because the disease decays their root systems, it kills trees directly by depriving them of water and nutrients, or makes them prone to windthrow by undermining their structural integrity (Thies 1984). The disease spreads through root contact with infected trees or stumps. Disease centers are believed to expand radially at the rate of about one foot per year (Nelson and Hartman 1975), and the number of trees impacted by the disease can generally be expected to double about every 15 years (Hadfield 1985; Nelson et al. 1981). *Phellinus weirii* attacks susceptible hosts regardless of tree size, age, or vigor.

We estimated that in the units planned for commercial thinning, the percentage of the area in disease centers is less than 25%. The actual levels of infection, however, may actually be slightly higher because it is not possible to detect all of the infection with on-the-ground survey techniques. Disease centers in the project area range in size from one to several acres in size. Mortality caused by laminated root rot creates openings in the canopy where shrubs and disease resistant tree species can respond to the additional available light and compete to occupy the gap. Some stands are so heavily infected with laminated root rot that the areas ability to remain occupied with productive forest is compromised. In order to regain productive site occupancy of commercial forest species, these heavily infected stands would be regeneration harvested to remove most of the susceptible trees and replanted with species that are either immune or have moderate to high levels of disease resistance. These proposed units are 5-12r, 21-1r, 31-2r, 33-2.1r, and 33-10r.

Douglas fir bark beetles occasionally kill Douglas fir trees that are stressed by other factors, such as root rot, moisture stress, and mechanical damage associated with windthrow during storms, etc. Periodically bark beetle populations can build up to levels where small groups of healthy trees are killed in discrete patches. These outbreaks occur every few decades and generally last only a year or two before subsiding. These outbreaks are not considered a forest management issue of concern in western Oregon.

Snags and Down Woody Debris

Snags and down woody debris are important components of forest ecosystems. They provide habitat for wildlife, provide substrates for vascular and non-vascular plant growth, contribute to soil nutrient cycling and, in the case of larger, more decayed down logs, act as sponges that absorb water during the wet season and slowly release it back to the atmosphere during the dry season thus contributing to temperature and humidity conditions in the forest.

Snags

Snag data was gathered at the same time as live tree data using the BLM's EcoSurvey stand exam program. EcoSurvey was designed for efficient and accurate data collection of standing trees, which includes snags, to update forest inventory. Because snags tend to be a landscape feature rather than something that occurs on an acre- by- acre basis we queried all of the available stand exam data in the East Fork Nehalem subwatershed in addition to the data specific to the proposed action units. From 2009 – 2012 the BLM conducted stand exams on 3,326 acres of BLM land in the East Fork Nehalem analysis area. These surveys covered 62 separate forest stands (including all of the proposed treatment units) with 1,268 plots generally oriented in a grid pattern at a rate of approximately one plot for every 3 acres (actual = 1 plot/2.6 acres). The surveys tallied 8,446 trees of which only 253 were snags (3%) which occurred on only 191 of the 1,268 plots (15%), indicating the high variability of snag density and distribution. While the sampling error for snags may be quite high, these are nonetheless the best data available.

In order to estimate snag numbers on a per acre basis we used the Tree Factor method (Bell and Dillworth, 1997 revised edition) which uses Basal Area Factor (BAF), a calibration index for devices used for variable plot sampling; the basal area of the snags sampled; and the total number of plots sampled. To simplify the process and make the output more useful for wildlife habitat analysis we first divided the empirical snag data into "hard" snags (decay class 1 and 2), "soft" snags (decay class 3, 4, and 5), and "hard snags ≥20 in"; and then averaged their diameters and heights (table 12).

The formula for calculating snags per acre using the Tree Factor method is:

Snags per Acre = (Number of Snags x Tree Factor)/Total plot

Where: Tree Factor = (BAF/Basal Area of average snag diameter) and,
BAF = 40 (the average Basal Area Factor used during stand exams)

Table 12: Snag data for all stand exams on BLM lands in East Fork Nehalem subwatershed

Total Acres Surveyed (plots)	Snag Type	Total Number	Average Height (range)	Average Diameter (range)	Basal Area of ave. snag	Tree Factor (BAF*/BA of ave. snag)	**Snags per Acre**
3,326 (1268)	Hard	126	77'(10'-199')	19.2"(10"-75")	2.01 ft^2	19.9	**1.97**
	Soft	127	28'(10'-169')	40.7"(12"-82")	9.03 ft^2	4.43	**0.44**
	20"+ All	168	46'(10'-199')	38.1"(20"-82")	7.92 ft^2	5.05	**0.67**
	20"+ Hard	45	99'(10'–199')	28.9"(20"-75")	4.55 ft^2	8.78	**0.31**

*BAF = 40

While we cannot with certainty know if these snag estimates are accurate due to the variable nature of snags, we do feel that these numbers appear to be in line with field observations made during visits by wildlife and silviculture personnel, therefore they will be used for planning and assessment purposes for the East Fork Nehalem Project.

Regarding snags specific to the units proposed for harvest we applied the same methodology. The results are shown in Table 13 below. The average BAF for this set of survey data was 41.

Table 13: Snag data for proposed action stands only

Total Acres Surveyed (plots)	Snag Type	Total Number	Average Height (range)	Average Diameter (range)	Basal Area of ave. snag	Tree Factor (BAF*/BA of ave. snag)	**Snags per Acre**
725 (227)	Hard	45	71'(10'-162')	18.4"(10.3-36.1")	1.85 ft^2	22.2	**4.40**
	Soft	39	30'(11'-141')	36.6"(12.1-75.5")	7.31 ft^2	5.61	**0.96**
	20"+ All	54	50'(11'-162')	33.9"(20"-75.5")	6.27 ft^2	6.54	**1.56**
	20"+ Hard	18	90'(20'-162')	25.2"(20"-36.1")	3.46 ft^2	11.84	**0.94**

*BAF = 41

Currently there is an average of about 2.4 snags per acre on BLM lands in the East Fork Nehalem analysis area that are at least 10" in diameter and 10' tall (these are the minimum sizes for data collection). These data were collected almost exclusively from forest stands that are 60 – 80 years old which makes up 73% of the BLM forests. There are also about 1,100 acres of private land that are also forested with 60-80 year old stands which together with the BLM lands represent about 21% of the analysis area. The current condition of these forests are the result of wide scale disturbances (fire and logging) from the 1930's and 40's. We can assume that the available snag data can be reasonably applied to all forests in the 60-80 age class. Within the proposed action units there are nearly 5.4 snags per acre. We speculate that the reason there appear to be so many more snags in the proposed harvest units is because several of the units were selected specifically because they have substantial root rot infestations which would result in having more snags than otherwise expected. Because the snag data was collected by variable plot sampling, having only a few plots fall within root rot pockets could skew the data and show higher than expected snag numbers.

There is not a great deal of empirical data available on snag numbers in Coast Range forests. Forests that are in the later mid-seral successional stages, as are the proposed action stands, are entering the stage where the least amount of coarse wood, including snags, would be expected to be present, especially stands subject to multiple fire disturbances (Spies and Franklin, 1991). The reason for this dearth of coarse wood is threefold: 1) snags (and down wood) that resulted from the initial disturbance 80 years before have decayed substantially, 2) small snags created from suppression mortality from 20-30 years earlier have mostly fallen and decayed, and 3) the current stand is mostly stocked with healthy trees that have not been exposed for extended periods to mortality factors such as periodic beetle outbreaks, storms, and thus are not developing new snags at an appreciable rate.

Down Woody Debris

Down wood data was also collected during stand exams using a random transect intersect methodology. The available down wood data also comes predominantly from 60-80 year old stands on BLM land. Down wood is very patchy in nature and is difficult to accurately sample therefore sample error for down wood can vary considerably. Also to complicate matters, surveys were done in two different survey periods that used different parameters. The older surveys (2009) used minimum 1" intercept and minimum 20' length as the trigger for recording a piece of down wood. The newer surveys (2011 & 2012) used 5" minimum intercept and 8' minimum length for data recording. We only used the newer data for analysis because its collection parameters are considerably closer to the collection parameters used in the available literature (4.9" intercept and 3.3' length – Spies and Cline 1988). Like the snag data, we also evaluated the down wood data on both the larger scale survey effort and the proposed action unit scale. Table 14 shows the estimated down wood levels at both scales.

Table 14: Weighted Averages (by acres) of Down Woody Debris – BLM Lands in East fork Nehalem Analysis Area

	Cu.Ft. Vol./acre	% Cover/acre	Linear Ft/acre Total	Linear Ft/acre Hard* Total	Linear Ft/acre Hard - 20" x 20' (RMP Standard)
Total BLM Sample EFN (1661 ac)	830	2.4	1275	496	39
Proposed Action Stands Only (725 ac)	804	2.3	1156	462	56

*Hard down wood includes decay classes 1 and 2

Because the analysis area has been heavily impacted by human activity over the last 150 years down wood conditions are considerably different than would be expected from natural forest stands of the same age that had not been harvested, salvaged and burned like the East Fork Nehalem subwatershed has been.

We looked at data for both the larger area and the proposed units only. We found the numbers to be very similar at both scales. For the proposed harvest units we found that there are 804 cu.ft. of volume, at 2.3% ground cover and 1156 linear feet of wood per acre, of which about 462 feet are in the earlier decay stages. Only about 56 feet of the down wood in earlier decay stages was at least 20" in diameter and 20' long.

The Salem District RMP requires that 240 linear feet per acre of down wood be left in regeneration harvest units to meet the needs of species dependent on down wood and to provide for other ecological functions. The required down wood must be at least 20" diameter at the large end and at least 20' long, and must be in either decay class 1 or 2; that is, in a harder, less rotten condition. Currently none of the stands proposed for regeneration harvest meet the down wood requirements. Table 15 shows the current levels of down wood that meet the RMP standards and the deficit that needs to be made up by leaving merchantable material from the harvest stand.

Table 15: Current Down Wood Levels – Regeneration Harvest Units (20" diam. X 20' long – RMP Standard)

Unit	Current Down Wood Level (20" x 20' or larger) Linear ft./ac	Deficit – Linear ft./ac
5-6r	72	168
5-7r	40	200
5-9r	0	240
5-12r	86	154
5-13r	0	240
17-2r	92	148
17-4r	0	240
21-1r	118	122
31-2r	0	240
31-3r	0	240
31-4r	49	191
33-2.1r	0	240
33-2.3r	0	240
33-10r	0	240
33-19r	0	240
33-24r	0	240

6.1.1 *ISSUE 1: What effect would timber harvest treatments, including regeneration harvest and harvest in stands older than 80 years, have on the development of BLM forest stand structure in the East Fork Nehalem subwatershed?*

Stand Modeling

For all alternatives we modeled stand growth over a 25 year period using the ORGANON model to compare expected changes.

Caveats regarding ORGANON: Here in the northern Oregon Coast Range we have been struggling to have the ORGANON model accurately reflect current and future conditions. While it seems that the quadratic mean diameters, basal areas and heights are reasonably accurate, we have found that often the model results in stand volumes that are considerably higher than currently exist and will grow the stands out to depict volumes that are considerably higher than actual existing stands of the same age and sizes. We have adjusted some of the model parameters to try to bring expected volume growth into line with empirically observed volume growth but then find that the model tends overestimate mortality in order to compensate. Some of the possible explanations for these observed overestimations are that; 1) many mid-seral stands in the area tend to slow growth to the point of stagnation, where density independent mortality (root disease, beetles, windthrow) predominates rather than exhibiting substantial density-dependent suppression mortality which the model induces, and; 2) possibly our stand exam sampling program is overestimating the number of trees that actually exist in the stand, especially the smaller trees; which would have the effect of overestimating mortality and/or growing volume on trees that do not exist. Despite these shortcomings, we nonetheless modeled our stands and treatments to show trends which we feel are useful for comparison.

Stand Ages

Most of the stands proposed for treatment are between the ages of 67 and 75 years old and comprise 626 acres or 86% of the proposed project stands. There is one stand totaling 26 acres that is proposed for treatment that is 29 years old. There are 6 stands that total 73 acres that will be 80 years old or older by 2018, the last year of the expected timber sales. These stands originated after the same fire (1930) and subsequent salvage (circa 1932 - 40) that occurred on lands proposed for harvest that are currently 70 – 75 years old. Some stands seeded in (or were aerially seeded – we're not sure) and became established a few years before others. None of the stands proposed for harvest have attained the structural features and character of mature stands, regardless of whether they are 80 years old or younger than 80. Because none of these stands are functionally mature forest, regardless of age, the following analysis will treat all stands, with the exception of the 29 year old stand, as mid-seral forest and describe the effects within that context.

6.1.1.1 Environmental Effects Alternative 1: No Action

Under this alternative, no regeneration harvest, commercial thinning, density management or *Phellinus weirii* treatments within commercial thinning units would take place 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 generally increase to fairly high levels over the next 25 years (Table 17).

Stands comprised largely of Douglas-fir are expected to become increasingly dense and uniform. As the level of competition among the trees remains high, crown development (live crown ratio, crown expansion, and branch growth) would stagnate or decrease, diameter growth rate can be expected to decline, and competition-related mortality would continue to slowly remove stressed and suppressed trees from the stands, resulting in small coarse wood additions. Density independent mortality would remove stems from the stands as relative densities rise and basal areas move past 300 ft^2 toward 350 ft^2 per acre and the rate of growth continues to decline. The 29 year old stand is comprised primarily of Douglas-fir and is already very dense and uniform. If left untreated this stand would move through the classic stem exclusion stage resulting in a large pulse of mortality from the suppressed class resulting in many small snags (6-10") over the next 20-30 years. In all stands, the trees that

remain would continue to compete for available light by putting growth resources toward height growth. This would result in the trees becoming very tall while the diameter of the stems would remain relatively small, resulting in trees that are less stable and susceptible to wind throw.

Stands made up primarily of hardwoods and/or that have substantial levels of laminated root rot are expected to become less densely stocked as the red alder senesce (naturally deteriorate due to advanced age) and infected Douglas-fir die. As the red alder and Douglas-fir die we expect that brush growth will increase and some of the young conifers in the understory, if present, would be released. However, the trees released will not fully occupy the site due to the continued presence of disease and the site would not be at productive capacity.

Understory tree development would also be limited because of high stand densities as well as a general lack of shade tolerant species in the overstory. Any conifers which may exist in the understory (i.e. saplings and seedlings) of some stands can be expected to decline in vigor and exhibit a very slow growth rate, with some possibly dying because they are no longer able to survive under the increasingly dense overstory shade. Due to the preponderance of Douglas-fir in the overstory of these stands, very little development of a second canopy layer, composed of shade-tolerant conifers, would be expected even if disturbances create openings in the canopy.

A declining trend in the hardwood component can be expected in the future as they are out-competed (overtopped) by the conifers in stands that are comprised of less than 50% hardwood. In addition, the trees are expected to become less stable, as expressed by the height/diameter ratio, and therefore, more likely to experience wind throw or break off in severe winter storms. The stands that consist of largely red alder will start to see the red alder die as the alder reach the age of 70 and above. The loss of the red alder will accelerate brush growth and release understory conifer trees that may be present in the understory. In areas lacking any existing understory conifers it is expected that vine maple or salal would become more robust until eventually a few trees, either conifers or hardwoods gain a foothold and grow out of the brush, which could take several decades. The density of the vine maple or salal would influence the amount of time it would take for tree seedlings to become established and overtop the brush.

In *Phellinus weirii* areas where tree species that are less-susceptible to this disease (species other than Douglas-fir and grand fir) are not filling in as Douglas-fir trees are killed by the disease, infection sites are expected to expand resulting in further decreases in conifer stocking and enlargement of the shrub-dominated openings. The developmental trajectory for the majority of these root disease infection centers appears to be vine maple or bigleaf maple dominated openings containing short-term snags (because they fall due to deteriorated root systems) and down logs. Depending on the overstory tree species present, these brushy areas may persist for some time. Often as trees fall they expose soil that is readily accessible for seedling growth, or they may become "nurse log" as they deteriorate. If species that are tolerant of the root disease, such as redcedar, are present to deliver seed, the area may become stocked with conifer trees sooner than if only susceptible species are present; in which case any seedlings that do become established would likely succumb to the disease before reaching mid-seral stage. While these disease areas provide structural and horizontal diversity to the stand, they reduce the capacity of the site to produce commercial forest products which is the primary emphasis for the Matrix LUA.

Table 16: Current Stand Parameters – No Action Alternative

Unit	Trees/Ac.	Basal Area (ft.^{2})	Quadratic Mean Diameter (QMD) (in.)	Curtis RD	Ave. Ht. (ft)	Crown Closure%
5-3	220	289	15.5	73	134	87
5-6	179	274	16.7	67	126	86
5-7	224	250	14.3	66	105	88

5-9	139	280	17.1	64	146	82
5-10-11	158	246	16.9	60	123	87
5-12	197	255	15.4	65	119	86
5-13	174	250	16.2	62	110	81
17-2	107	209	18.9	48	144	75
17-4	195	354	18.2	83	143	87
21-1	78	232	22.5	45	150	71
21-3	87	268	23.7	55	155	76
21-10	105	259	21.2	56	153	77
31-2	151	259	17.7	61	141	83
31-3	213	273	15.3	70	125	86
31-4	102	257	21.5	56	145	76
33-2.1	131	269	19.4	61	148	79
33-2.3	167	298	18.1	70	158	82
33-2.4	132	287	20	64	150	82
33-5	175	280	17.1	68	152	84
33-9	164	261	17.1	63	142	83
33-10	90	250	22.6	53	158	77
33-11.1	142	250	18	59	134	80
33-11.2	196	267	15.8	67	137	83
33-11.3	122	264	20	59	150	80
33-12	145	251	20.1	47	134	83
33-19	181	295	17.3	71	146	84
33-24	207	327	17	79	147	87
33-25	339	253	11.7	74	93	91

Table 17: Predicted Stand Parameters in 25 years – No Action Alternative

Unit	Trees/ Ac.	Basal Area (ft.^{2})	Quadratic Mean Diameter (QMD) (in.)	Curtis RD	Ave. Ht. (ft)of the 40 Largest Trees Measured*	Crown Closure%
5-3	176	354	19.2	96	169	87 %
5-6	159	326	19.4	92	169	86 %
5-7	171	285	17.5	84	141	87 %
5-9	128	322	21.5	87	184	82 %
5-10-11	153	334	20.0	90	162	87 %
5-12	172	302	17.9	88	155	86 %
5-13	110	230	19.5	65	172	74 %
17-2	95	263	22.6	70	190	75 %
17-4	128	369	23.0	97	179	84 %
21-1	75	289	26.1	70	180	71 %
21-3	81	316	26.7	79	191	75 %
21-10	96	323	24.8	83	190	77 %
31-2	127	327	21.8	88	176	82 %
31-3	185	309	17.5	91	155	85 %
31-4	107	318	23.4	80	180	78 %

33-2.1	115	350	23.6	91	184	81 %
33-2.3	115	347	23.5	91	190	80 %
33-2.4	121	355	23.2	94	184	83 %
33-5	166	326	19.0	93	188	84 %
33-9	139	311	20.3	86	177	82 %
33-10	87	302	25.2	77	190	76 %
33-11.1	136	301	20.2	84	169	81 %
33-11.2	162	312	18.8	89	180	83 %
33-11.3	117	316	22.3	84	180	80 %
33-12	137	316	20.6	87	177	83 %
33-19	136	349	21.7	94	178	82 %
33-24	149	349	20.7	96	176	84 %
33-25	225	332	16.4	100	155	88 %

*ORGANON reports the average height of the largest 40 trees in the stand after harvest which could overestimate the average of all trees. Since the treatment would remove the smaller trees from the stand while reserving the largest, the average of the 40 largest trees would be expected to be only slightly higher than the average of all trees.

6.1.1.2 Environmental Effects Alternative 2: Proposed Action

Under the proposed action five different treatment types would take place. These treatment types are regeneration harvest (r), commercial thinning (ct), *Phellinus weirii* treatments within the commercial thinning, Riparian Reserve density management – understory release (ur), and Riparian Reserve density management with underplanting (up).

Regeneration Harvest

The stands targeted for regeneration harvest vary from stands that are Douglas-fir dominated that have reached culmination of mean annual increment, to Douglas-fir stands that are heavily infected with *Phellinus weirii,* to stands that are dominated by hardwoods. All of the stands prescribed for regeneration harvest will be treated in a similar fashion. Aggregations of trees, accounting for approximately 75% of the trees prescribed to be left per acre would be reserved and occur at a rate of approximately one per 1 to 6 acres depending on the size of the unit. The remaining 25% of the trees to be left per acre would be distributed singly or in groups of 2-3 trees across the acres outside of the clumps. No trees would be harvested from inside of the clumps although in rare cases it is possible some trees may need to be cut to facilitate operations.

Effects Immediately and 1-5 Years after Harvest

The most immediate effect of the regeneration harvest treatments would be that 299 acres (1.4% of the subwatershed, 6.5% of the BLM lands) of mid-seral forest would be converted to early seral shrub and seedling habitat with a partial overstory of scattered large trees and the occasional clumps of trees. This would differ from early seral habitat on adjacent private lands in the watershed due to the remaining overstory trees, which are not present in private harvest areas.

Perhaps as much as 75% of the shrub layer would suffer some crushing of woody vegetation and disturbance of root systems from falling and harvesting operations, especially in the ground-based harvest areas. Fuels treatment and site preparation prior to planting would also reduce the height and density of the brush layer. We expect that the brush layer will recover to pre-harvest levels within a few years (5 or less) (Chan et al. 2006) at which time it may be necessary to control some of the understory vegetation to foster planted tree seedling survival. Seedling maintenance would result in a portion of the shrub layer within a few feet of seedlings being cut for 3-5 years after planting until such time that the trees are free to grow above the shrub layer. From about five years after harvest until 15 -20 years after harvest the vegetative condition would be characterized as complex early seral forest with varying mixes of conifer trees and shrubs.

The retained overstory trees would be subject to winds in ways that they had not before and a portion of them may be windthrown. It is impossible to predict the level of windthrow that may occur, however the East Fork Nehalem project is well inland and not especially affected by strong winter storm winds, but strong east winds could result in occasional windthrow. A portion of the reserved trees have been retained for the express purpose of contributing to a down wood deficit, so moderate levels of windthrow would be considered beneficial.

Tree clumps varying in size from about ¼ acre to over an acre would be distributed irregularly throughout the harvest units; clumps may have 40-100+ trees in them. Small units (2 – 7 acres) may only have one or two clumps whereas the largest units (60 – 70 acres) may have as many as 20 aggregations. These aggregations would provide a diverse edge vegetation type where the reserve trees would maintain longer crowns as adjacent understory trees would respond to the additional available light. These clumps would also cast shade along the northern and eastern edges that could retard the growth of nearby Douglas-fir seedlings to some degree. Shade tolerant seedlings in these areas may out-compete Douglas-fir.

Effects 25 Years after Harvest

The retained reserve trees that do not blow down or otherwise die would be expected to accelerate in both height and diameter growth based on the reduced competition for site resources (Table 19). They would be expected to grow into large legacy trees that exhibit the characteristics of mature trees with massive crowns. The planted seedlings would be 25 years old and approximately 40 – 70 feet tall and would mostly have closed together and excluded most of the shrubs. The stand would exhibit a clear two aged stand comprised mostly of young trees.

Most of the trees retained within the clumps would also experience additional growth due to increased light levels, with the possible exception of the middle of the largest clumps where a modicum of interior forest like conditions may persist (Chen et al. 1995). Some inter-tree completion would still occur that could result in a low level of mortality. Trees along the outside of the clumps may sprout epicormic branches along the stem of the tree which would have the effect of partially elongating crowns. As the adjacent trees and shrubs grow in height and crowns elongate on the overstory trees, a wall of vegetation would develop that would shade out the mid-story side light and slow air flow below the canopy, which would provide cooler, moister forest conditions than occurs outside of the clumps.

Beyond 25 years, after pre-commercial thinning of the younger stand, the forest would move into the mid-seral forest condition with very large legacy trees present and forest patches moving into late-seral complex forest condition creating a diverse patchwork of forest structure across the stands.

Table 18: Current Stand Parameters – Proposed Regeneration Harvest (r)

Unit	Acres	Age	Trees per acre	Basal Area (BA) (ft.^{2})	Quadratic Mean Diameter (QMD) (in.)	Ave. Ht. (ft)	Crown Closure%	Species composition by Basal Area[2]
5-6 r	27	69	179	274	16.7	126	86	DF-70% WRC-10% RA-9% BLM-6% WH-4% GF-1%
5-7 r	65	67	224	250	14.3	105	88	DF-35% RA-31% BLM-20% WRC-12% WH-2% GF-trace
5-9 r	3	75	139	280	17.1	146	82	DF-89% WH-5% BLM-3% RA-3%
5-12 r	15	71	197	255	15.4	119	86	DF-84% WH-12% RA-2% WRC-2%

5-13 r	4	69	174	250	16.2	110	81	RA-84% DF-16%
17-2 r	21	74	107	209	18.9	144	75	DF-72% RA-15% BLM-10% WRC-2%
17-4 r	4	73	195	354	18.2	143	87	DF-100%
21-1 r	70	73	78	232	22.5	150	71	DF-99% RA-1%
31-2 r	23	73	151	259	17.7	141	83	DF-85% BLM-12% WRC-2% RA-1%
31-3 r	9	76	213	273	15.3	125	86	DF-98% BLM-2%
31-4 r	3	79	102	257	21.5	145	76	DF-96% BLM-4%
33-2.1 r	12	72	131	269	19.4	148	79	DF-98% RA-2%
33-2.3 r	14	74	167	298	18.1	158	82	DF-100%
33-10 r	14	79	90	250	22.6	158	77	DF-90% BLM-10%
33-19 r	10	76	181	295	17.3	146	84	DF-68% RA-16% BLM-9% GF-7%
33-24 r	2	71	207	327	17	147	87	DF-100%

Table 19: Regeneration Units (r) Post Harvest

Unit	Acres	Total Trees/Ac.	Immediately Following Harvest		25 Years Following Harvest	
			BA (ft^2)	QMD (in.)	BA (sq. ft.)	QMD (in.)
5-6 r	27	19	23	31.9	37	40.2
5-7 r	65	22	30	33.3	44	40.3
5-9 r	3	20	28	33.8	41	41.0
5-12 r	15	19	18	27.0	32	36.1
5-13 r	4	22	22	28.3	39	37.8
17-2 r	21	16	30	36.8	45	45.1
17-4 r	4	18	26	34.0	40	42.0
21-1r	70	25	38	34.1	61	43.6
31-2 r	23	16	34	40	54	50.5
31-3 r	9	24	31	33.6	43	39.5
31-4 r	3	20	24	33.7	38	42.4
33-2.1 r	12	18	23	32.1	45	43.1
33-2.3 r	14	18	27	35.2	47	46.4
33-10 r	14	16	36	40.6	51	48.4
33-19 r	10	20	28	36.2	51	48.9
33-24 r	2	20	18	32.4	34	40.1

Commercial Thinning

The objective of this entry is to thin the stands to capture natural mortality, keep the stands growing vigorously, and maintain good crown ratios and stable, windfirm trees. The commercial thinning prescriptions are thin from below prescriptions. Thinning from below targets the smaller diameter trees in the stand. This style of thinning tends to remove suppressed and intermediate trees. If a stand is fairly uniform with most of the trees being of a similar height and diameter then the prescription may also remove some of the smaller co-dominate trees. Effects to snags and coarse wood are covered in the next issue beginning on page 79.

One of the primary reasons to thin is to keep trees growing rather than dying or stagnating. The trees left after thinning are expected to respond to the reduced competition. Growth models showed that these trees increased in basal area by an average of 42% after 25 years vs. an average of 26% with no treatment. The increased rate of

basal area growth essentially means that the trees will increase in diameter, which means more volume added per tree in a shorter period of time. This should not be confused with producing more total volume for the unit at the time of final harvest since a portion of the unit volume was already removed and is no longer available to keep growing. The treatment would result in both a larger QMD immediately following the harvest and also in 25 years when compared to the QMD in 25 years following the no action. Table 21 shows the stand QMD and basal area immediately following harvest and 25 years post-harvest.

With less inter-tree competition, trees tend to reallocate available resources toward radial stem and crown growth with less emphasis on height growth, which results in more stable, windfirm trees. Trees that are grown in tight stands put most of their resources into height growth to prevent being over topped by neighboring trees. Over time this leads to very tall, small diameter trees and is often referred to as trees having poor height to diameter ratio (Wonn, 2001). Trees that have poor height to diameter ratios are prone to wind throw.

With a more open canopy more sun would be available to reach the forest floor which would increase shrub and seedling (if they are present) growth. However, as time moves on the overstory trees would again start to close in the canopy by expanding their crowns and reduce understory sunlight. The increase in brush growth would be expected to last for 5 to 10 years based on the proposed prescriptions.

Phellinus weirii Treatments

Approximately 25% of the commercial thinning acres have substantial Phellinus *weirii* infections varying from less than one acre, up to approximately seven acres in size. These areas would receive treatments specifically aimed at reducing the effects of the disease. Due to the scale of the project it is likely that not all *Phellinus weirii* areas would be located and designated as such during the commercial thinning. The effects inside these areas would be similar to the effects described for the regeneration harvest. The main difference would be that the post-harvest planting species mix would be different in that Douglas-fir and grand fir would not be replanted, as it would in regeneration harvest units. Maintenance of the plantation would be the same as with regeneration harvest. This treatment would slow the spread of the disease but by no means eradicate it from the project area. The effect of slowing the disease would be that over time more acres would remain highly productive for forest production.

Hardwoods

As can be seen in table 20 most of the stands proposed for commercial thinning contain hardwood trees, particularly red alder and big-leaf maple. The percentage of the stand occupied by hardwoods varies from 0 – 16%, with a weighted average of just over 5%.

In two of the commercial thinning units (5-6ct and 33-12ct), totaling 9 acres, all the hardwoods would be removed. Two of these stands have higher percentages of hardwoods and thinning the hardwoods would not be beneficial to the hardwoods or meet the objectives of the 1995 RMP by improving site productivity with higher value species. In both stands the hardwoods are interspersed through the stand in such a way that most if not all would be damaged during logging.

In two other stands (5-3ct and 5-10-11ct) totaling 32 acres, all the red alder would be removed because they are near the end of their predicted life expectancy but the big-leaf maple would be reserved. In all of the remaining units all of the hardwoods would be reserved to retain stand diversity. Some will likely be damaged during logging operations but being that they comprise a small percentage of the trees in the stand overall damage is expected to be light.

The overall reduction in hardwoods would reduce forest stand diversity and complexity but would improve site productivity by increasing the percentage of faster and larger growing conifers, which is an objective of Matrix lands.

Table 20: Commercial Thinning (ct) - Current Stand Parameters

Unit	Acres	Age	Trees per Acre	Basal Area (ft^2)	Quadratic Mean Diameter (QMD) (in.)	Curtis RD	Ave. Ht. (ft)	Crown Closure %	Species Composition by Basal Area
5-3 ct	14	74	220	289	15.5	73	134	87	DF-87% RA-6% WH-4% WRC-2% BLM-1% GF-trace
5-6 ct	7	69	179	274	16.7	67	126	86	DF-70% WRC-10% RA-9% BLM-6% WH-4% GF-1%
5-10-11 ct	17	68	158	246	16.9	60	123	87	DF-69% WH-9% WRC-11% RA-8% BLM-3%
21-10 ct	14	75	105	259	21.2	56	153	77	DF-93% RA-5% WH-1% WRC-1%
33-2.4 ct	8	77	132	287	20	64	150	82	DF-98% BLM-2%
33-9 ct	8	74	164	261	17.1	63	142	83	DF-97% BLM-2% WRC-1% RA-trace
33-11.1 ct	9	72	142	250	18	59	134	80	DF-100%
33-11.2 ct	2	71	196	267	15.8	67	137	83	DF-97% WH-3%
33-11.3 ct	7	71	122	264	20	59	150	80	DF-97% BLM-3%
33-12 ct	2	70	145	251	20.1	47	134	83	DF-84% BLM-14% RA-2%
33-25 ct	25	29	339	253	11.7	74	93	91	DF-98% RA-2%

Table 21: Commercial Thinning (ct) – Stand Condition Changes *Immediately after Harvest* and *25 Years after Harvest* (estimated by ORGANON)

Unit	Trees/Ac. After Harvest		BA (ft^2) After Harvest		QMD (in.) After Harvest		Curtis RD After Harvest		Ht.40 Largest Trees (ave.) After Harvest		Est. Crown Closure% After Harvest	
	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.
5-3 ct	84	83	180	258	19.8	23.9	48	65	152	172	66	72
5-6 ct	93	83	180	241	18.8	23.1	51	63	149	172	67	73
5-10-11 ct	112	87	160	240	16.2	22.5	47	61	137	158	69	75
21-10 ct	55	55	200	264	25.7	29.6	51	63	167	194	62	65
33-2.4 ct	80	80	240	311	23.4	26.6	63	77	166	187	72	76
33-9 ct	82	81	210	266	21.7	24.5	57	69	155	180	71	72
33-11.1 ct	84	84	200	253	20.9	23.5	55	66	149	172	68	71
33-11.2 ct	97	95	200	257	19.4	22.2	56	69	158	184	69	72
33-11.3 ct	82	81	220	274	22.2	24.9	59	70	159	184	70	72
33-12 ct	69	69	200	261	23.1	26.4	53	65	151	181	69	70
33-25 ct	150	139	180	295	14.8	19.7	57	83	113	161	74	81

Riparian Reserve Density Management – Understory Release (ur) and Underplanting (up)

The objective of the Riparian Reserve density management is to redirect the trajectory of stand development toward a more structurally diverse forest with very large trees and multiple canopy layers. About 157 acres of the Riparian Reserve that is proposed for treatment currently has an understory that is at least partially stocked with western hemlock and western redcedar, two shade tolerant conifer species that would benefit from reduced

overstory canopy to accelerate growth. Another 147 acres of the proposed project are composed of stands that do not have any understory conifers and few shade tolerant conifer trees in the over story that could provide seed.

The proposed action would remove Douglas-fir trees primarily but would also remove some of the hardwood trees that are near the end of their life expectancy or that impede the development of the understory, especially in the few units that contain a substantial percentage of hardwoods. The canopy would be opened by about 20% - 30% (slightly more open in the understory planting vs. understory release units) which would provide more light to the forest understory and spur growth of the planted and existing understory conifers. During harvest the shrub layer would suffer some crushing of the woody vegetation and disturbance to root systems, especially in the ground-based harvest areas. Fuels and site preparation treatments prior to planting in those units proposed to be underplanted would also reduce the height and density of the brush layer. Chan et al. (2006) found that by the fifth year after thinning that the brush layer recovered to pre-harvest levels. After about 5 years it may be necessary to control some of the understory vegetation to foster underplanted and released tree seedling survival.

By having fewer overstory trees, more moisture and nutrients would also be available to the understory vegetation and the residual trees. Because more light would be available to the understory and the canopy would be more open, we expect that microclimate conditions would be warmer and dryer under the reserve tree canopy which may adversely affect plants that favor cool moist conditions.

The overstory trees would also respond to reduced competition by redirecting some resources to radial stem growth and crown enlargement. Stand modelling shows that the average basal area (best indicator of stem growth) of trees in the understory release units would increase by 34% over 25 years vs. 20% if no treatment occurred; and in the underplanting units, by 34% vs. 22% for the no treatment alternative. Chan et al. (2006) also found that crowns of thinned trees expanded and closed the overstory opening at a rate of about 2 feet/ year.

Over the next 25 – 30 years the overstory canopy would slowly close as tree crowns expand and occupy space. In a few small units (less than 20 acres total) where underplanting would occur and hardwoods are especially prevalent in the overstory, the canopy would continue to recede slightly as overstory hardwoods die. We would expect that the declining crown closure trend would occur without treatment also since these overstory hardwoods are currently approximately 75 years old and rarely live beyond about 90 – 100 years old.

By maintaining crown closures below about 65 -70% for several decades, as ORGANON models, the planted and released understory conifers would be expected to grow at acceptable rates and begin to reach into the mid-story level about 25 -30 years after treatment. Chan et al. (2006) found that in thinned stands, 88% of the underplanted seedlings survived after eight years whereas in the unthinned control, all of the underplanted seedlings died. We also found this to be true from project monitoring of our Muletail Density Management Project that we thinned and underplanted about 19 years ago. That project thinned the overstory trees to three different densities – 30, 50, and 70 trees per acre. As expected the planted understory trees grew best in the 30 tree per acre treatment areas, where the post-harvest crown closure was about 50%, and now some of the trees are 30 – 40 feet tall. Trees in the 50 tree per acre treatment areas also became established and grew, but at a slower rate than in the more heavily thinned areas. Trees in the 70 tree per acre areas are still present and growing slowly, but are far from moving into the midstory layer. Those understory trees in the East Fork Nehalem Project which occupy a relatively more open crown position would be expected to be about 40 feet tall after 25 years. As the understory conifers move into the midstory, a more vertically diverse forest structure would develop. In areas of higher density trees, the shrub layer would recede and forbs that tolerate shade would again become more prevalent. In other areas with fewer midstory trees, the shrub layer would remain more robust and in a patchy distribution adding further structural and biological complexity.

Not all the released or planted understory trees would be expected to survive. Some will die early from competition and others may be killed by animals such as elk or rodents that may girdle the trees. Some of the trees may die after one or two decades from their inability to compete for light or other resources and yet others may die after several decades, which would have the effect of contributing a small amount of 6 -10” coarse wood.

Hardwoods

Most of the Riparian Reserve density management units proposed for treatment contain some hardwoods. Most of these stands are comprised of less than 10% hardwoods but one 48 acre stand has more than 50% hardwoods and about 40 acres of other stands have between 15 – 20% hardwoods. On 69% of all of the density management acres all of the existing hardwoods would be reserved from harvest (except where a few trees may need to be cut for operational purposes). On 8% (units 31-2 and 33-10) of the proposed treatment acres all of the hardwoods would be harvested in order to open the canopy enough to release understory conifers. On the remaining 23% of the acres (units 5-6, 5-7, 5-10-11, 17-2 and 33-12), some hardwoods would be removed while others would be reserved.

While reducing the overall occurrence of hardwoods in the Riparian Reserve, the variability of the treatments would maintain hardwood diversity on the landscape while allowing for a second canopy layer to begin developing.

Table 22: Riparian Reserve Density Management – Understory Release (ur) - Current Stand Parameters

Unit	Acres	Age	Trees per Acre	Basal Area (ft^2)	Quadratic Mean Diameter (QMD) (in.)	Curtis RD	Ave. Ht. (ft)	Crown Closure %	Species Composition by Basal Area
5-3 ur	23	74	220	289	15.5	73	134	87	DF-87% RA-6% WH-4% WRC-2% BLM-1% GF-trace
5-6 ur	7	69	179	274	16.7	67	126	86	DF-70% WRC-10% RA-9% BLM-6% WH-4% GF-1%
5-7 ur	48	67	224	250	14.3	66	105	88	DF-35% RA-31% BLM-20% WRC-12% WH-2% GF-trace
5-9 ur	3	75	139	280	17.1	64	146	82	DF-89% WH-5% BLM-3% RA-3%
5-10-11 ur	8	68	158	246	16.9	60	123	87	DF-69% WH-9% WRC-11% RA-8% BLM-3%
5-12 ur	4	71	197	255	15.4	65	119	86	DF-84% WH-12% RA-2% WRC-2%
17-2 ur	12	74	107	209	18.9	48	144	75	DF-72% RA-15% BLM-10% WRC-2%
31-2 ur	15	73	151	259	17.7	61	141	83	DF-85% BLM-12% WRC-2% RA-1%
31-3 ur	8	76	213	273	15.3	70	125	86	DF-98% BLM-2%
31-4 ur	7	79	102	257	21.5	56	145	76	DF-96% BLM-4%
33-2.1 ur	2	72	131	269	19.4	61	148	79	DF-98% RA-2%
33-2.3 ur	6	74	167	298	18.1	70	158	82	DF-100%
33-2.4 ur	4	77	132	287	20	64	150	82	DF-98% BLM-2%
33-11.1 ur	4	72	142	250	18	59	134	80	DF-100%
33-11.3 ur	4	71	122	264	20	59	150	80	DF-97% BLM-3%
33-25 ur	1	29	339	253	11.7	74	93	91	DF-98% RA-2%

Table 23: Riparian Reserve Density Management – Understory Release (ur) – Stand Condition Changes *Immediately after Harvest* and *25 Years after Harvest* (estimated by ORGANON)

Unit	Trees/Ac. After Harvest		BA (ft^2) After Harvest		QMD (in.) After Harvest		Curtis RD After Harvest		Ht.40 Largest Trees (ave.) After Harvest		Est. Crown Closure% After Harvest	
	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.
5-3 ur	97	89	180	242	18.5	22.3	50	62	152	169	67	71
5-6 ur	98	87	170	231	17.8	22.0	50	62	146	171	68	73
5-7 ur	100	94	160	217	18.0	20.6	51	60	115	143	73	77
5-9 ur	61	59	180	227	24.2	26.6	50	57	164	186	63	66
5-10-11 ur	105	83	140	215	15.6	21.8	41	56	119	144	65	72
5-12 ur	75	71	140	195	18.4	22.4	40	52	138	158	61	69
17-2 ur	53	51	150	206	22.7	27.2	40	51	175	200	59	63
31-2 ur	55	55	210	267	26.4	30.4	53	66	155	179	66	68
31-3 ur	102	101	200	249	19.0	21.2	60	68	139	158	72	74
31-4 ur	58	56	200	244	25.1	28.2	51	59	158	181	63	64
33-2.1 ur	74	68	220	296	23.4	28.2	58	72	162	187	67	70
33-2.3 ur	71	71	240	306	24.9	28.2	61	75	171	193	68	71
33-2.4 ur	70	70	220	290	24.1	27.7	57	71	166	187	69	73
33-11.1 ur	71	71	180	224	21.6	24.6	49	60	149	172	64	67
33-11.3 ur	72	71	200	253	23.3	25.5	53	64	159	183	67	68
33-25 ur	150	139	180	295	14.8	19.7	57	83	113	161	74	81

Table 24: Riparian Reserve Density Management with Underplanting (up) - Current Stand Parameters

Unit	Acres	Age	Trees per Acre	Basal Area ($ft.^2$)	Quadratic Mean Diameter (QMD) (in.)	Curt is RD	Ave. Ht. (ft)	Crown Closure%	Species composition by Basal Area[2]
5-3 up	15	74	220	289	15.5	73	134	87	DF-87% RA-6% WH-4% WRC-2% BLM-1% GF-trace
5-6 up	3	69	179	274	16.7	67	126	86	DF-70% WRC-10% RA-9% BLM-6% WH-4% GF-1%
5-7 up	2	67	224	250	14.3	66	105	88	DF-35% RA-31% BLM-20% WRC-12% WH-2% GF-trace
5-13 up	2	69	174	250	16.2	62	110	81	RA-84% DF-16%
21-1 up	56	73	78	232	22.5	45	150	71	DF-99% RA-1%
21-3 up	11	69	87	268	23.7	55	155	76	DF-99% RA-1%
21-10 up	18	75	105	259	21.2	56	153	77	DF-93% RA-5% WH-1% WRC-1%
33-2.3 up	3	74	167	298	18.1	70	158	82	DF-100%
33-2.4 up	4	77	132	287	20	64	150	82	DF-98% BLM-2%
33-5 up	5	78	175	280	17.1	68	152	84	DF-89% BLM-11%
33-9 up	7	74	164	261	17.1	63	142	83	DF-97% BLM-2% WRC-1% RA-trace
33-10 up	3	79	90	250	22.6	53	158	77	DF-90% BLM-10%

33-11.1 up	1	72	142	250	18	59	134	80	DF-100%
33-11.2 up	9	71	196	267	15.8	67	137	83	DF-97% WH-3%
33-12 up	6	70	145	251	20.1	47	134	83	DF-84% BLM-14% RA-2%

Table 25: Riparian Reserve Density Management with Underplanting (up) – Stand Condition Changes *Immediately after Harvest* and *25 Years after Harvest* (estimated by ORGANON)

Unit	Trees/Ac. After Harvest		BA (ft^2) After Harvest		QMD (in.) After Harvest		Curtis RD After Harvest		Ht.40 Largest Trees (ave.) After Harvest		Est. Crown Closure% After Harvest	
	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.	0yr.	25yr.
5-3 up	71	62	110	169	16.9	22.4	32	43	125	150	51	58
5-6 up	81	72	120	176	16.5	21.1	36	48	145	173	58	65
5-7 up	83	78	120	170	16.3	20.0	36	47	100	131	66	72
5-13 up	47	33	110	118	20.7	25.7	30	30	148	175	50	45
21-1 up	47	47	190	247	27.2	31.0	47	58	158	184	61	62
21-3 up	43	42	200	246	29.3	32.9	48	56	167	196	61	60
21-10 up	47	43	160	215	25.1	30.4	41	51	161	189	54	56
33-2.3 up	52	52	200	265	26.5	30.5	50	62	171	193	59	64
33-2.4 up	52	52	180	248	25.2	29.6	46	59	166	187	61	66
33-5 up	89	79	140	187	17	20.9	42	51	137	165	57	61
33-9 up	43	43	140	191	24.4	28.7	36	46	155	180	54	57
33-10 up	44	44	210	256	29.7	32.8	50	59	166	194	63	62
33-11.1 up	50	50	140	190	22.7	26.4	37	47	149	172	54	58
33-11.2 up	60	59	140	194	20.7	24.6	39	50	158	183	54	59
33-12 up	42	41	140	194	24.9	29.5	36	47	153	182	55	57

6.1.1.3 Cumulative Effects: Proposed Action

The proposed regeneration harvest would move 1.4% of the acres in the analysis area from a mid-seral forest condition to an early-seral forest condition. When considering all other lands and projects, the overall acreage in early seral forest habitat (0-20 years old) would increase to approximately 3,750 acres, or about 8% of the acres in the subwatershed. From a timber management perspective the subwatershed is still somewhat below an even flow regulation of timber production characterized by having acreages fairly evenly distributed among decadal age classes, where we would expect about 20% of the watershed to be in the 0-20 year age classes.

The commercial thinning and Riparian Reserve density management portion of the proposed action would increase the acres of more open canopy mid-seral forest from about 500 acres to about 900 acres when considering the BLM's recently past Baked Tater and Trigger Finger thinning projects. In the long term (over 30 years) we expect that the commercial thinning forests would be available for regeneration harvest where the riparian density management acres would be occupied by multi-layered, more complex, mid to late-seral forests, increasing the total late-successional forest acres to perhaps a little over 1,000 acres in the subwatershed. We would not expect any increase in late-successional forest on private lands in the analysis area.

Considering that nearly all of the non-BLM lands in the analysis area are intensively managed for timber production, both the BLM and industrial lands are generally reducing the overall percentage of hardwood trees in the subwatershed. Most likely the analysis area has a higher preponderance of hardwoods than would be expected to occur naturally due to fire and logging history that highly impacted the soils thus favoring hardwood development on what would otherwise be conifer sites. Under more natural conditions fewer acres would likely be occupied by hardwoods, and therefore the general reduction in hardwood trees in the subwatershed could be moving toward a more natural state. The proposed action would slightly reduce the potential incidence of

Phellinus weirii, or at least the spread of the disease which would have the effect of very slightly improving the overall tree growth productivity of the subwatershed.

By and large the proposed action would have only small cumulative impacts to forest conditions within this highly managed forest landscape, several of which that are positive for forest commodity production.

6.1.2 *ISSUE 2: What effect will treatments have on the availability of snags and down wood?*

6.1.2.1 Environmental Effects Alternative 1: No Action

Snags

Under the No Action Alternative current snag levels would be maintained as the occasional snag would fall or break apart to be replaced by new snags that develop as a result of non-density related mortality such as root rot, beetle kill or damage from storms or animals. Because many of the existing snags are a result of root disease we expect that about 40% of those currently standing will fall within the next decade (DecAID; Mellen-McLean, et al. 2012), but that new ones would be produced as root rot pockets expand and kill more trees. Also, a few suppressed trees in the smallest diameter classes would succumb to competition. Unit 33-25 is a 29 year old stand that currently contains 339 trees per acre. This young stand is beginning to undergo stem exclusion which will result in many small (4”-7”) snags developing in the next decade or so. These small snags would last only for a short while as they either fall or decay.

Down Woody Debris

We also expect down woody debris levels would remain about the same for the next few decades as older more rotten wood decays into the earth while new wood is input by falling trees associated with root rot pockets. Beyond the next several decades as the 70-80 year old stands become 120-130 years old, we expect that inputs from larger overstory trees would start to increase the down wood volume as gaps with falling trees become larger and more persistent (Spies and Franklin, 1991).

6.1.2.2 Environmental Effects Alternative 2: Proposed Action

Snags

Commercial Thinning and Riparian Reserve Density Management

Both the commercial thinning and Riparian Reserve density management treatments would remove the smallest trees from the stand which are also those most likely to become snags due to competition related mortality. Spies, Franklin, and Thomas (1988) found that stands in western Oregon similar to the proposed action stands had approximately 41 snags per acre less than 19.7” diameter, slightly more than 7 per acre larger than 19.7”, but only 1.6 per acre larger than 19.7” and greater than 16’ tall; and only 0.24 per acre larger than 19.7” and greater than 38’ tall. The average diameter of all snags was 11.8” indicating that the preponderance of snags are quite small. In fact, it must be noted that these authors included snags as small as 4” diameter and 4” tall (yes, inches). Our data only includes snags that are at least 10” in diameter and 10’ tall. If we were to include snags as small as Spies, Franklin, and Thomas did, we would undoubtedly record many more snags in the <10” diameter classes. Available data gathered from the late 1970’s to the mid-1990’s from western Oregon and Washington showed that in stands disturbed by harvesting about 62% of the snags were cut down and another 16% had fallen down (DecAID; Mellen-McLean, et al. 2012). Project Design Features incorporated in the East Fork Nehalem project would reserve all snags from harvest and only allow snags to be felled if necessary for safety or operational reasons. Additionally, larger hard snags (≥20” diameter and 20’ tall) would be protected by reserving the nearest four trees surrounding the snag to reduce the possibility that it would be disturbed. Because, with the exception of unit 33-25, the stands proposed for thinning and density management are either at the tail end or past the stem exclusion stage, we would expect that only a few trees that would otherwise become snags due to suppression

mortality in the next few decades, would be lost to harvesting. The *Phellinus weirii* treatments that are proposed in the commercial thinning units would reduce snags in two ways; first, a number of trees that would be expected to succumb to the disease while still standing would be harvested and secondly, some of those that do remain would be more prone to fall or be knocked over as a result of the treatment. We expect that this could be the case on about 25% of the treatment acres. We believe that it is reasonable to expect that, of the current 5.4 snags per acre that 0.5 to 1.5 per acre would be lost as a direct result of the thinning actions, mostly from the small diameter classes. Despite the reduction in snag development resulting from the treatments, there would undoubtedly be some new snags that would develop although it is difficult to say how many. Damage to reserve trees from yarding activities can often result in mortality to some trees as well as trees damaged by greater exposure to storms, especially after the first few winters. Because suppression mortality is no longer an important producer of snags (except in unit 33-25), and that there is greater than usual prevalence of root rot (density independent mortality factor) in several of the treatment stands, stand growth and yield models (Organon, FVS) are not especially accurate in predicting future snag development because these models mainly model density dependent mortality. Studies have shown that about half of snags formed as a result of root disease remain standing after ten years and that 60% of all snags 10”-39” remained standing after 10 years (DecAID; Mellen-McLean, et al. 2012). Considering that potentially 40% of snags may be lost every decade, after three decades it is possible that as few as 1 of the current snags would still be standing, of which perhaps only one hard snag over 20” in diameter would occur per every 2-3 acres, which would most likely be the very largest of the hard snags. Considering these factors, we expect that immediately after harvest we would still have about 4 - 5 snags per acre remaining and that after about three decades there would be about 1 per acre of the original snags remaining.

In order to estimate how many snags we could expect to develop in the next three decades after thinning, we looked at several uniform Douglas-fir stands in the Nestucca drainage that were thinned in the late 1970’s. These stands covered 273 acres and ranged in age from about 55 to 65 at the time of thinning. Approximately 30 years later, stand exams were conducted within these previously thinned stands and showed that 7.8 snags per acre exist as of 2008 (year of stand exams). Of these 7.8 snags per acre, approximately 75% of them are in later stages of decay and likely existed prior to the previous thinning. This would suggest that approximately 2 snags per acre developed naturally in the 30 years since the original thinning. It is also important to note that the Nestucca stands exhibit little, if any, laminated root rot and the root disease was not the cause of the mortality. However in the East Fork Nehalem stands, there is a high level of this disease which we believe will recruit snags at a level greater than that observed within the Nestucca stands. Therefore, we feel that we can reasonably expect that at least two, and probably more, new snags per acre would develop over the next 30 years. Also, adjacent untreated stands would continue to contribute to snag recruitment by various means (including: insect, diseases, windthrow etc.) within the surrounding areas.

Available data on “large” snag (>19.7”) distribution in natural unharvested coast range forests indicates that 78% of these forests had an average of 2 per acre (range 0 to 4) (DecAID; Mellen-McLean, et al. 2009). Given the number of existing snags, the possible rate of snag development and the snag recruitment potential within adjacent untreated stands, we believe that snag quantities are currently, and would continue to be after harvest (for at least 3 decades) similar to what unharvested stands of similar age and location are expected to have, based on available data.

Regeneration Harvest

The proposed regeneration harvest treatments would remove the majority of trees that might otherwise have died and become snags in the future. In order to minimize these effects, an additional 2 trees per acre (beyond those required to account for cavity nesting birds, Matrix green tree retention, and down woody debris deficit) would be retained for the express purpose of providing snag habitat in the future. As within the thinning treatments, all existing snags would be reserved and protected to the extent possible. We expect that a portion of the smaller sized snags may be knocked over or need to be felled due to safety concerns. Existing large snags (greater than 20” dbh and 20’ in height) outside of areas infected with *Phellinus weirii,* would be reserved and surrounded by the nearest four green trees to help protect them from damage.

Throughout regeneration harvest areas, approximately 16 to 25 trees per acre (including the 2 mentioned above) would be retained. We expect that a portion of the retained trees would fall and become important down woody debris habitat and a portion would remain standing and eventually become snags. Those standing trees killed by insects or suppression mortality (mostly within reserve clumps) would result in snags that last longer (>10 years) than those that are affected by root disease or wind. Trees to be retained for the purpose of snag recruitment would be of larger sizes (>20in DBH) which would provide a more resilient snag in the future (DecAID; Mellen-McLean, 2012).

Distribution of retained green trees would be throughout the regeneration harvest treatment units in clumps (75%) as well as dispersed (25%). It is possible that a small amount of density dependent mortality could occur within the reserve clumps which would provide a source of snags within the regeneration harvest units. Some clumps would be strategically placed to surround higher quality snags where possible, reducing the chance that they would be damaged as a function of logging operations. As discussed above, we expect that a portion of the leave trees would die naturally, however we would monitor the post-harvest units for a few years and if the expected mortality is not occurring we would convert a portion of the green trees to snags by girdling or topping trees.

Similar to the commercial and Riparian Reserve thinning effects, we expect that 0.5 to 1.5 small snags per acre would be lost to logging operations leaving approximately 4 – 4.5 snags per acre remaining. After 30 years we would expect based on snag fall rates from the data in DecAid that only about 1 of the original snags would remain. With the greatly reduced recruitment potential the regeneration harvest units would have fewer snags per acre after 30 years than unharvested stands. Undoubtedly some of the 16 – 25 trees that would be reserved per acre would become snags naturally which would help offset the lost potential. Within the next 30 years we expect that the harvest stands would still be able to maintain an average of two large snags per acre, similar to what Franklin, Spies and Thomas (1988) (also DecAID; Mellen-McLean, et al. 2009) found for unharvested stands of similar age, based on the retention design features and recruitment from the reserve trees, especially associated with laminated root rot areas. Beyond 30 years, as the planted stand begins to move into mid-seral forest condition, we would expect additional small snags to begin to accumulate as inter-tree competition begins to produce mortality.

<u>Down Wood</u>

Commercial Thinning, Riparian Reserve Density Management and Regeneration Harvest

Down wood occurs naturally in unevenly distributed patches across the landscape, and quantities depend on stand development cycles. The RMP specifies minimum amounts of down wood to retain in regeneration harvest units by linear foot measure (See table 15). The proposed action would include Project Design Features which require the project to meet the RMP's specified linear foot management direction for regeneration harvest units as well as applying the same basic management direction in partial harvest treatments while considering timing of stand development cycles (mid-seral for this project). However, the relevant literature reports quantities of down wood in terms of cubic foot volume (cu.ft. or $ft.^3$) and/or percent ground cover (table 14). For purposes of comparing effects of the proposed action to that of taking no action, the following discussion pertains to cubic foot volume and percent ground cover.

Stands at or near 80 years old are in the successional stage where the least amount of down wood would be expected (Spies, Franklin 1991). According to Spies and Cline (1988), young stands (<80 years) had approximately 1,100 cubic feet per acre of down wood covering an average of 3.8 % of the ground. These quantities include all stages of decay and pieces of down wood as small as four inches in diameter. Although approximately 73 acres of the total 709 acres proposed for treatment will be 80 or older by 2018, these stands do not exhibit mature characteristics and are very similar to the stands younger than 80 proposed for treatment (except 33-25). Therefore, we compared our data to the young stands documented in Spies and Cline. Data gathered from within the treatment units during the more recent surveys show that there are approximately 804 cubic feet per acre of down wood, covering 2.3% of the ground. These figures are within the range of what Spies and Cline found for unharvested Coast Range Stands, but on the low end.

As previously explained, data gathered from the East Fork Nehalem project area was more restrictive regarding dbh and length, resulting in less material being counted. Given this, we expect that if the smaller pieces (<5" dbh and <8 ft long) would have been counted during our surveys, our down wood quantities could be more comparable to the mean for young stands surveyed by Spies and Cline.

Although all existing down woody debris would be protected to the greatest extent possible from disturbance during treatment, we expect that a portion of the existing down wood would be disturbed and some of the late decay stage pieces may be broken apart into smaller pieces. It is not possible to quantify the extent of disturbance since the down wood levels vary considerably from unit to unit, are not evenly distributed and the level of disturbance would be different for different harvest methods. The post-harvest input of fresh down woody debris, both small sizes from slash (tops and branches) and large woody debris (cull material) from the harvest operation would help offset the damage to existing coarse wood associated with harvesting within treatment units. If whole tree yarding were to occur we could expect that up to 75% of limbs and tops (smaller than about 5") would be removed and thus unavailable for ground cover purposes. Fuel treatment prescriptions within the underplanted Riparian Reserve thinnings and regeneration harvest treatment areas would remove a portion, but not all, of the small woody debris generated from the treatments (predominantly pieces <6" in diameter). We are expecting that some post-harvest windthrow would occur, especially from the dispersed reserve trees in the regeneration harvest units, although windthrow could occur in the thinnings as well. These windthrow inputs would be large pieces that would persist on the landscape much longer than limbs or tops.

In order to supplement current down wood levels within Riparian Reserve all reserve trees that are needed to be cut for operational purposes would be left on site except in specific cases where they may cause a safety hazard. In the commercial thinning units within the CON LUA, 2 trees per acre would be left onsite and in the GFMA, 1 tree per acre would be left on site. These trees left on site would augment current down wood levels in addition to the coarse wood inputs from the logging operations.

Proposed regeneration harvest units would have similar, if not the same affects to existing down wood as commercial thinning and density management treatments. However, since almost all trees would be removed from these treatment areas, the BLM has management direction that applies to regeneration harvest treatments within the Matrix to ensure that ecological functions are supported. As discussed within the affected environment, none of the stands proposed for regeneration harvest meet the down wood requirements set forth within the RMP. In order to meet these requirements, merchantable material from the harvest stands would be retained to make up for the deficit (Table 15). It is expected that these leave trees would contribute down wood due to windthrow over time following harvest. The harvest units would be monitored for 2 to 4 years following harvest to evaluate the amount of blow down and post-harvest mortality to determine if additional treatments are needed to meet down wood habitat objectives.

A continuous contributor to down wood is the presence of *Phellinus weirii* within the treatment areas. Most trees infected with this disease fall due to decayed root systems which contributes substantial quantities of down wood on the landscape. The additional retained trees (ranging from an estimated 4 to 12 trees per acre, depending on unit) could contribute approximately 520-1,560 cu. ft. per acre of down wood if and when they fall, increasing the down wood potential within analysis area. Therefore, we believe that the current amount of down wood present within the treatment units, combined with the additional down wood inputs expected to occur both naturally and as a result of the treatments, would maintain down wood at levels appropriate for these stands' development cycles.

6.1.2.3 Cumulative Effects: Proposed Action

The proposed action would modify forest stand conditions, including snags and down wood, on approximately 418 acres by thinning treatments and approximately 299 acres by regeneration harvest. As described in the Affected Environment section (Section 6.1), past and present actions and events have led to the existing condition of the landscape within the analysis area. In the past 5 years approximately 500 acres of commercial and Riparian Reserve thinning have occurred within the analysis area on BLM managed lands. As a result, these areas have a

diminished likelihood of naturally recruiting small snags through suppression mortality. However they have an increased potential to recruit down wood in the near term and are more likely to recruit larger snags in the future. Another past action was the creation of approximately 514 snags by top girdling and topping live trees, as well as felling trees to contribute to down wood throughout various riparian areas within the East Fork Nehalem subwatershed, which increased snag and down wood resources which may partially or wholly offset any reductions caused by the proposed action. Seventy-eight percent of the land within the analysis area is owned by industrial timber companies or private landowners, the majority of which is managed according to the Oregon Forest Practices Act on a 40 - 50 year harvest rotation. These relatively short harvest rotations preclude the development of large snags and down wood. As a result, those private lands harvested in the last 20-30 years have very few snags remaining and we can expect that the 3,000-5,000 acres that may be harvested in the next 10 years would further reduce large snag and down wood resources in the analysis area. Private lands may produce small snags (4-7") for a decade or so before harvest and would therefore be an ongoing source of small snag habitat. By and large BLM management within the analysis area would maintain larger snag and down wood resources for the next several decades commensurate with that found in unharvested stands that are also in similar seral stage with similar fire histories. While actions on private lands may substantially reduce the levels of larger snags and down wood in the analysis area, the proposed action would be expected to maintain snags and down wood at levels similar to what may be expected on unharvested lands of similar origin, thus not contribute cumulatively to adverse effects.

6.2 Hydrology Issues

The following sections describe the basic hydrological condition of the analysis area as well as more detailed information related to the issue related to stream sedimentation.

6.2.1 *ISSUE 3: How would sediment generated by proposed road maintenance and renovation affect the physical integrity, water quality and sediment regime of streams (Aquatic Conservation Strategy Objectives 3, 4, and 5)?*

Affected Environment

Landscape Setting

All proposed harvest units and gravel and natural surfaced roads that the project would use are located in the East Fork Nehalem River 6th field subwatershed (#171002020108; East Fork Nehalem River), a subset of the Headwaters Nehalem River 5th field watershed of the Nehalem River subbasin. Essentially all of the land in the analysis area is used for forestry. The East Fork Nehalem River 6th field subwatershed analysis area contains approximately 20,608 acres and about 218 miles of streams. Approximately 22% (about 4,572 acres) of the subwatershed is managed by the BLM, in the checkerboard federal ownership pattern typical of the Coast Range of Oregon and includes about 35 miles of streams. The proposed action would occur within portions of 5 sections (T4N-R3W Sec. 5, 17, 21 and T5N-R3W Sec. 31 and 33).

The majority of project area is located in the Willapa Hills ecoregion of the northwest Oregon Coast Range (Omernik and Griffith 2013). The Willapa Hills are characterized by mountains and more rolling hills with lower drainage densities than are typical in other portions of the Coast Range. The geology consists primarily of marine sedimentary and tuffaceous rocks (rock consisting of compacted volcanic ash). The sedimentary geology is very susceptible to erosion after disturbance (Omernik and Griffith 2013). The southeastern portion of (T5N-R3W) section 33 and the eastern edge of (T4N-R3W) section 21 are in the volcanics ecoregion underlain by fractured basaltic rock (Omernik and Griffith 2013) which is less erosive.

The analysis area has wet, cool winters, warm, dry summers and relatively mild temperatures throughout the year. The project area ranges from about 700 to 1,600 ft. in elevation and gets about 60-70 in. of precipitation per year, the vast majority as rain between October and June. Snow is likely at higher elevations in most years. About 1/3rd of the project area is within the transient snow zone susceptible to rain-on-snow events (>1,200 ft. in

elevation with no dominant snow zone or snowpack) where rain-on-snow events have the potential to increase peak flows. The precipitation rate of a 2-year precipitation event is high, but moderate for the region, at approximately 2.7 inches in a 24-hour period (estimated at: http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm).

Beneficial Uses and Water Quality Concerns

The most sensitive beneficial uses of the water in the subwatershed that could potentially be affected by project activities are cold-water fisheries (including salmonid habitat) and stream habitat for other aquatic life (Kasper *et al.* 2003).

The Nehalem River is included on Oregon's 303(d) list (Clean Water Act, US EPA) of impaired streams for stream temperature and bacteria and is within the area covered by the North Coast Subbasin Total Maximum Daily Load (TMDL; Kasper *et al.* 2003). The East Fork Nehalem River (East Fork Nehalem River; 6th field subwatershed) was listed for summer stream temperatures in 2002, with the goal of keeping water temperatures below 64˚ F to maintain rearing habitat suitability for juvenile salmonids (Kasper *et al.* 2003). While the East Fork Nehalem River is not 303(d) listed for sediment impairment, one author feels that the river and its tributaries are "likely impaired by excess fine sediment" (Demeter Design 2008), though there is no sediment TMDL or other specific regulatory status related to sediment.

Summary of Project Area Stream Resources

There are approximately 26 miles of streams within the 5 BLM sections that comprise the proposed action area; about 14% of the total stream miles in the analysis area. About ½ of the mileage of project area streams is seasonally intermittent (with surface flow only during the rainy season) and ½ are perennial and flow year 'round.

The project area is on top of gently sloping mountains that are very steeply and deeply incised by erosion. As a result, the upland harvest units generally have mild slopes until the abrupt edges of very steep gullies, typically over 80% slope. These gullies are extremely unstable, where "root throw", or trees sloughing off banks and across or into stream channels below is common (Faustini 2000; Figures 10 and 11 below).

Figure 10: "Root throw" in sec. 19.

Figure 11: Down Wood in Section 5. The volume of wood in the channel illustrated below is average and typical of the low order, seasonally intermittent stream channels in the project area.

Stream morphology in the analysis area is dictated by the underlying geology, slope and the frequency and size of instream large wood in stream channels. Intermittent streams average 1-3 ft. bankfull width and are hillslope constrained cascades of about 20% gradient. Intermittent streams in the project area tend to be too steep for fish to reside in. The 2nd order tributaries range from about 6-12 ft. bankfull width and tend be perennial, but most are also too steep or have too little discharge to support fish. The 1st and 2nd orders in the southern units are very small (1 - 2 ft. bankfull), less steep, with little discharge. The small tributaries in the south are not incised to the degree that the streams in the north are and thus get less root throw and subsequently have less wood. Many of the headwaters are almost completely vegetated (Figures 12 and 13) and thus stable.

Figure 12: Vegetated Channel. Note that this intermittent channel in section 17 is almost completely vegetated

Figure 13: Note the low discharge in May 2014 and how little water is visible.

Kenusky Creek is a 4th order stream that crosses section 33 and the northwest corner of section 5. What the BLM calls the Gunner's Lake Fork is a 4th order tributary to the East Fork Nehalem River and crosses section 17. A 3rd order tributary to Gunner's Lake Fork, Floeter Pond Creek, also crosses section 17. The mainstem East Fork Nehalem River begins below the confluence of Gunner's Lake Fork and a 4th order reach of the East Fork Nehalem River about 2,000 ft. downstream of section 17. Section 5 is as close as about 2,700 ft. overland distance from the mainstem East Fork Nehalem River. The other timber harvest units would all be farther from the river.

Table 26 includes a summary of important morphological metrics for the major project area streams which are discussed in more detail to follow. Aquatic habitat benchmarks used by the Oregon Department of Fish and Wildlife (ODFW) are included as a means for comparisons (ODFW and BLM 2006).

Table 26: Project area riparian and stream channel geomorphology summary.

From Oregon Department of Fish and Wildlife Reach Surveys (ODFW and BLM 2006 – 2007)									
Stream	Shade %	Bankfull Width (ft)	Width/ Depth Ratio	Gradient %	% Area Pools	LWD[1]/ 100m	Key Pieces[2] /100m	Riffles, Sand/Silt %	Riffles, Gravel %
Kenusky Creek (2006)	>82	14 – 24	10 – 18	0.3 – 3.2	23 – 52	18–35	0.2-1.1	17-37	38-61
Gunner's Lakes Fork and Floeter Pond Creek (2007)	>87	10- 21	12 – 15	1 – 9	8 – 15	19–24	0.6-1.5	24-80	20-39

Gunner's Mainstem (Gunner's + Floeter)	>69	21	17	1	54	16	0.3	27	20
ODFW "desirable" benchmarks	>70	na	<15	na	>35	>20	>3	<10	>35

[1]LWD = Large Woody Debris = pieces >15cm x 3 m (6 in. x 10 ft.)
[2]Key Pieces = > 60cm x >10m (24 in. x 33 ft.)

Forest stands immediately adjacent to streams (within no harvest buffers) are generally well stocked and provide full or nearly full shade.

Stream Sedimentation (ACS Objectives 3, 4 and 5)

Excessive sediment in streams simplifies habitat by filling in pools and embedding rougher substrates (filling in the interstitial spaces between pieces of gravel) which reduces hyporheic flow (stream flow within substrate). Hyporheic flow can help maintain (cool) water temperatures and has important biological/ecological consequences. Sedimentation can reduce stream habitat variability which reduces aquatic animal productivity and species diversity. Upstream reaches with excessive sediment become sediment source areas for downstream reaches.

Stream habitat data indicated that reaches of the major project area streams have concentrations of sediment in riffles that are higher than the ODFW benchmark (Table 26; "riffles, sand/silt" column; a measure of the concentration of fine sediment in riffles). Project area soils are very prone to erosion, particularly following disturbance (Omernik and Griffith 2013). The current extent of stream sedimentation reflects both the sedimentary nature of the geology and the ongoing effects of past fires, timber harvesting and road building practices.

Road and stream crossings can contribute sediment to streams from the road prism, including the road surface, erosion from cut banks, fill slopes and roadside ditches. There are approximately 188 miles of road with 344 stream crossings in the subwatershed. The proposed action would utilize about 33 miles of gravel and natural surface roads with approximately 45 stream crossings, with only about 6 crossings of perennial streams (estimated with ArcMap).

Turbidity (sediment suspended in the water column) in project area streams tends to be extremely low during the summer dry season, relatively high during the first few fall/winter storms, returning to a low turbidity, clear condition between substantial rain events during the wet season.

Headwater basins on private land are clear cut without stream buffers and covered by logging slash which causes streams to aggrade with sediment. Aggraded upstream reaches can be sediment sources for downstream reaches.

Road maintenance and timber haul unrelated to the proposed project contributes to stream sedimentation by increasing the supply of fine sediment which gets routed to streams during rain events.

6.2.1.1 Environmental Effects Alternative 1: No Action

Stream Sedimentation (ACS Objectives 3, 4 and 5)

The existing road network in the analysis area would continue to contribute sediment to streams under the No Action alternative. A modeled estimate of sediment production and delivery to streams from road/stream crossings was done to evaluate sediment production under the No Action alternative. Data values used for modelling purposes come mainly from Luce and Black (1999), who found that untreated road segments (control) routed 50 kg (110 lbs.) of sediment through culverts per wet season. Luce and Black also found that road treatments including re-contouring, blading, and ditch cleaning elevated sediment production and transport as much as 7.5 times above background levels (mostly from ditch cleaning). Based on County Soil Survey data, project area soils weigh approximately 1,778 lbs. /cubic yard (yrd^3). This would equate to about 0.062 yrd^3 of soil

routing through culverts on untreated roads per wet season. This estimate can be used as a baseline for sediment production per road/ditch segment during the wet season. Under the No Action alternative, BLM would not perform extensive road maintenance or replace culverts in the project area and therefore not increase road-related sediment relative to the background rate. However, roads in the project area identified as having poor surface conditions or undersized or failing culverts would not be renovated, thus any sedimentation caused by those conditions would not be corrected. Inadequate road prism drainage increases the likelihood of road segment failures that could produce large or persistent sources of sediment that could be routed into streams and alter channel morphology and embed substrates and in turn reduce biological productivity. Road/stream crossings outside of the project area but within the analysis area could be maintained or renovated in support of private industrial timberland operations.

Assumptions we made for analysis purposes are:

- That the most consequential portion of each year's sediment production occurs during the wet season and therefore only that portion of the year would be considered for analysis.

- The conditions described in the literature were similar enough to the project area conditions to make reasonable comparisons.

- That the first wet season following road work would produce the full magnitude of project-caused sedimentation and that elevated rate of production would decline 70% the second year, 90% the third year and return to background levels in year 4 (Luce and Black 1999).

- That seasonally intermittent streams as well as perennial streams would receive sediment with the same effects.

- Background levels include continued sediment input from the approximately 344 stream/road intersections at the rate of 0.062yrd^3/ crossing per year (0.062 yrd^3 x 344 crossings x 7 years = 170.6 yrd^3).

- Background levels also include new inputs from private industrial timberland operations. Approximately 4,400 acres of merchantable private timber remain in the analysis area as of 2014. We assume that harvest would occur at an annual rate of 440 acres per year. By looking at the locations of those private stands and their orientation within the road network, we think that 50 miles of road with 96 road/stream crossings could plausibly be maintained or renovated to harvest those acres. For modeling purposes we assumed that road maintenance would occur at 9.6 stream crossings/year (16.65 - 31.25 yrd^3 over seven years).

Conclusions:

With our assumptions, the existing road network and private industrial timber operations would contribute 187 to 202 yrd^3 of sediment to streams within the analysis area over the next 7 years.

6.2.1.2 Environmental Effects Alternative 2: Proposed Action

Under the Proposed Action, road maintenance and renovation would occur on portions of about 23 miles of rocked and natural surface roads. Most of the maintenance and renovation work entails rock placement and grading and a lesser amount of ditchline shaping and cleaning. The grading and shaping of rocked roads de-armors the road surface and has the potential to release fine-grained material embedded in the road surface after substantial rainfall. Most of the released material from road grading becomes re-embedded in the surface or runs off the road edge into the roadside vegetation and is trapped there and thus has only a small effect to sediment transport to streams (Luce and Black 1999). Where the road is of higher gradient and is shaped with a defined ditch line fine material can run off and travel down the ditch to streams if they are present. Most sediment is

released to the stream system during rain events following ditchline clearing and shaping in the vicinity of stream crossings. The de-vegetated ditches can input sediment to creeks if there are no ditch relief drains or other structures designed to trap or reroute sediment. This can occur throughout the rainy season until re-vegetation and re-armoring occurs, typically during the next growing season. In another study, Luce and Black (2001) found that sediment production following road treatments including grading and ditch cleaning declined by 72% in the second year and 90% by the third year following treatment mostly due to the re-armoring process (roads and ditches becoming re-compacted and thus less permeable by water). By the fourth year, sediment levels had returned to background levels.

The road maintenance and renovation associated with the Proposed Action includes work in the vicinity of approximately 45 stream crossings (about 10% of crossings in the 6th field subwatershed; estimated with GIS) Included in road maintenance and renovation activities is the replacement of 12 culverts on streams, 4 on perennial streams and the remainder on intermittent streams. It would be impossible to accurately predict how much sediment is actually delivered to streams from road maintenance activities. What is clear is that activities that generate sediment in the vicinity of creek crossings, such as grading of rocked surfaces and ditch cleaning, have a much higher potential to increase sediment input to the stream system than activities occurring further from streams. Consequently a modeled estimate of sediment production and delivery to streams from road/stream crossings was done to evaluate the effects of the proposed action. (Hydrology Specialist Report). The process for creating this modelled estimate is the same as that described above under the No Action alternative.

Based on the findings of Luce and Black (1999), if we consider post-treatment sediment production to be up to 7.5 times background levels, the calculated upper level of sediment production would be 829 lbs. (0.465 yrd^3) per road segment per season. For comparison, a low end scale effect of post- treatment sediment production used is 4 times background level (0.248 yrd^3).

Assumptions we made for analysis purposes (in addition to those listed under the No Action alternative) are:

- The proposed action would be implemented through three timber sales and that 33% of the road maintenance and renovation included in the proposed action would be in three separate years spread out over a five year period (years 1, 3 and 5) and that by the third year after the initial maintenance that sediment production would return to background levels. Also we assumed that the road work would occur at 1/3 of the estimated 45 stream crossing each year for three years.

- While individual sites could vary considerably in their volume/mass of sediment production, production over the scale of the proposed action and the analysis area would be reasonably approximated with averages and would remain constant over time, varying only by treatments.

Conclusions:

With our assumptions, we could expect that the proposed action would result in an additional 10 -16 yrd^3 of material to enter streams beyond what is expected without treatment. That would equate to a total increase of 6 – 8% over the estimated seven year period until return to background levels. This additional sediment would be distributed over roughly one-half of the 6th field subwatershed. If the Proposed Action were spread out over more timber sales, sediment production could occur over a longer period of time but would be a smaller amount per time period. That is to say, total production would be the same regardless of the time period it occurred in. The Proposed Action includes management practices that would include the installation of ditch relief culverts on roads with steeper grades to disconnect the ditch from the stream network, construction of sediment catch basins and/or the installation of other sediment control features such as wattles in ditches where cleaning actions occur. These types of measure would considerably reduce the potential for sediment input to streams and would likely reduce the relative production of sediment from the model considerably. It is not known how much sediment currently exists in the analysis area or what an appropriately natural level would be. In addition to the background levels of sediment transport associated with road and forest management actions we can expect, given the erosive character of the subwatershed (Omernik and Griffith 2013), that landslides, debris flows, streambank

erosion and other natural processes are transporting much higher sediment volumes than that estimated to originate from road work associated with the proposed action. Duncan et al. (1987) found that about half of sediment generated from roads that enter small streams such as those associated with the proposed action stayed in the stream within about 330 feet of the point of entry and that sediment <0.063mm in size transported efficiently through the system. Bilby et al. (1989) found that the majority of sediment produced by gravel roads was finer than 0.004mm and that the movement of this sized material through the stream system had little discernable effect on the composition of streambed gravel. Consequently, we can expect that during the initial rain events of the season after treatment, sand-sized and larger sediment would likely be stored immediately below stream crossing sites while the finest materials would move down the stream network and flush through the system. During this time, there may be a slight, visible, increase in turbidity, and sediment plumes may be visible within about 100 feet downstream of replaced culverts or renovated road segments with cleaned ditches.

The extent of sedimentation in the larger project area streams generally exceeds ODFW habitat quality benchmarks (Table 26), although the relative contributions of natural, geologic factors and anthropogenic ones are not clear. We don't expect that the small increase in sediment produced from the proposed action relative to overall sediment volumes in the watershed would change the ODFW habitat quality benchmarks or result in measureable changes to stream morphology or substrate composition beyond the immediate area of stream crossings.

6.2.1.3 Cumulative Effects: Proposed Action

Stream Sedimentation (ACS Objectives 3, 4 and 5)

The proposed action would result in a 6 – 8% total increase in sediment delivery to the stream network over an estimated 7 year period. We considered that forest management activities on private land, including road maintenance and hauling would continue to occur regardless of whether the proposed action would be implemented or not. Because these actions would occur regardless, we considered these actions to be part of the background affected environment that we compared our action to and are therefore not cumulative. Also, we don't expect that there would be any other BLM actions active during the same time as the proposed action that could contribute to cumulative effects either. Because sediment delivery associated with road maintenance would only occur for a few years, private action would occur regardless, and no other BLM actions would contribute sediment during the same time period, no cumulative effects are likely to occur as a result of implementation of the proposed action.

6.3 Wildlife Resources Issues - (Includes ESA listed species, BLM Special Status Species, Survey and Manage Species, Migratory Bird Treaty Act species, and certain RMP species requiring coarse wood habitat)

6.3.1 *ISSUE 4: What effect would the proposed timber management treatments have on Northern Spotted Owls and their habitats?*

Affected Environment

Spotted Owl Habitat Conditions at the Landscape Scale

The majority of forest lands within the portion of the state which includes the East Fork Nehalem project area is privately owned and is currently managed for timber production in such a way as to preclude the development of suitable owl habitat or maintenance of adequate dispersal habitat. Federal lands in the area are distributed in a checkerboard fashion and do not lend themselves to the management of wide ranging species such as the spotted owl. Many of these federal lands are within the Matrix LUA and are managed with rotation lengths that would also preclude the development or long-term maintenance of suitable spotted owl habitat. The nearest large block of federal land in the Oregon Coast Range within the LSR (Late Successional Reserve) LUA is located approximately 38 miles southwest of the proposed project areas. Clatsop and Tillamook State Forests are located

approximately 13 miles northwest, west and southwest of the project areas; USFWS has designated large blocks of spotted owl Critical Habitat on Clatsop and Tillamook State Forests (USDI-USFWS 2012). A large contiguous block of private land separates the proposed project area and these larger holdings of public land. Land use practices and current habitat conditions at the landscape scale, which include a general lack of adequate spotted owl dispersal habitat, has effectively isolated the proposed project area from these larger blocks of public ownership.

Spotted Owl Habitat Conditions within the East Fork Nehalem 6th Field Subwatershed Analysis Area

Table 27: Habitat Definitions for the Northern Spotted Owl (USDA & USDI 2012). These are general definitions; site-specific determinations of habitat type may be modified by the unit wildlife biologist according to local structural characteristics or the uses of habitat by spotted owls.

Northern Spotted Owl Suitable Habitat: Consists of stands with sufficient structure (large trees, snags, and downed wood) to provide opportunities for owl nesting, roosting, and foraging. Generally, these conditions are associated with conifer-dominated stands, 80 years old or older, multi-storied in structure, have trees greater than or equal to 18 inches mean diameter at breast height (dbh) and the canopy cover generally exceeds 60 percent. Stands are defined at a larger scale (i.e. province) as suitable based just on age or size (i.e. 80 years, >18") alone. The local biologist evaluates all project areas to make a final determination of habitat type based on the structural complexity associated with functioning nesting, roosting, and foraging habitat.

Northern Spotted Owl Dispersal Habitat: For assessing impacts to spotted owl habitat, dispersal habitat will refer to the subset of habitat used by dispersing spotted owls that does not contain suitable habitat. These stands provide protection from avian predators and at least minimal foraging opportunities during dispersal. At a minimum, dispersal habitat is comprised of conifer and mixed mature conifer-hardwood habitats with a canopy cover greater than or equal to 40 percent and conifer trees greater than or equal to 11 inches average diameter at breast height (dbh) but less than the habitat characteristics described for suitable habitat above. Generally, spotted owls use younger stands to move between blocks of suitable habitat, roost, forage and survive until they can establish a nest territory. Juvenile owls also use dispersal habitat to move from natal areas (areas of birth).

The proposed action areas are not designated as spotted owl critical habitat (USDI-USFWS 2012). Spotted owl critical habitat will receive no further discussion or analysis within this EA. The East Fork Nehalem project is consistent with Recovery Action 32 (as described in the 2011 Northern Spotted Owl Recovery Plan (USDI, 2011)) because proposed treatment units would not include any high quality complex habitat.

An evaluation of the spotted owl habitat quality and quantity within the analysis area was done using BLM GIS data, 2012 aerial photographs, 2013 LIDAR data and on-the-ground site visits. Table 28 below displays the results of this habitat evaluation by the estimated acres of owl habitat types located on the various ownerships (BLM, ODF or Private (Non-BLM)).

Approximately 265 acres of suitable owl habitat were identified within the analysis area, all of which are on BLM land and are considered to be low in quality (T.5N. R.3W. section 31, T.4N. R.3W. section 5, and T.4N. R.3W. section 3). This is based on the fact that they lack sufficient coarse wood (snags and down wood), a complex multi-storied structure, and/or are distributed in small forest patches set in the context of a highly fragmented landscape dominated by early and mid-seral stage habitats. The proposed action would not occur in any of these stands.

Table 28: Estimated Acres of Spotted Owl Habitat Types Currently within the East Fork Nehalem Spotted Owl Analysis Area by Ownership

Habitat Type	BLM	Non-BLM	Total Acres	Percent of Total Forest Lands
Suitable	265	0	265	1%
Dispersal	3,701	4,391	8,092	39%
Non-habitat	606	11,645	12,251	60%
Total	4,572	16,036	20,608	n/a

Currently, approximately 40% of the forest lands within the analysis area are estimated to be in a condition to facilitate spotted owl dispersal – that is to say, either dispersal or suitable habitat. Approximately 46% of the habitat currently in a condition to facilitate spotted owl dispersal is located on checker boarded BLM land, although BLM manages only 22% of the forestland within the analysis area. Given the current trends, we expect that much of the dispersal habitat currently located on non-federal land will be clear-cut harvested within the next decade. As a result of current trends, the amount, quality and distribution of habitat is not considered sufficient to currently support spotted owl movement and survival (dispersal) within the analysis area.

Spotted Owl Surveys and Proximity to Known Spotted Owl Sites

The last known spotted owl surveys to be conducted within any portion of the analysis area were conducted in the early 1990s in support of the BLM's Dog Creek, Tunnel Vision and Coney Road timber sales. These surveys covered the majority of the analysis area including all of the East Fork Nehalem Project proposed treatment areas. These surveys resulted in two spotted owl responses located within the NW corner of T.5N. R.3W. section 28 (Female, 1993) and the center of T.4N. R.3W. section 5 (Male, 1994). Despite numerous follow up surveys, BLM was unsuccessful in relocating either of these owls.

There are no historic or known occupied spotted owl sites within the analysis area, including near any of the proposed project areas. The nearest known spotted owl site (North Cedar) is historical in nature and is located approximately 2 to 3 miles east of the nearest proposed project area; the last spotted owl documented at this site was in 1980. Approximately 1 mile north of the proposed treatment units there is a block of Oregon Department of Forestry (ODF) land, totaling approximately 4,500 acres, which is centered within Township 5 N., Range 3 W. (Willamette Meridian). Surveys have been conducted within this ODF block intermittently from 1994 to present with no spotted owl responses. Barred owls have been detected on almost every one of these ODF surveys. Given the habitat conditions within the general project area, it is highly unlikely that there are any spotted owls currently inhabiting the analysis area or would be expected to in the foreseeable future.

Spotted Owl Habitat Conditions within the Proposed Treatment Units

The proposed project includes the thinning (commercial and Riparian Reserve density management) of approximately 418 acres and the regeneration harvest of approximately 299 acres. Although there is considerable variation in habitat quality, we have determined all of the treatment acres, with the exception of unit 33-25, to be spotted owl dispersal habitat. There is no spotted owl suitable habitat within any of the proposed treatment units. This is due to young stand age and the general lack of structural diversity, legacy trees and sufficient snags and downed wood present within the proposed treatment units.

There is considerable variation in the amount of CWD (downed wood and snags) within the proposed treatment units but in general they are deficient, as far as spotted owl habitat is concerned, especially in larger higher quality (early stages of decay) snags (See EA Section 6.1.2). These large snags can be utilized by spotted owls for roosting and nesting habitat, as well as provide habitat for their prey species (northern flying squirrels, deer mice, wood rats etc.). Down wood also provides habitat and protective cover to spotted owl prey species. Given that

spotted owl prey species are associated with high-levels of down wood, the current low levels of CWD results in marginal spotted owl habitat.

While there is uncertainty regarding the forest conditions required for spotted owl dispersal, it is assumed dispersal success is better when the habitat more closely resembles suitable habitat (USDI-USFWS, 2011). The majority of the conifer and mixed conifer-hardwood stands to be treated are currently considered to be fair to good quality dispersal habitat. One stand aging approximately 29 years old, (unit 33-25) making up approximately 26 acres is not considered to be dispersal habitat, due to its small tree size (QMD=11.7), high tree density (339 TPA) and lack of adequate down wood. This stand's high tree density makes it very marginal in quality due to the lack of open space under the canopy which likely inhibits an owl's ability to fly.

There have been several visual and audio detections of barred owls within the proposed treatment units located in sections 21 and 33. As stated in the 2011 Revised Recovery Plan *"Barred owls reportedly have reduced spotted owl site occupancy, reproduction, and survival. Limited experimental evidence, correlational studies, and copious anecdotal information all strongly suggest barred owls compete with spotted owls for nesting sites, roosting sites, and food, and possibly predate spotted owls*". The fact that barred owls inhabit the analysis area further compromises the usefulness of the existing dispersal habitat.

6.3.1.1 Environmental Effects Alternative 1: No Action

Also see the Environmental Effects section of the No Action alternative for Issue 1(section 6.1.1.1) for a description of the expected impacts to the forest vegetation component of wildlife habitat.

Under the No Action Alternative no management activities would occur on BLM land at this time or within the foreseeable future. There would be no Riparian Reserve density management thinning, commercial thinning, regeneration harvest or underplanting. Stands that are proposed for commercial thinning and Riparian Reserve density management vary from single storied Douglas-fir dominated stands, to conifer mix stands dominated by Douglas fir in the over-story and western hemlock and western redcedar within the understory. If not thinned, both types of stands would experience decreased crown development and decreased growth rates, resulting in stands becoming increasingly more dense and uniform. They would also both continue to experience coarse wood additions mainly from the presents of *Phellinus* weirii root rot pockets, and to a lesser degree from competition-related mortality. *Phellinus weirii* root rot pockets would continue to expand in areas where susceptible tree species (Douglas-fir and grand fir) are present, potentially increasing the amount of shrub dominated openings, short-lived snags (<10 years), down wood and generally increasing the stands structural diversity. There would be some scattered medium to larger size snags that could provide habitat for northern flying squirrels and thus benefit the spotted owl. Additionally, under the No Action Alternative, hardwoods would be expected to decline over time in areas where they occupy a minor component of the stand, as a result of being out-competed (overtopped) by surrounding overstory conifers.

Within the single storied Douglas-fir dominated stands, spotted owl dispersal habitat would continue to be present. The lack of understory and structural diversity (shade tolerant species) in these stands would limit the potential habitat for spotted owl prey species, thus increasing the time necessary for spotted owl suitable habitat to develop. Eventually, as insect and windthrow events occur the canopy could become more open and diverse, thereby releasing some of the over-story trees. Douglas-fir seedlings, taking advantage of the new openings, may eventually develop into a mid-story, however it is most likely that these stands would continue to lack a mid-story and thus function as marginal suitable habitat. Given that the natural thinning process occurs over many decades and the lack of structural diversity within these stands, suitable spotted owl habitat would not be expected to begin to develop naturally for approximately 50 or more years, depending on natural disturbance processes.

Within the conifer mix stands, spotted owl dispersal habitat would continue to be present. Although these stands contain shade tolerant trees, the majority of them have stalled in their vertical growth, resulting in an understory that is underdeveloped and lacking vigor. If not thinned, the Douglas fir over-story would continue to dominate the shade tolerant species and the under-story would continue to be underdeveloped. Eventually, as Douglas-firs

die as a result of, root diseases, insects or windthrow events, opening of the canopy could occur and release some of the over-story and under-story trees, thus over time providing an increase in structural diversity. However, without thinning within the relative near future, this process could take up to 50 or more years to begin to start developing suitable spotted owl habitat.

Under the No Action alternative, the younger stand (unit 33-25) proposed for commercial thinning would continue to not function as dispersal habitat, barring any natural disturbance. Eventually this stand could thin out as a result of suppression mortality, becoming marginal to fair quality dispersal habitat. Another possibility is that the stand remains in a dense state, continuing to grow in height and becoming less stable. This scenario would maintain very marginal dispersal habitat. As time continued, spotted owl dispersal habitat would continue to persist and Douglas fir seedlings could take advantage if any new openings developed. Without the presence of shade tolerant conifer species it is unlikely that a mid-story would ever develop. Therefore the development of suitable spotted owl habitat would not begin to start developing for approximately 80 or more years and even then, would function as marginal suitable habitat.

6.3.1.2 Environmental Effects Alternative 2: Proposed Action

Due to the poor quality of the suitable habitat as well as the lack of spotted owl presence in the area, potential disturbance to unknown spotted owls resulting from implementation of the East Fork Nehalem Project is highly unlikely, thus disturbance to spotted owls will not be discussed further within this analysis.

Impacts due to Modification of Spotted Owl Dispersal Habitat

All acres proposed for treatment have been identified as being dispersal habitat of varying qualities, with the exception of unit 33-25 (26 acres). The 691 acres of dispersal habitat proposed for treatment represents 3% of the land within the analysis area. Considering all ownerships within the analysis area, this represents approximately 9% of the habitat which could facilitate owl dispersal. As a result of the proposed action 5% of dispersal habitat currently present within the analysis area would be modified by commercial and Riparian Reserve thinning treatments, while 3.7% would be removed as a result of regeneration harvest treatments. This would reduce the percentage of the analysis area in dispersal habitat condition from 39.2 % to 37.8%, a reduction of 1.4%.

Not all thinning units or portions of units would be treated with the same silvicultural prescription which would help promote a horizontal diversity of habitats across the larger parcel. Also, contributing to the horizontal diversity of habitats is the fact that proposed treatment areas are generally intermingled with areas not proposed for treatment. These areas include no-harvest stream buffers and areas dropped from the treatment proposal due to lack of economical access, logging feasibility, stand age or various resource concerns.

Commercial Thinning within the GFMA LUA

The proposed commercial thinning treatments would remove most of the suppressed, intermediate, and some of the co-dominant trees in the stand. The management of hardwoods within these treatment units would vary. On approximately 53% of commercial thinning unit acres, all hardwoods would be reserved, on approximately 32% all alders would be removed, on approximately 17% all hardwoods (alder and big-leaf maple) would be removed, and on 12% no hardwoods are present. Numerous studies have cited the importance of hardwoods as an element of spotted owl habitat and for their prey (Hershey 1998, Thraikill et al. 1998, Glenn et al. 2004, Forsman et al. 1984). Scattered hardwoods within conifer-dominated stands not only can increase the horizontal and vertical complexity of the forest, but larger, older hardwoods often contain numerous denning opportunities for prey species. Scattered and small clumps of hardwoods, especially red alder in mixed conifer-hardwood stands can also increase the future horizontal diversity of the stand by creating canopy gaps as they are much shorter-lived species, dropping out of the stand sooner as it moves through successional stages. Therefore, removal of all the hardwood or even just the alder component from approximately 49 acres of the GFMA Commercial Thinning treatment units would have a negative impact upon the current and future spotted owl habitat quality within the treatment areas.

Within the northern coast range of Oregon, flying squirrels are the principal prey species of the spotted owl (Forsman et al., 1991, 2004). Carey (2000) found lower abundances of flying squirrels in recently-thinned (within 10 years) stands in Washington than in stands that were clear-cut 50 years prior to the study, with retention of both live and dead trees. He attributed his results to the apparently negative effects of commercial thinning on canopy connectivity, downed wood and truffle communities in the area. Wilson (2010) also reported that most thinning is likely to suppress flying squirrel populations for several decades as well, but cites reductions in mid-story occlusion, as well as lowered canopy cover, as attributing factors. Any adverse impacts to dispersal habitat resulting from a reduction in canopy closure and connectivity would be expected to ameliorate over time (<20 years) as the retained trees respond to the thinning with increased growth rates and expanding crowns. Chan et al. (2006) found that thinned stands in the Oregon Coast range may experience increasing canopy cover by up to 2% per year. They also found that thinning stopped crown recession by increasing the longevity of lower branches that would have been suppressed if the stands were not thinned resulting in a promotion of higher crown ratios. This helps provide more complex stand structure which benefits spotted owl prey species by improving their habitat. Therefore, the proposed commercial thinning treatments within the GFMA may have adverse effects on the quality of current spotted owl dispersal habitat; however they would still function as dispersal habitat post-treatment. This is largely based upon the fact that the average canopy closure within the thinned stands would be expected to remain between approximately 66% and 74% immediately after thinning (based on ORGANON modelling - see Table 21). While the stands proposed for thinning would be expected to continue to function as dispersal habitat post-treatment, the thinning operation would be expected to have some negative impact upon the habitat quality of the thinned stands (e.g. hardwood removal, uniform spaced thinning, suppressed flying squirrel habitat). While there may be negative impacts to dispersal habitat, there is little likelihood of impacts to spotted owls.

Treatments addressing *Phellinus weirii* pockets would heavily thin areas (sizes ranging from 1-5 acres) within commercial thinning units in order to slow the spread of the disease by removing Douglas-fir since it is highly susceptible to the disease. Areas treated for this purpose would retain approximately 20 trees per acre and would be underplanted with shade tolerant conifer species. *Phellinus* pockets which receive this treatment are not expected to act as barriers, prohibiting spotted owl dispersal. In the long-term, treated pockets would beneficially contribute to the stand structure.

Thinning within Riparian Reserve & Connectivity LUAs

Riparian Reserve density management treatments include using multiple "thin from below" to varying basal area target prescriptions. Thinning from below would result in the removal of the smallest trees within the stand and the largest trees within the stand being retained. Canopy closure immediately post-harvest would average 63% (range 50% to 74% based on ORGANON modelling). Accelerated growth rates post- harvest would occur, thus growing larger trees faster. Out of the approximately 304 acres proposed for thinning within Riparian Reserves, 147 of them also include underplanting of shade tolerant conifers to promote the development of multistoried structure. The remaining 157 Riparian Reserve acres currently have understory shade tolerant saplings present which would be released by opening the overstory and would contribute to a multistoried structure in the future.

In addition to the largest Douglas-fir within the stands, all other coniferous trees of minor species (western redcedar, western hemlock) would be reserved. Depending upon the natural spacing of these minor species, a variable spaced post-harvest stand would be expected. As Wilson (2010) reported, most thinning is likely to suppress flying squirrel populations for several decades due to reductions in mid-story occlusion. He also reported that structural components present within stands that support high abundances of flying squirrels included multiple canopy layers. Therefore, although thinning treatments would temporarily adversely affect spotted owl prey species, long-term (>30 years) benefits to their habitat would be expected within the Riparian Reserve thinning units as understory tree layer develops into a mid-story layer, resulting in improved habitat.

Most of the Riparian Reserve density management units proposed for treatment contain some hardwoods. Most of these stands are comprised of less than 10% hardwoods but one 48 acre stand (unit 5-7) has more than 50%

hardwoods and about 40 acres of other stands have between 15 – 20% hardwoods. On 69% of all of the density management acres all of the existing hardwoods would be reserved from harvest (except where a few trees may need to be cut for operational purposes). On 8% (units 31-2 and 33-10) of the proposed treatment acres all of the hardwoods would be harvested in order to open the canopy enough to release understory conifers. On the remaining 23% of the acres (units 5-6, 5-7, 5-10-11, 17-2 and 33-12), some hardwoods would be removed while others would be reserved. While the overall occurrence of hardwoods would be reduced through the proposed action, hardwoods would still be prevalent and well distributed, including in all of the no-harvest areas nearer to the streams, thus maintaining forest diversity which would be beneficial to the spotted owl.

Similar to thinning within Riparian Reserve, proposed thinning within the CON LUA would also be thinned to varying basal area targets. All hardwoods would be reserved and canopy closure immediately post-harvest would be approximately 62%. Similar to within the GFMA, *Phellinus* root rot pocket treatments would also occur within the CON LUA. Effects to spotted owl dispersal habitat would be expected to be the same as discussed within the GMFA commercial thinning discussion. All proposed thinning treatments within Riparian Reserve and Connectivity LUAs may have temporary adverse effects on the quality of spotted owl dispersal habitat. However, these stands will continue to function as dispersal habitat post-treatment. Retention of hardwoods and shade-tolerant conifer species will help provide structural complexity which will benefit spotted owls and their prey species.

Proposed thinning treatments within the Connectivity and Riparian Reserves LUAs would result in some habitat features developing sooner than would be expected without treatment. These features include large trees within the overstory which would be potential sources of future snags and down logs. In addition to the trees retained within the overstory, the proposed thinning is expected to result in increased or maintained growth rates and crown ratios of the understory conifer (where present) and shrub species. Also, underplanting of shade tolerant conifer species would help diversify the stands and eventually provide multiple canopy layers within the stands. Multi-layered and multispecies canopies are one of the most crucial habitat components for spotted owls and their prey species. Overall treatments would have temporary adverse effects on spotted owl dispersal habitat, however, in the long-term, would provide key habitat features sooner than if treatments were not conducted.

<u>All Thinning Treatments</u>

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 proposed thinning treatments would modify spotted owl habitat by reducing snag recruitment potential, through removal of small to medium sized trees from the stands, which are those most likely to become snags sooner than the dominant trees in the stand. This would not account for a substantial amount of snag recruitment. The majority of snag recruitment potential lost by the proposed thinning treatments would be from trees too small to provide meaningful habitat for owls prey species (Manning et al. 2012). While density dependent mortality is effectively no longer a producer of important snag resources in the proposed treatment stands currently, density independent mortality is, and would continue to occur even after treatment. Untreated areas located around treatment units, would help provide a mosaic of diverse habitat types on differing stand development trajectories across the landscape and provide some of the habitat features expected to be in shorter supply within the proposed treatment units.

In Riparian Reserve thinning units as well as Connectivity LUA thinning units, habitat complexity would increase as mid-story occlusion increases by the understory trees moving into the mid-story, which would benefit flying squirrels and thus increasing foraging opportunities for spotted owls.

Although design features would be in place to minimize the loss of existing snags, a portion of these snags would be expected to be felled as safety hazards or inadvertently knocked over during logging operations, however, they would be retained on site as down woody debris habitat (See Snags and Down Wood Analysis). Also, snags felled due to logging operations or safety hazards are often smaller in size and less valuable to spotted owls and their prey. The thinning would also provide a small pulse of newer CWD (down wood and to a lesser degree

snags) near the time of harvest. This input would largely be expected to be in the form of trees broken or damaged during timber harvest operations and potential windthrow after harvest. This would be beneficial to small mammals and temporarily help offset some of the identified adverse impacts associated with the loss of some existing snags and disruption of the natural snag recruitment processes. Also, in order to reflect the appropriate amount of down wood for the timing of stand development, 1-2 additional green trees per acre in the Matrix LUA and all of trees in the Riparian Reserve LUA that are cut for operational purposes would be retained on site to augment down woody debris habitat (See EA Section 4.4 Project Design Features).

In the long term (30+ years) the 304 acres of Riparian Reserve thinning would be expected to begin to develop into spotted owl suitable habitat sooner than under the No Action Alternative. Consistent with the ROD/RMP and NWFP, it would be expected that the 100 acres of forested stands proposed for commercial thinning within the GFMA LUA would be evaluated for regeneration harvest in approximately 15 to 20 years and likely harvested prior to or soon after developing into suitable owl habitat. The 12 acres proposed for commercial thinning within the CON LUA would be managed on a 150 year rotation – that is to say, acres within this LUA are to be regenerated at a rate of approximately 1/15th per decade. Connectivity LUA acres, in association with their adjacent Riparian Reserves, could provide for the maintenance of suitable owl habitat on the landscape for several decades; the beneficial impacts of the thinning proposal would therefore be most noteworthy and long-lasting on these acres.

To summarize, all proposed thinning treatments would have adverse effects on the quality of current spotted owl dispersal habitat in the short term (<30 years), however they would still function as dispersal habitat post-treatment. Proposed commercial thinning treatments within the CON LUA would improve dispersal habitat in the long term, by employing thinning prescriptions that are designed to create variable spacing, as well as hardwood retention. Thinnings within the Riparian Reserve as well as the Connectivity LUAs would improve dispersal habitat, in the long term, by either releasing existing understory shade-tolerant conifer species or underplanting them (where they are not already present) in order to promote a future mid-story.

Regeneration Harvest Treatments

Approximately 299 acres of spotted owl dispersal habitat are proposed to be regeneration harvested (removed), 228 acres of which are within GFMA and 71 acres are within CON LUA. This equates to approximately 4% of dispersal habitat on all land ownerships within the analysis area, reducing the percent of dispersal habitat in the analysis area from 39% to 35%.

Proposed regeneration harvest stands vary from single storied Douglas fir dominated stands, to conifer mix stands dominated by Douglas fir in the over-story and western hemlock and western redcedar within the understory and lastly, conifer/hardwood mixed stands. All proposed regeneration harvest stands are considered to be fair to good quality spotted owl dispersal habitat.

The acres proposed for regeneration harvest are scattered across 5 sections of land and configured into approximately 14 non-contiguous treatment areas averaging approximately 20 acres in size; sizes range from approximately 2 to 71 acres. The dispersed configuration of these units would help minimize some of the impacts associated with regeneration harvest as compared to if the same number of acres were configured into one or two larger units. However, the fact remains, regeneration harvest would contribute to further fragmentation of the remaining dispersal habitat and result in the removal of dispersal habitat in an area which currently does not contain adequate acreage of habitat in a condition to effectively facilitate owl dispersal. The interagency Level 1 Team (terrestrial subgroup) for the North Coast Planning Province has determined that the geographic isolation of the affected BLM-administered lands creates a low likelihood that this habitat currently facilitates owl dispersal between blocks of suitable habitat (See Section 8; Consultation).

While there would be adverse impacts to spotted owl habitat resulting from the proposed action, the actual impact to spotted owls would be expected to be relatively minor. This is based on the current quality of the habitats to be impacted, lack of historic or known occupied owl sites within or near the area, design features incorporated to

help offset or minimize some of the identified adverse impacts, but most notably the fact that the project is set in the context of a landscape which is so heavily impacted by management practices occurring on industrial timber lands and where BLM managed lands are geographically isolated from blocks of suitable habitat, that it likely is not currently supporting dispersing owls.

6.3.1.3 Cumulative Effects: Proposed Action

The Proposed Action's impact on spotted owls would amount to the modification of 392 acres of dispersal habitat and the removal of 299 acres of dispersal habitat. As described in the Affected Environment section (Section 6), past and present actions and events have led to the existing condition of the landscape and habitats within the analysis area. Included in the past actions is the approximate 500 acres of commercial and Riparian Reserve thinning that have occurred within the analysis area on BLM managed lands in the last 10 years. These treatments have diminished the quality of dispersal habitat upon those acres. Another past action involved the creation of snags and down wood by girdling and felling trees to contribute to down wood and snags throughout various riparian areas within the analysis area. These treatments have provided important habitat components for spotted owl prey species within those riparian areas treated. In addition, there are future actions that are reasonably certain to occur that may also affect the forested environments within the analysis area. Reasonably foreseeable actions include continued short rotation timber harvest on adjacent lands owned by industrial timber companies. It can be expected that the land managed by these companies will continue to be managed according to the Oregon Forest Practices Act, and be managed on a 40-50 year rotation. That is to say that stands will grow to reach approximately 40-50 years old and then be harvested using clear cut harvest techniques.

Currently there are approximately 8,092 acres of spotted owl dispersal habitat within the analysis area, 4,391 acres (54 %) of which is primarily owned and managed by industrial timber companies. Given the short rotation timber harvest practiced on these lands it can be reasonably assumed that the dispersal habitat currently present will be removed (clear cut) within 10-20 years. However, it can also be assumed that about the same amount of dispersal habitat will grow and develop during this time period as well. In addition to removal of dispersal habitat, continued industrial timber harvest will also continue the trend of limiting available habitat for species requiring large green trees, snags, or CWD (such as prey species of the spotted owl); as clear cut harvesting removes the majority of CWD from the landscape, as well as removes any trees that could become CWD in the future. Because private industrial timber companies own the majority of the subwatershed, their management practices would preclude the development of suitable habitat or maintenance of adequate dispersal habitat. Given this, the analysis area is already deficient in spotted owl suitable habitat and continuous blocks of dispersal habitat.

Although the Proposed Action would further reduce spotted owl dispersal potential through an area where such habitat is currently limited, the geographic isolation of the area creates low likelihood that this habitat currently facilitates owl dispersal between blocks of suitable habitat or dispersal between territories. 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 poor (as in the no action) regardless of whether the proposed action occurred or not. This logic is supported by the Interagency Level 1 Team (terrestrial subgroup) for the North Coast Planning Province (USDI – USFWS 2014).

6.3.2 *ISSUE 5: What effect would the proposed forest management treatments have on cavity nesting birds present in the project area?*

Affected Environment

The Salem District Resource Management Plan requires that, when conducting timber harvests, that enough snags be retained to support species of cavity nesting birds at 40% of potential population levels. Cavity nesting bird species found within the Oregon Coast Range include but are not limited to: chestnut-backed chickadees *(Poecile*

rufescens), brown creepers *(Certhia americana)*, northern pygmy owls *(Glaucidium gnoma),* red-breasted sapsuckers *(Sphyrapicus ruber)*, red-breasted nuthatches *(Sitta Canadensis)*, northern flickers *(Colaptes auratus)*, downy woodpeckers *(Picoides pubescens)*, hairy woodpeckers *(Leuconotopicus villosus)*, and pileated woodpeckers *(Hylatomus pileatus)*. In order to manage cavity nesting bird species' habitat needs, habitat requirements for primary cavity nesting birds (birds that excavate their own holes (woodpeckers)) must first be met. It is believed that by meeting the needs of these woodpecker species, most other snag-dependent species habitat requirements will also be met (Neitro et al. 1985). Woodpeckers, such as the northern flicker excavate new cavities within snags which provide habitat for secondary cavity nesters such as chickadees and nuthatches. Secondary cavity nesting birds are highly dependent upon the availability of these abandoned nest cavities.

In the wet forests of western Oregon snags generally develop as a result of suppression mortality in young stands (35-50 years old) and by density independent factors such as *Phellinus weirii* infections or beetle attacks of already stressed trees in older stands. Snags tend to decay from the outside in towards the center from sapwood rotting agents introduced from the outside. This rarely results in high quality long lasting stable cavities such as those that develop by heart rotting agents that enter from wounds such as when the top is removed from the tree when the tree is still alive. Small snags do not last on the landscape with most falling within the first five years, while very large snags could persist for very long time periods. Generally hard snags are preferred for cavity excavating birds. Ideal snag diameters and decay stages vary between species of cavity nesting birds. Some birds prefer smaller soft snags such as the hairy and downy woodpeckers, whereas the pileated woodpecker prefers large hard snags (See Table 29).

Kim Nelson (1989) studied cavity nesting birds within the Oregon coast range and found that most cavity nesting birds within her study were positively associated with numbers of large snags. Also, some species, such as the northern pygmy owl, were associated positively with higher densities of bigleaf maple trees. Neitro (1985) analyzed snag requirements for five west side species of woodpeckers that are found in Douglas-fir dominated temperate coniferous forests. Table 29 summarizes the number of snags necessary to support those five woodpecker species at 40 percent of potential population level (Neitro et. al, 1985). These quantities are used as management direction for snag retention and management in the Matrix LUA (USDI, 1995 p.21). Neitro finds that the five westside woodpeckers require about 122 snags/100 acres or an average of 1.2 snags/ac.

Table 29: Minimum number of snags necessary to support westside woodpecker species at 40 percent of potential population levels (USDI, 1995, per Neitro et al, 1985).

Diameter class (inches dbh)	***Snag Decay Stage***		***Total by diameter class (per 100 acres)***
	Hard 1-2	***Soft 3-5***	
11+		Downy woodpecker (6)	6
15+	Red-breasted sapsucker (18)	Hairy woodpecker (77)	95
17+		Northern flicker (19)	19
25+	Pileated woodpecker (2)		2
Total – all diameter and decay classes			**122**

There are currently approximately 2.4 snags per acre on all BLM stands sampled within the East Fork Nehalem subwatershed (Table 12 in Section 6.1). As an illustration of the uneven distribution of snags across the landscape - when looking specifically at the proposed treatment units, there are approximately 5.4 snags per acre, of which, approximately 1.5 are greater than 20" dbh. Of these, 1 snag per acre is within its earlier stages of decay (more structurally sound). It is expected that a portion of the existing snags within the proposed treatment units have been created by *Phellinus weirii, w*hich commonly results in snags that do not persist long due to decayed root structures. Seventy-eight percent of the lands in the analysis area are privately owned and managed for timber production. About 4,400 acres of private land forests are currently about 40-80 years old which could reasonably be expected to also have about 2 -2.4 snags per acre existing. We expect that most if not all of those acres would be harvested in the next 10 years. Stands younger than 40 years likely have few if any snags

remaining, and any new snags that do develop would be from suppression mortality and be quite small; perhaps 4-7".

6.3.2.1 Environmental Effects Alternative 1: No Action

Under this alternative, no Riparian Reserve density management, commercial thinning, regeneration harvest, *Phellinus weirii* treatments or underplanting would take place at this time. These stands would continue to develop into more uniform and dense forests with decreasing crown development and growth rates. The minor amounts of snags created from suppression mortality would be small (4 to 10" DBH) and persist for only a short time (generally less than 10 years). Also, *Phellinus* root rot pockets would continue to expand providing a continuous supply of short lived, hard snags. Suppression mortality created snags would be of little benefit to woodpecker species that excavate cavities for secondary cavity nesting birds because of their small size, and snags created by *Phellinus* would only provide snag habitat for short periods of time (<10 years). There would be some scattered medium to larger size snags created by insect or weather related damage that could provide habitat for cavity nesting birds that prefer larger snags, such as the northern flicker, but generally most of these snags would not be large enough to accommodate pileated woodpeckers, which require snags a minimum of 25 inches in diameter.

Eventually as mechanical (storm damage, other trees falling, etc.) or disease factors create canopy openings, the understory would respond in a patchy pattern which would create a modicum of structural diversity. A declining trend in the hardwood component can be expected over time as they are out-competed (overtopped) by the conifers, potentially limiting habitat for cavity nesting species that prefer hardwoods (northern pygmy owl). In addition, as trees grow in height in response to competition the trees would become less stable (greater height:diameter ratio) and therefore, more likely to experience windthrow or breakage during winter storms. Breakage from storms could contribute to larger snags (although probably few that are large enough to fully accommodate pileated woodpeckers) as the stands grow, providing a small amount of habitat for cavity nesting birds.

In summary, under the No Action alternative there would be the continued preponderance of developmentally simple forest structure on BLM lands within the analysis area for the foreseeable future. Given that there are currently 5.4 snags per acre within the treatment units and that some density dependent (unit 33-25) as well as density independent mortality would continue, we expect that snag levels would continue to support cavity nesting birds at, at least 40% population levels under the No Action Alternative.

6.3.2.2 Environmental Effects Alternative 2: Proposed Action

<u>Commercial Thinning and Riparian Reserve Density Management Treatments</u>

All proposed thinning and density management treatments would modify cavity nesting bird habitat by reducing snag recruitment through the removal of smaller to medium sized trees from the stands. With the exception of trees in the *Phellinus weirii* pockets, these are the trees more likely to become snags before the larger dominant trees in the stand. However, the few trees expected to succumb to such mortality would be too small in size (8-12 inches) to provide meaningful habitat for cavity nesting species, other than perhaps the minimum required for downy woodpeckers. These smaller snags have less value for wildlife species than the larger material over 15 inches (Rose et. al., 2001). Snag associated species such as chestnut backed chickadees, red breasted nuthatches, brown creepers and hairy woodpeckers have shown selectivity to foraging habitats based on deciduous trees, large diameter conifers, and large diameter heavily decayed snags and logs (Weikel, 1999).

<u>Regeneration Harvest and *Phellinus weirii* Treatments within Commercial Thinning</u>

All proposed regeneration harvest and *Phellinus weirii* treatments within commercial thinning units would modify cavity nesting bird habitat by removing the majority of trees that might otherwise have died and become snags in the future. As within the thinning treatments, all existing snags would be protected to the extent possible.

Protection of the existing large snags discussed above also applies within regeneration harvest treatment areas. It is expected that this design feature would protect the majority of the larger existing snags within the regeneration harvest units. Within *Phellinus weirii* treatment areas snags would be protected by species other than Douglas-fir where possible. If no other trees are available then Douglas-fir would be used.

Conclusion

Although there is an average of 5.4 snags existing currently within treatment units, we expect a portion of these snags would be felled/knocked over due to logging operations, or because they are safety hazards, or that they may fall on their own. Consequently, at the completion of harvest we expect that 4 - 4.5 snags per acre would be remaining (See Section 6.1.2).

There currently are enough snag resources within the proposed treatment units to accommodate cavity nesting bird populations above the 40% potential population level required by the RMP. With design features that would protect most of the existing snags, especially the larger ones, and retain extra green trees specifically for snag recruitment purposes, we expect that the proposed treatments would maintain snags at the completion of harvest at levels that would continue to support species of cavity nesting birds at, at least 40 % population levels (1.2 snags per acre) as required by the RMP.

6.3.2.3 Cumulative Effects: Proposed Action

The proposed action includes the modification of cavity nesting bird habitat on approximately 418 acres by thinning and density management treatments, and by regeneration harvest on approximately 299 acres. However, we expect that all proposed treatment areas would continue to provide habitat for cavity nesting birds at levels prescribed by the RMP (40% potential population levels). Because the threshold for effects for cavity nesting birds is imposed by the RMP, and the proposed project would still provide for meeting the threshold, there would not be direct and indirect effects that would contribute to cumulative effects.

6.3.3 *ISSUE 6: What effect would the proposed timber management treatments have on migratory birds and their habitats?*

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 (MBTA). 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". On April 12, 2010 the Director of the BLM signed a Memorandum of Understanding with the USFWS which outlines a collaborative approach to promote the conservation of migratory bird populations. The portion of the MOU that is most applicable to the East Fork Nehalem Project requires that: "*At the project level, evaluate the effects of the BLM's actions on migratory birds during the NEPA process, if any, and identify where take reasonably attributable to agency actions may have a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. In such situations, BLM will implement approaches lessening such take . . .*"

The East Fork Nehalem project would cut and remove trees, construct, renovate and decommission roads; and conduct site preparation and slash reduction which could result in negative effects to adult or nestling birds that are covered by the MBTA, or result in failed nesting attempts. The act of changing forest structure will affect bird species. Whether it is through changing forest density or converting mid-seral forest to early-seral forest, some species could be negatively affected while others may be positively affected. In order to determine which species to focus on we reviewed the USFWS's 2008 "Birds of Conservation Concern" list for the U.S. portions of the Northern Pacific Forest Bird Conservation Region for species that likely could occur in the East Fork Nehalem

Project and could be affected by the project. The Birds of Conservation Concern 2008 list encompasses three distinct geographic scales including at the National level (United States in its entirety, including island "territories" in the Pacific and Caribbean), at the North American Bird Conservation Initiative (NABCI) Bird Conservation Regions (BCRs), and at the U.S. Fish and Wildlife Service Regions level. The list is primarily derived from assessment scores from three major bird conservation plans: *Partners in Flight North American Landbird Conservation Plan,* the *United States Shorebird Conservation Plan,* and the *North American Waterbird Conservation Plan.*

Four species from the list are known or expected to inhabit the project area during their nesting season and could be affected by the proposed action, they are: the olive sided *(Contopus cooperi)* and willow flycatchers *(Empidonax traillii)*, purple finch *(Haemorhous purpureus)* and the rufous hummingbird *(Selasphorus rufus)*.

Affected Environment

For information on the analysis area (East Fork Nehalem 6th field subwtareshed), See Section 5 – General Setting.

Birds of Conservation Concern habitat within the analysis area

Seventy eight percent of forest land within the analysis area is privately owned and is currently managed for timber production in such a way as to preclude the development of high quality habitat for the species discussed here. The industry's practice of short harvest rotations limits the development of large, tall trees and their use of herbicides after harvest prevents the development of many flowering plants that produce nectar, seeds and fruit that are characteristics of high quality early seral habitat. Federal lands in the area are distributed in a checkerboard fashion and provides mid-seral Douglas-fir habitat, mixed hardwood-conifer habitat as well as small portion of early seral conifer stands. Habitats offered by federal lands consist of nesting and foraging habitat for the species of concern.

MBTA habitat within treatment units

Olive-sided Flycatcher

In the Coast Range, the olive-sided flycatcher builds nests in tall trees in conifer stands, preferring western hemlock and Douglas-fir, with openings nearby such as early seral forest stands, marshes, ponds, etc., over which they forage. They are most abundant in landscapes containing late-seral forests highly fragmented by early-seral habitats – a landscape rich in high contrast edges (Altman and Sallabanks, 2000). Olive-sided flycatchers are conspicuous when singing and fly catching from high perches on snags or tall trees adjacent to openings.

Although the oldest stands within the area are still somewhat younger than those preferred by olive-sided flycatchers for nesting, the East Fork Nehalem project area does contain olive-sided flycatcher habitat. This habitat is located along forest edges containing relatively larger trees particularly along forest gaps such as *Phellinus weirii* areas or previous timber sale boundaries.

Willow Flycatcher

In northwest Oregon's conifer-dominated landscapes the willow flycatcher nests within a few feet of the ground in brushy, early-seral habitats with a high degree of deciduous plant composition, often with willows and alders. Industrial timber lands do provide a great deal of early-seral habitats, however many typically treat recent clearcut units with herbicides and then replant the site exclusively with Douglas-fir seedlings. Under this management scenario, brushy thickets are usually rare if not totally lacking and deciduous plants are discouraged. These stands generally will not have time to develop complex early seral conditions before the site is completely occupied by the monoculture of Douglas-fir seedlings.

Stands within the proposed treatment units currently do not provide habitat for the willow flycatcher with the possible exception of small BLM forest openings that may be located directly adjacent to a private clearcuts.

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 (Vroman D.P.; in Birds of Oregon: A General Reference, 2003).

Purple finches undoubtedly breed in the vicinity of the East Fork Nehalem Project along riparian corridors, at the edges of *Phellinus weirii* areas, along edges of old clearcuts and in other areas of reduced canopy cover. With the exception of the outer edges, the proposed treatment units are probably not currently 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 East Fork Nehalem area. While the private lands near the project area are strongly dominated by early seral habitat, management strategies there keeps competing vegetation suppressed which includes flowering shrubs. Thus, while there is a large quantity of early seral habitat, much of it may not be suitable for rufous hummingbirds. In general, the proposed units themselves do not currently contain hummingbird habitat in that there is little foraging opportunity. Possible exceptions would include along an edge of a proposed harvest unit, property line or near a current opening within the treatment unit where suitable habitat exists.

6.3.3.1 Environmental Effects Alternative 1: No Action

Also see the Environmental Effects section of the Forest Vegetation analysis of the No Action alternative (section 6.1.2.1) for a description of the expected impacts to the forest vegetation component of wildlife habitat.

Under the “No Action” alternative the current habitat conditions for the birds of conservation concern would be unaffected now and in the near future. The stands would continue to grow at a declining rate and become less stable over time. Eventually disturbances such as windthrow, root disease, insect attack, or possibly fire will influence the character of the stands and introduce more structural diversity into the ecosystem thus affecting the suite of animals that would use these stands.

The current relatively dense single-story, closed-canopy stands are non-habitat for the willow flycatcher, poor habitat for the rufous hummingbird, marginal habitat for the purple finch and possibly also the olive-sided flycatcher. It is likely these habitat conditions would continue for the foreseeable future until such time that the stands move into late-successional forest stages with more complex structure, more open overstory, and enlarged canopy gaps that provide patches of early seral habiat. Disturbances that convert forests to early seral conditions while maintaining legacy trees, such as fire or windthrow, would greatly improve habitat for all of these species.

6.3.3.2 Environmental Effects Alternative 2: Proposed Action

Olive-sided Flycatcher

There is a small possibility that the proposed project could affect individual flycatcher nests and thus result in the loss of breeding potential for the season of the disturbance. This potential impact is however, considered to be rather remote based on the fact that even the oldest stands within the area of the East Fork Nehalem project are still somewhat younger and more structurally closed canopied and simple than those preferred by olive-sided flycatchers.

The proposed treatments would mostly benefit olive-sided flycatcher habitat by opening up forest canopies, especially near forest gaps (root rot pockets) and adjacent to regeneration harvest areas. The reserved tree aggregations in the regeneration harvest units coupled with scattered large trees over complex early seral habitat would create good quality habitat in the near term (less than 30 years) until such time that the planted forest begins to approach mid-seral conditions and begins to close again. In the long-term (beyond 30+ years), habitat for olive-sided flycatchers would continue to be available as forests move into late-successional condition near streams and adjacent to root rot patches.

Willow Flycatcher

The forest stands within the proposed treatment units currently do not provide habitat for the willow flycatcher, therefore the proposed treatments have little likelihood of causing direct impact to individuals.

The proposed regeneration harvests may result in the creation of habitat suitable for willow flycatchers because the post-harvest treatments would allow for complex early seral habitat to develop, which includes dense shrubby areas containing deciduous trees species. As their name suggests, willow flycatchers are attracted to willow thickets which are much more common in riparian areas than in upland forest areas. Consequently, while habitat for willow flycatchers may be created by the proposed action, the highest quality habitat, that containing willows, would likely not develop as a result of the proposed action. As the planted trees grow and begin to dominate the regeneration harvest areas, habitat for willow flycatchers would diminish and disappear. This may take approximately 15 years after harvest.

Purple Finch

There is a small possibility that the proposed project could affect individual purple finch nests and thus result in the loss of breeding potential for the season of the disturbance. In western Oregon, purple finches prefer open to semi-open conifer forest habitat. The proposed thinning would generally benefit the purple finch by increasing or improving breeding habitat through the opening of the canopy and treatment of *Phellinus weirii* areas by removing the majority of trees in infected patches thus creating small, early seral gaps/edges. The regeneration harvest may reduce the amount of nesting habitat, although the effect may be small since the units proposed for treatment are not now high quality nesting habitat. The post-harvest regeneration units would contain high quality foraging habitat characterized by seed, nut and fruit producing plants. This improved foraging habitat would remain for about 15 years until conifers close the canopy on the site.

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 along an edge of a proposed harvest unit, property line or near a current opening within the treatment unit where suitable habitat exists. On the other hand, the expected development of the understory brush layer within thinning treatment units, especially in the gaps created to treat *Phellinus weirii*, as well as the complex early seral habitat created by the regeneration harvest would appreciably improve hummingbird foraging and nesting habitat within the area for the next 15 or more years.

Conclusion

Considering that there is a low probability for negative impacts associated with a small potential for loss of breeding potential for a few individual birds, but a high potential for improving habitat for all of the species discussed here, there is little possibility that the proposed action would have measureable negative effect on populations of these migratory bird species.

6.3.3.3 Cumulative Effects: Proposed Action

Because the proposed action would not likely have any negative effects to population of migratory birds of concern, there would not be any cumulative effects.

6.4 Botany and Invasive Plants Issues - (Includes BLM Special Status Species and Survey and Manage Species)

Affected Environment

Invasive plants are non-native plant species whose introduction causes economic or environmental harm or harm to human health. Noxious weeds are a subset of invasive plants with formal federal or state designations. More than 100 invasive and 25 listed noxious weed species have been documented on lands administered by the Salem District BLM. Invasive plant species' have a wide variety of distribution patterns, spread strategies, and responses to integrated pest management strategies. Invasive species which currently do not occur within the Salem District, but which have the potential to invade are considered "Early Detection Rapid Response" species (EDRR) and there are over a hundred known species that fit this category. Those that would be of particular concern in the East Fork Nehalem subwatershed would be False Brome (*Brachypodium sylvaticum),* Garlic Mustard (*Alliaria petiolata*), Knotweed (*Polygonum spp.*), Spurge Laurel (*Daphne laureola*), and *Clematis vitalba*.

Management activities, particularly those which are ground disturbing like heavy equipment operation can facilitate the spread of invasive plants. Prevention practices are normally included in management actions to help limit the introduction and spread of invasive plants.

Existing vegetation within the East Fork Nehalem project area consists of dominant and co-dominant conifers with scattered pockets of hardwood tree overstory, an under-story of common shrubs and scattered populations of grasses and forbs. A comprehensive plant species list from the proposed project area is located at the Tillamook Resource Area field office located in Tillamook, Oregon at 4610 3rd St. Varieties of habitats are represented throughout the project area (substrates, rock, features, elevations, slopes, aspects, water, and topography). Examples of forest management activities associated with the East Fork Nehalem project areas that could cause soil disturbance and influence the spread of invasive/non-native plant species are: commercial density management thinning, regeneration harvest, new road construction, road decommissioning, road maintenance, and culvert replacements. 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, and wind. Many past and present management activities tend to open dense forest settings 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 proposed project area. Because these species are present in and adjacent to the proposed project area, newly formed seed is readily available and/or an established seed bank is present.

Botanical surveys for invasive, non-native plant species within the East Fork Nehalem project area began in May 2010 and concluded in August 2012. Completed surveys indicate that where mature native plant communities were established, non-native species were either non-existent or present at low levels. Non-native invasive 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*), St. Johns-wort (*Hypericum perforatum*), Oxeye daisy (*Leucanthemum vulgare*), buttercup *(Ranunculus repens*), and horsetail (*Equisetum telmateia*). 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).

6.4.1 *ISSUE 7: What effect would the proposed action including road construction, maintenance, harvesting and hauling have on the potential spread or new infestation of noxious and/or invasive weed species?*

6.4.1.1 Environmental Effects Alternative 1: No Action

Surveys completed show that most invasive/non-native species found were located along existing roadways and in small open areas where there was a break in the canopy allowing more light exposure. For all invasive weed species identified no appreciable increase in populations would be expected to occur if the No Action alternative is chosen. Plant communities within the proposed project area would continue to be dependent on ecological processes currently in place. Based on the lack of shade tolerance 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 private lands adjacent to public lands, an increase of non-native invasive plant species may invade the areas that have soil disturbance and are exposed to higher intensities of light.

6.4.1.2 Environmental Effects Alternative 2: Proposed Action

Most common invasive non-native plant species are not shade tolerant and would not persist in a forest setting as they compete for light when tree canopies close and light to the understory is reduced. So, based on what we know about invasive plant distribution, dispersal mechanisms and their ability to establish in newly disturbed sites we can expect new and old populations of these common species to fluctuate over time within the proposed analysis area based on these factors as described. However, there are some EDRR species (i.e. false brome and garlic mustard) that are shade tolerant and have allelopathic properties (have the capacity to suppress the growth of neighboring plants) that allow them to become dominant in the understory and out-compete native flora. This would essentially create a monoculture in the understory and significantly reduce the plant diversity affecting soil structure and wildlife habitat.

Most of the invasive non-native weed species found during surveys were located along existing roadways and in small open areas where there was a break in the canopy allowing more light exposure. All the invasive/non-native plant species identified during surveys are intolerant of shade and are negatively affected by competition for light. We can expect initial increase in population size and new establishment due to timber harvest activities that reduce the overstory canopy cover, especially in regeneration harvest areas, but should be limited to areas where native vegetation has been removed and soil exposed, and would be expected to decrease as native species recover and canopy closure occurs. Proposed density management thinning areas may be slightly slower to recover until released and underplanted trees, as well as the shrub layer grow tall enough to exclude the shade intolerant invasive/non-native plants. The shade tolerant invasive non/native plant species that are most concerning, such as false brome and garlic mustard are not now present in the project area and design features such as washing harvesting equipment prior to entering the project area, and monitoring for three years after project completion would minimize the potential for these species to become established in the project area. We expect that if new populations were to be introduced they would be detectable within three years at which time appropriate eradication measures would be undertaken.

Another potential source of introduction of invasive species comes from placement of gravel during road renovation or construction. Gravel sources can be troublesome because trucks and equipment used for gravel production and haul visit many sites throughout western Oregon, both on public and private lands, where they may encounter and transport invasive species. Also, stored stockpiles of rock can become infested with weeds

over time, especially by wind borne seeds. Currently there are no regulations requiring rock pits to be weed free. BLM's Tillamook RA is a partner in several Cooperative Weed Management Areas (CWMA's) that are focused on the north Oregon coast and the Willamette valley corridor west of Portland Oregon. These CWMA's are working with DOGAMI (Department of Geology and Mineral Industries) and ODA (Oregon Department of Agriculture) to explore the possibility of regulating gravel sources to mitigate the spread of invasive non-native plant species. Because this discussion is in its infancy it is unlikely that regulations would be in place prior to completing the analysis for this EA, if they are enacted at all. For these reasons this project includes a design feature that requires the use of rock from sources that the BLM has approved by inspecting for the presence of EDRR weeds. The BLM would evaluate all of the potential sources that are within a reasonable distance and inform the timber sale purchaser of those pits that are acceptable to use. If the purchaser proposes the use of uninspected pits the BLM would inspect prior to use. This design feature would be a first step in minimizing the introduction and spread of EDRR weeds. Post treatment monitoring is still the strongest defense available to identify and treat new introductions of invasive non-native plant species, so it would also occur for three years after project implementation.

Implementing these Project Design Features would minimize the potential risk for introduction and spread of EDRR weeds to a level where it is unlikely that adverse effects would occur.

6.4.1.3 Cumulative Effects: Proposed Action

The analysis area for cumulative affects to noxious/non-native invasive plant species is the East Fork Nehalem River 6th field watershed. A combination of Federal, State and private timber lands are found within the proposed project area. 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 regeneration harvest, commercial and pre-commercial density management thinning, young stand maintenance, new road construction, road decommissioning, road maintenance, culvert replacements, helicopter landing zones, power line rights-of-way and motorcycle trails. Many past and present management activities tend to open dense forest settings and disturb soils therefore provide opportunities for widespread weed infestations to occur. Private timber management, illegal garbage dumping, OHV use and other recreation activities that occur independent of the East Fork Nehalem project could potentially bring in new invasive non-native (EDRR) species that would be considered high priority to control especially if they were to appear on BLM managed land or road accesses. Because these other activities that could introduce new infestations of invasive species may occur without the implementation of the East Fork Nehalem Project and because it is unlikely that the East Fork Nehalem Project would introduce EDRR species, implementation of the proposed action would not result in cumulative effects in the analysis area.

6.5 Soils Issues

Analysis Area

For the purposes of this analysis, determination of direct and indirect effects on soil quality standards will be applied to the individual harvest units proposed for treatment within the East Fork Nehalem planning area due to the localized impact of timber harvesting activities. Cumulative effect analysis will utilize the entirety of the 20,608 acre East Fork Nehalem planning boundary.

Analysis Timeframe

The temporal scale is dependent on the specific issue being addressed, with no one scale being appropriate for all issues. The analysis may need to evaluate the effects of proposed management over all seasons for several days, years or decades. The temporal scales can be defined as long and short-term. For this evaluation, short-term effects are those that occur approximately within the first 10 years following proposed management activities. Long-term effects are those that occur approximately after 10 years or more following proposed management activities.

Affected Environment

Geology and Soils

Geologically, the East Fork Nehalem planning area sits almost entirely on the Scappoose formation with some geologic influence in the eastern portion of the planning area of the Columbia River Basalt Group. Soils were formed primarily from the parent material of tuffaceous and arkosic marine sedimentary rocks of sandstone and siltstone deposited during the middle Miocene to upper Eocene era (approximately 20 to 35 million years ago) when the area was an inner to mid continental shelf prior to continental uplift. The planning area encompasses several tributaries that flow directly into the Nehalem River, primarily Kenusky Creek and Jim George Creek. Drainages are primarily steeply sided with many slopes approaching or exceeding 80%, however, there are several streams within the planning area with very low gradient. Ridge tops in the planning area are generally broad with deep to very deep, well drained, highly productive soils.

Three criteria were used to determine and assess the existing conditions for soil resources within the planning area:

- Soils and Productivity
- BLM and Salem District's Timber Production Capability Class
- Existing site conditions and past activities.

Soils and Productivity

The most productive part of the soil occurs near the surface at the contact between the forest litter and the mineral soil. This layer is frequently only a few inches thick but it contains most of the soil nitrogen, potassium, additional nutrients, and mycorrhizae that must be present for a site to be productive.

Soils in the East Fork Nehalem planning area are mostly comprised of deep to very deep, well drained, fine-silty to fine-loamy mixed, mesic silt loams. The most prevalent soil series within the planning units are Maygar silt loams and Tolany loams that comprise most of the ridgetop soils, and Scapponia-Braun silt loams and Braun-Scapponia silt loams that are the predominant soils on slopes within the planning units. These soils are productive for the growth of timber, with site indexes ranging from 112 in Tolany loam soils to 130 in Scapponia-Braun silt loams. Site indexes for Douglas-fir in the Coast Range of Oregon can range from site indexes of 50 in low quality growing sites to 160 in sites with optimal growing conditions. In general, these soils have a low resistance to compaction, pose a severe rutting hazard as well as pose a severe erosion hazard from roads and trails. They also have a low potential for fire damage and a high capacity for restoration potential due to temperate climate, moist winters and high vegetative production.

BLM and Salem District Timber Production Capability Classification (TPCC)

The Timber Production Capability Classification system (TPCC) is defined by the BLM Standard Operational Practices for Upland Soil Productivity in Western Oregon as a system "designed to identify land capable of supporting and producing commercial forests on a sustained yield basis without degradation of their productive capacity. Commercial forest land is defined as being capable of yielding at least 20 cubic feet of wood per acre per year of commercial tree species. Factors such as soil depth, available moisture, percent slope, aspect, drainage, and slope stability are evaluated to determine the suitability of timber management activity on a particular site. This would include sites capable of sustaining standard timber harvest practices, special practices, or limitations to prevent degradation, and sites too fragile to tolerate any timber management without long-term loss of productivity. Legislative requirements (O&C Act, 1937) and BLM policy specify that timber harvests will be planned and carried out only on lands which can be managed without loss of the potential productivity of the site".

Proposed units were cross referenced with the existing TPCC data GIS layer, and all highly fragile and non-suitable soil was removed from the project. In addition, 274 acres of land initially proposed for treatment that was

rated as suitable woodland has subsequently been determined to be non-suitable woodland, mainly due to fragile conditions associated with gradient concerns of having streamside slopes greater than 80%. Approximately 115 of those acres would have been included within established no-harvest stream buffers. Of the remaining units analyzed for the project, most TPCC limitations were reforestation concerns due to disease and light, and all concerns and recommended practices of fragile and restricted TPCC soils will be applied via silvicultural prescriptions and treatments.

Existing Site Conditions and Past Activities

The East Fork Nehalem planning area is approximately 20,608 acres in size with 4,572 acres of it being managed by the BLM. Virtually the entirety of the land in the planning area has been in some form of timber production and timber harvest throughout most of the last century. Of the units that are being analyzed in this project, available historical BLM timber sale data show two recent timber management projects to have taken place; however, historical evidence shows that most of these units were previously logged and/or burned at one time or another, and that various site preparation activities occurred at some level on the landscape within the units.

Soil resource existing conditions were determined using historical records, The Columbia County Soil Survey, aerial photography, GIS data, LiDAR data and field inspection. In the fall of 2014 and winter of 2015 the proposed units were field checked and data was recorded to estimate the degree of soil disturbance from previous forest management activities. Onsite assessment followed guidelines from the US Forest Services Soil Disturbance Monitoring Protocol of 2009, which included random shovel tests along transects to determine soil characteristics and compaction levels throughout the proposed activity areas. Transects were also supplemented by visual observation during the walk-through. While there was visual evidence of historic skid trails within the area, almost all sampled sites with historic visual impact were not in a detrimental state in terms of compaction, and bulk densities within the top 6-8 inches of the soils profiles appeared similar to the surrounding intact forest floor via field observation, and were shown primarily to be in a recovering state. Assessing the amount of disturbance to soils that would still be considered in a detrimental state from previous forest management activities is difficult to determine due to the high potential for soil restoration in much of the Oregon Coast Range, but it is estimated that adversely impacted soils are found primarily on old roads, skid trails and railroad grades, are small and localized in nature, are in a state of recovery and occupy small percentage of the landscape. Other sampled areas that had no visual signs of impact seemed to be in a natural state; and organic matter content also seemed intact throughout the proposed activity areas.

6.5.1 *ISSUE 8: What effect would the proposed action, which includes timber harvest and road building, have on soil erosion and soil productivity?*

6.5.1.1 Environmental Effects Alternative 1: No Action

No new management-induced detrimental direct and indirect impacts would occur in the East Fork Nehalem planning area. No new road construction or timber harvest would occur. No management induced impacts to soil productivity would occur, no additional compaction would occur and soil erosion would occur naturally in areas where natural disturbances would expose soils to weathering elements. Soils impacted from previous forest management activities would continue to recover.

6.5.1.2 Environmental Effects Alternative 2: Proposed Action

Erosion is a natural process that occurs throughout the landscape. Timber harvest and road building activities create conditions such as concentrated overland run-off from soil compaction and vegetation removal, altering the ground water regime through timber removal, directing water flow via road construction and the associated ditch lines and creating areas of displaced soil by general operational necessity. All road building projects and timber harvest activities will implement necessary BMP's to minimize/remediate erosion rates as well as limit sediment delivery to streams.

Timber Harvest

The proposed action identifies 717 acres for timber management activities on BLM managed land and two acres outside of harvest units (road construction) within the East Fork Nehalem subwatershed analysis area; of which, 558 acres would be ground based yarded and 159 acres skyline cable yarded. The most significant ground disturbing activities that occurs while conducting forest management actions takes place in cable yarding corridors, skid roads and constructed roads and landings. While soil disturbance will occur at some level throughout the harvest units, project design features are designed to limit the level and amount of disturbance within units. For the purpose of analysis, we assume that all detrimental soil impact within harvest units not calculated for detrimental impact in skid roads and landings to be small and localized in nature and will not substantially add to the amount of detrimental soil impact calculated in approved skid roads and landings.

The units proposed for ground based logging would occur generally on slopes of less than 35%. Although there are some areas within the proposed ground harvest units that have slopes exceeding 35%, logging equipment would not be allowed to operate on that ground and all timber being proposed for harvest must be directionally felled and reached from less steep slopes. Ground based yarding systems cause a higher degree of soil impact than skyline systems due to utilizing ground based machinery to forward logs to landing areas as well as the possible use of ground based equipment to harvest timber. The areas most impacted by ground based logging are generally located along designated skid roads where logs are transported to landing areas, as well as the landing areas themselves, where there will most likely be detrimental levels of top soil and organic matter displacement and soil compaction. A properly designed skid trail system with a minimum of 150 foot spacing between skid trails and restricting equipment to operating on a single lane generally has an area extent of ground disturbance of approximately 5-8% of a harvest unit dependent upon size and shape of the unit. Several of the larger broad ridge ground harvest units analyzed are elliptical in shape, with a primary operational road generally splitting the unit along the major axis, which would require a greater number of trails of much shorter skid distance, laid out in a parallel fashion and with less volume of timber transported across them to landings. Utilizing the length of planned forwarding trails designed by the Timber Layout logging plan and assuming skid trail widths to be 12 feet in width, it is estimated that 27 acres of soils within the ground based harvest units would be comprised of detrimentally impacted soils within skid trails (4.8%).

Skyline yarding has a lesser degree of impact to the soil resource than does ground-based yarding. Most detrimental impacts to soils in skyline yarding units occur in landings and in discontinuous strips in approved yarding corridors. Utilizing the length of planned cable yarding corridors designed by the Timber Layout logging plan and assuming the area of soil disturbed by yarding corridors to be 4 feet in width, it is estimated that approximately 5 acres of soils within the skyline harvest units would be comprised of detrimentally impacted yarding corridors (less than 1%).

Skyline timber harvest and haul during seasons other than the dry season that are proposed for units in section 17, 21, 31, and 33 would most likely increase the level of soil compaction of impacted areas than operating in a dry season environment due to operating in wetter soil conditions, as well as the increased probability of soil displacement from rainfall, however; the area of impacted surfaces would remain very similar to what would occur when conducting dry season only timber harvests on these units , and project design features of minimum stream buffer distances of 60 feet on intermittent streams and 100 feet on perennial streams, and requirements that operators leave skyline roads in an erosion resistant state when finished operating on them would protect streams from receiving increased sediment delivery.

It is estimated that 31 constructed landings (newly disturbed ground) and many landings on existing roads (approximately 178) will be needed to accomplish the proposed action. Soils within newly constructed landing areas are detrimentally impacted by compaction and displacement by forest management activities such as landing construction, log transport to landings, and log processing and loading at landings. Project design features limit landing sizes to the minimum area necessary to safely conduct operations, and a 100 foot diameter was assumed to be the area of impact that constructed landings have. It is estimated that the area of detrimental impact by landing construction to be approximately 6 acres (less than 1 % of the unit). Roadside landing impacts are not

calculated to have impacts to soils within the units due to most ground impacts occurring within the Right-of-way clearing limits of existing, renovated, improved or constructed roads which are already calculated as detrimentally disturbed ground within the proposed units.

All proposed constructed landings and all approved ground harvest skid trails within regeneration harvest units are required to be de-compacted and reseeded with native nitrogen-fixing vegetation to reestablish hydrologic function and more quickly remediate ground impact from forest management activities, but overall recovery of de-compacted and reseeded soils is expected to take decades.

Road Construction, Renovation, Maintenance and Decommisioning

2.9 miles of new road construction is planned under the proposed action, with 2.7 miles being naturally surfaced roads that are to be fully decommissioned after use, and 0.2 miles being rocked to facilitate all season access of EA unit 21-3up, and would be decommissioned after use. The new construction would result in approximately 10 acres of additional highly disturbed soils within the planning area.

All newly constructed roads are to be fully decommissioned after use. Road decommissioning would restore some of the hydrologic function as well put the roads in a more erosion resistance state, but full recovery of these road surfaces are expected to take decades.

Minimal additional soil impacts would occur from the proposed road maintenance and renovation activities such as blading, drainage improvements, and surfacing on existing dedicated roads.

Mechanized Slash Treatment

Activity-fuel treatments that may affect soils under the action alternative include the piling of fuels into slash piles via mechanical methods, which will increase the amount of machine traffic within the stand and the probability of increased levels of soil compaction and displacement. To alleviate any additional ground disturbance from mechanized slash fuel treatments, all machine piling equipment are required to remain on existing skid trails created from the timber sale activity and pile what slash can be reached from there. All other fuel treatments within units that are not reachable from existing skid trails by mechanized equipment will be treated via hand piling. Utilizing the design feature of limiting mechanized piling equipment to operate on existing skid trails only will ensure that the proposed fuel treatments will not cause any additional detrimental ground impact from what was generated during the proposed timber sale activities.

6.5.2 *ISSUE 9: What effect would the proposed action have on soil organic matter?*

6.5.2.1 Environmental Effects Alternative 1: No Action

No new management-induced detrimental direct and indirect impacts would occur to soil organic matter on BLM lands in the East Fork Nehalem planning area. No harvest would occur that would remove organic material from the assessment areas. No slash piling or burning would occur. Natural nutrient cycling would continue to occur as trees grow, die and decay. Atmospheric carbon would continue to be stored as the forest stands continue to increase in volume, although at a reduced rate on those lands that are overstocked and growth is slowing.

6.5.2.2 Environmental Effects Alternative 2: Proposed Action

Organic Matter and Nutrient Removal

299 acres are being evaluated for regeneration harvests where most of the tree boles would be removed from the site. Remaining within the stand would be 16-25 standing trees per acre and the residual tops, limbs and breakage from harvest activities, as well as residual coarse woody debris that was within the stand prior to harvest operations until fuel reduction activities occur. Although technically not a whole tree harvest, the actions of

removing most of the standing timber within a stand combined with piling and burning much of the remaining logging slash within a few years after the harvest will remove much of the coarse wood nutrients stored in the above ground tree from the site. The concern is what effect will the removal of nutrients stored within the boles of trees removed from the site during harvest operations and the woody biomass of fuel treatments that are piled and burned have on site productivity in the form of nutrient cycling, soil chemistry and the overall nutrient budget on the newly regenerated forest stand.

Studies conducted by Presscott and Laiho (2002) in rocky mountain coniferous forests and Busse (1994) in coniferous forests of central Oregon found that the role of coarse woody debris in nutrient cycling in forests to be relatively small compared to the overall total pool of ecosystem nitrogen and that net benefit to all nutrients in soils from CWD is small due to "exceedingly low nutrient content of CWD" Busse et al (2014). Studies at the Fall River Long-Term Soil Productivity Trial in western Washington State concluded that the growth of Douglas-fir trees "were not significantly affected by the removal of residual biomass, in the form of tree branches and tops, at rates that exceeded the removal amounts that might be implemented operationally" (S.M. Holub et al).

Conversely, studies conducted in upland forests by Nave et al (2010) found that carbon losses from timber harvest on Inceptisol soils, like those in the East Fork Nehalem area, were temporary in nature, with carbon stocks returning to preharvest levels within 6-20 years after harvest. Studies by Kraemer and Hermann (1979) on the long term effects of broadcast burning on physical and chemical properties on soils in the western Cascades of Oregon and Washington after clearcutting found that there were no statistically significant differences in soil chemical or physical properties 25 years after a broadcast burning of the logging slash generated during harvest compared to an unburned control area, suggesting that the removal of nutrients via the burning of logging slash to be temporary in nature.

6.5.2.3 Cumulative Effects: Proposed Action – All Issue Questions

<u>Timber harvest and slash piling soil compaction</u>

Most of the long-term, cumulative soil disturbance would occur as the result of building new roads (approximately 10 acres) and landing construction. Nearly all of the newly constructed roads (93%), all constructed landings, and all approved skid roads in regeneration harvest units will be de-compacted after use. Road, landing and skid trail de-compaction following timber harvest would reduce impacted soils bulk densities, improve moisture infiltration, and increase air spaces in the soil; however, a portion of the soil function and soil productivity would be adversely impacted for several decades.

The effect of compaction on forest stand site productivity is complicated and difficult to measure effectively. Tree-growth studies have shown short-term responses to the residual/regenerating forest stand ranging from negative, to indeterminate, to positive (Ares et al. 2005, Froehlich et al. 1986, Gomez et al. 2002, Miller et al. 2001, Parker et al. 2007, Ponder et al. 2012). The net response of forests to soil compaction depends on (1) the degree of compaction, as determined by a variety of soil properties and machinery specifications; (2) the areal extent of compaction; (3) soil texture—e.g., compaction may improve soil water availability and vegetation growth in sandy soils, and (4) soil resilience, or the time required for recovery.

Currently, approximately 27 acres (3.5%) of the soils within the total proposed harvest area are highly disturbed soils, primarily existing roads. It is estimated that another 22 acres of detrimental soil disturbance will result from implementation of the proposed action cumulatively adding another 3% of highly disturbed soils within the planning units.

For the purpose of cumulative effects analysis of detrimental ground impact within the watershed boundary, the following estimations and assumptions will be used.

Utilizing the BLM's GTRN layer, it is estimated that there are 183 miles of road (5.68 miles of road per square mile of land) within the watershed. Utilizing a 30 foot wide impact area for all roads, it is estimated that there are

approximately 659 acres (3.2% of watershed) of soils within the watershed that are detrimentally impacted by roads.

All land ownership within the watershed outside of the BLM managed property is industrial forest land in various forest age classes. LiDAR image analysis was used to estimate stand ages in private forests via feature height generalization and harvest method was estimated using LiDAR slope class generalization. It is assumed that all detrimental soil impacts outside of roads in private forest stands older than 30 years old are in or working towards a state of recovery, and that detrimental soil impacts on industrial forests within stands aged less than 30 years old to be 20% on ground harvest units (slopes less than 35%) and 8% in skyline harvested units. It is estimated that 3,890 acres of ground yarding and 2,759 acres of skyline yarding were conducted on industrial forests in the East Fork Nehalem Watershed within the last 30 years, creating an estimated 778 acres of highly disturbed soils within ground harvest units and 221 acres of highly disturbed soils in skyline yarding units.

Utilizing the above estimations and assumptions, calculations of highly disturbed and detrimentally impacted soils currently within the watershed total approximately 1,658 acres (8.04% of the watershed). The estimated addition of 22 acres of detrimentally disturbed soils from the proposed action would cumulatively increase detrimental ground disturbance within the East Fork Nehalem Watershed by approximately .11%, from 8.04% to 8.15% of the watershed.

Organic Matter and Nutrient Removal

Analyzing for a cumulative effect in regards to nutrient removals from timber harvest within the East Fork Nehalem planning area is impossible to determine at this time. It is assumed that private timberland within the planning area will continue to be managed for timber production, and will be managed as single aged stands on a short rotational basis; however, any immediate nutrient deficiencies on private land would most likely be augmented with the addition of nutrients through fertilization. BLM managed forests would continue to be managed on longer rotations than private forests in the planning area, with much of the forested stands being evaluated for regeneration type harvests in GFMA land use areas.

Also, long term studies on the effects of nutrient removals due to timber harvest have existed for many years, but a thorough understanding of long term cumulative effects will take several stand rotations which could take several more decades. Current studies show that there is an initial loss in nutrient capital immediately following a timber harvest, but that nutrient levels in soils tend to return to pre-harvest levels within a few decades. The long term cumulative effect of nutrient removals on forest growth continues to be an ongoing study, but most results indicate that growth loss due to nutrient removal from intensive forestry operations to be very small (Ares et al. 2007), and that whole tree removal impacts to soil carbon and nitrogen levels diminish over time (Johnson et al. 2001, Jones Et al. 2008)

7. COMPLIANCE WITH THE AQUATIC CONSERVATION STRATEGY

Based on the analysis described in the previous sections of the EA, Tillamook Resource Area staff has determined that the Proposed Action complies with the ACS at the 5th field watershed (the Headwaters Nehalem River 5th field watershed) and on the project (site) scales by seeking to maintain and enhance the processes that promote and maintain dynamic aquatic ecosystems. The project complies with the four components of the Aquatic Conservation Strategy, as follows:

- **ACS Component 1 - Riparian Reserves:** The Proposed Action would comply with Component 1 by incorporating Riparian Reserves and their associated management guidelines to "protect the health of the aquatic system and its dependent species" and provide dispersal corridors for a variety of species (USDI - Bureau of Land Management 1995). No-harvest buffers and areas outside the boundaries of proposed timber harvest units would maintain their existing stock of trees and serve as sources for large wood recruitment to streams.

- **ACS Component 2 - Key Watershed:** The East Fork Nehalem Timber Management Project is within the East Fork Nehalem 6th field subwatershed which is not a Key Watershed (ROD/RMP p. 7), therefore this component of the ACS does not apply.

- **ACS Component 3 - Watershed Analysis:** The project would comply with Component 3 by incorporating the following recommendations from the East Fork Nehalem Watershed Analysis (pp. 53-56):

    - Identify road-related sediment problems, such as old railroad grades with inadequate or failing water crossing structures and roads with failing sidecast. Evaluate the potential for sediment delivery from these sources to determine whether it is appropriate to fix the problems.
    - To increase the amount and size of large woody debris in stream channels, floodplains, and riparian areas, the highest priority areas for enhancement projects are those streamside areas that are dominated by hardwoods or overstocked conifer stands that would benefit from thinning or underplanting.
    - When logging inside Riparian Reserves, leave a no-cut vegetation buffer along all intermittent and perennial stream channels, lakes, ponds, and wetlands. The width of this buffer should be not less than 50 feet on intermittent streams and 100 feet on perennial streams and other waterbodies and wetlands, and should include stream-adjacent slopes with a high potential for landsliding. The purpose of this is to protect the streams and riparian zones from any direct or indirect disturbance from logging activities, and to ensure that existing shading is not reduced.
    - Thin well-stocked and over-stocked mid-aged conifer stands in Riparian Reserves to encourage remaining conifers to attain larger sizes in a shorter amount of time than would occur through the natural "self-thinning" process. Variable-density thinnings could also be used to enhance structural complexity of relatively dense conifer stands.
    - Maximize the current and future benefits derived from Riparian Reserves, LSRs and administratively withdrawn lands for cavity dwellers and other species dependent upon Late-seral stage habitat features. Evaluate LSR stands under 80 years old and Riparian Reserve acres and consider the application of silvicultural prescriptions to benefit the development of late-seral stage habitat. Potentially beneficial treatments include thinning to encourage rapid growth and enhance the development of late seral stage habitat, creating snags (eventual down woody debris), and underplanting with long lived coniferous species in areas where they are largely absent.
    - Black cottonwood, a native, rapidly growing tree with the potential of getting very large is commonly used by a wide range of wildlife species including cavity nesters. Take advantage of opportunities to plant cottonwoods in suitable riparian areas, especially those in young plantations, as a method of increasing biodiversity, providing rapid shade, and providing future large trees and CWD.

- When implementing silvicultural prescriptions in Riparian Reserves, utilize logging systems and site preparation methods that would minimize site disturbance, and maintain a "no-cut buffer" appropriate to site specific conditions along stream channels.
- Clean heavy equipment that will be used in Riparian Reserves and LSR's, and that will conduct soil disturbing activities, of soil and vegetation from outside sources.

- **ACS Component 4 - Watershed Restoration:** The project would comply with Component 4 by maintaining at least the existing extent of overhead, thermal cover, streambank stability and terrestrial detritus inputs to streams. Thinning in the Riparian Reserves outside of No-Harvest buffers would speed the development of larger trees that could be accessible to streams which is an important ecological process in the Upper Nehalem watershed generally and the East Fork Nehalem subwatershed specifically. This thinning would also improve stand structural diversity sooner which would directly benefit riparian associated species and provide for improved dispersal corridors for a variety of terrestrial species. Re-establishing a species-diverse understory should improve secondary stream shading, result in more diverse allochthonous inputs to streams and thus support macroinvertebrate and other stream dependent community diversity as well as provide a seed source for shade tolerant tree species that can contribute to instream wood over time. The combination of thinned and un-thinned areas in Riparian Reserves would promote plant and animal species diversity, enhancing both terrestrial and aquatic habitat complexity in the short- and long- terms. Thinning coupled with underplanting is expected to result in long-term restoration of large conifers and multi-story canopies. No-harvest buffers and the design of timber harvest unit boundaries would retain most of the current potential for large wood recruitment that could contribute to instream habitat complexity in the long-term.

Tillamook Resource Area staffs have reviewed this project relative to the ACS objectives at the project or site scale with the following results:

The No Action alternative would not retard or prevent the attainment of any of the nine ACS objectives because this alternative would maintain current conditions. The No Action alternative would also not proactively enhance or facilitate more timely achievements of ACS objectives. The Proposed Action would not retard or prevent the attainment of any of the nine ACS objectives for the following reasons.

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.

No Action: The No Action alternative would maintain the development of the existing vegetation, associated stand structure, and instream habitat at its present (slow) 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. Density management with variable spacing would result in forest stands that exhibit attributes typically associated with stands of a more advanced age and stand structural development (larger overstory trees, a more complex developed understory, development of a shade tolerant mid-story and an increase in size and quality of potential snags and down logs). This would occur sooner than under the No Action alternative. Thinning treatments in Riparian Reserves would increase the growth of residual trees and reduce the time for those trees to become large enough to provide a future source of high quality large woody debris to stream channels. Reserving of all trees cut for operational purposes would immediately increase the amount of CWD, both snags and down logs, which would benefit both terrestrial and aquatic species. The Proposed Action would thus be expected to meet the objectives of ACSO 1.

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

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

Proposed Action: The Proposed action would maintain terrestrial forest structure in the subwatershed within the range of natural variability both in the short term (at the time of harvest and other treatments) by maintaining at least 50% canopy closure, protecting existing large snags and down wood, and the long term (50+ years out when forest structure would begin to show many of the hallmarks of late-successional forest (large overstory trees, multilayered canopy, and decadence features such as large snags, down wood and crown structures). Riparian zones would be maintained by incorporating no-harvest buffers wide enough to include over 90% of the in-stream large wood generating potential and restored over time as understory forest features develop uphill of the buffered zones. Water quality would be maintained both at the time of treatment by maintaining shade to the extent that there would not be an increase in water temperature and into the future by providing for the development of additional shade through understory and mid-story canopy layer development beyond the immediate treatment. The Proposed Action treatments would positively contribute to forest complexity and connectivity both at the 6th field level subwatershed and the larger 5th field watershed level and thus would meet the objectives of ACSO 2.

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

No Action: Under the No Action alternative, under-maintained culverts and roads could deteriorate to the extent that stream channels could be negatively affected. The degree of hydrological and ecological function of current instream wood may decline as current and older instream wood is not replaced quickly enough by new instream wood. Most of the Riparian Reserve areas proposed for treatment are along 1st and 2nd order stream courses which have appreciable amounts of newer as well as older in-stream wood. Lower valley bottom, higher order streams would continue to meet or exceed ODFW aquatic habitat benchmarks for key piece sized in-stream wood, while still remaining short of the 80 key pieces per mi. benchmark used by several federal agencies (USDA Forest Service *et al.* 2004). BLM restoration work done in the Kenusky Creek drainage currently exceeds and would continue to exceed both benchmarks. The No Action alternative would have no effect on the progression of these processes.

Proposed Action: In-stream large wood is critical in maintaining the physical integrity of streams in the project area. While the proposed action will slightly decrease potential wood recruitment relative to the No Action alternative, it is not expected to decrease actual wood recruitment to a measurable extent due to the low potential probability of trees from the outer edge of the in-stream contribution zone actually falling into the stream, and thus would not affect the hydrologic processes dependent on in-stream large wood. A species-diverse understory as a result of thinning and underplanting could result in more stream-side recruitment of shade tolerant trees which in turn could positively contribute to maintaining the physical integrity of project area streams.

The only stream channels that will be directly affected by the proposed action are those where culvert work will occur. The proposed action includes culvert work at 12 stream crossing areas, eight on intermittent steams and four on perennial 1st or 2nd order streams. Two of the culvert installations are temporary one–season use culverts which would be removed upon completion. All of the existing culverts proposed for replacement would be replaced with larger culverts which will allow natural hydrologic processes to restore the reach affected by the undersized culvert to a more natural condition (one determined by channel slope and hydrologic forces as opposed to an undersized culvert). The channel segments would adjust (locally erode and aggrade) to the new culverts during high flow periods during the first 1-2 winters following replacement. The culvert replacements will help restore the physical integrity of project area streams by reducing the potential for future culvert and road fill failures that could degrade stream physical integrity. The ACS allows for active management to “maintain and restore” (USDI – BLM 1995, p. 6) and specifically requires restoration to “control and prevent road-related runoff and sediment production” (p. 7); sediment sources that are managed through such actions as using appropriately sized culverts.

An increase in stream sedimentation from timber haul is expected, but of immeasurable and inconsequential magnitude. For the reasons stated above we expect that the proposed action would meet the objectives of ACSO 3.

ACSO 4: Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems.

No Action: We expect that the No Action alternative would maintain the current water quality conditions. It is possible that without the road and culvert maintenance that would occur under the Proposed Action, that isolated locations along the road network that are currently incompletely drained could begin to negatively affect project area water quality by mobilizing sediment from the road prism. The No Action alternative would maintain the current condition regarding the lack of shade tolerant conifers in the understory and mid-story of riparian forests which could hinder a favorable reduction in water temperature in the subwatershed.

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 including culvert and cross-drain installation, replacement and maintenance, and timber hauling (1 to 2 years at specific site of action). Turbidity increases would not be expected to be visible beyond ~100 ft. downstream from road/stream intersections and would not be expected to affect recognized beneficial uses. Over time (beyond about 3 years at any given stream crossing), 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. For these reasons we expect that the proposed action would meet the objectives of ACSO 4.

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

No Action: We assumed, based on published studies and institutional experience that the current levels of sediment delivered to streams would fluctuate and perhaps gradually increase as roads go through cycles of deterioration and maintenance. We expect that if the proposed action is not implemented that a basic level of maintenance would still occur primarily to address severe problems, but most of the roads that would be used for the proposed action would receive little maintenance under the No Action alternative.

Proposed Action: Localized increases in turbidity following culvert installation, road maintenance and timber hauling are expected to be immeasurable at the subwatershed and watershed scales. By the second winter following project implementation (at a given site), sediment delivery from the project area would be expected to decrease as ditches and stream/road crossings stabilize following road maintenance and culvert work. Project planning, PDFs and BMPs would minimize sediment delivery to streams. We therefore expect that the Proposed Action would meet the objectives of ACSO 5.

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.

No Action: The current instream flow regime (of relatively high discharge following storms and rain-on-snow events in winter, followed by lower, base flow in the summer) would continue. By and large the 6th field subwatershned is fully forested with only 15% comprised of forest stands less than 20 years old. There is no reason to believe that the patterns and magnitude of current seasonal or other fluctuations in stream discharge in the project area are outside of historical precedence or are otherwise geographically inappropriate. Sediment production in streams is probably higher in the watershed than if no roads existed, but due to the geological nature of the watershed (sandstone), sediment levels tend to be naturally higher than areas with more durable substrate. In-stream wood levels and delivery would be expected to remain favorable in the lower order (higher in the watershed) streams, while streams in the lower valleys would continue to be deficient (80 key pieces/mile federal benchmark) in large in-stream wood. We expect that selection of the No Action alternative would have no bearing on the goals of ACSO 6.

Proposed Action: In Pacific Northwest evapotranspiration may account for 40% of annual precipitation in conifer forests. The proposed timber harvest treatments could theoretically add to stream discharge by reducing evaporation and transpiration caused by reducing the number of trees in the watershed. That effect would however be countered by the accelerated growth of the remaining trees in the thinning and density management treatments and regrowth of the brush layer and understory. The 299 acres of regeneration harvest would account for the removal of only 1.4% of the forest cover in the subwatershed, which would be replaced by seedling stage forest. Biologically relevant changes in summer base flows would be unlikely, and if present and measurable, would be of short duration (1-3 years), and be equally likely to be small increases as decreases. The inability to maintain minimum flows that sustain ecological processes would not likely to be caused by the Proposed Action. The likelihood, duration, and frequency of maximum, effective discharge would not be expected to change in the project area in response to the Proposed Action, based on the analyses conducted, therefore we expect that the Proposed Action would meet the objectives of ACSO 6.

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

No Action: The current degree of connectivity between streams and floodplains in the project area and water table elevations in meadows and wetlands would be expected to be maintained.

Proposed Action: The Proposed Action would not be expected to have any effect on the timing, variability or duration of floodplain inundation. Small magnitude changes in local water table elevations could occur but would not be expected to be measureable or ecologically relevant in any meadows or wetlands; which are rare in the vicinity of any of the proposed action areas. For these reasons we expect that the Proposed Action would meet the objectives of ASCO 7.

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.

No Action: Over 850 acres of Riparian Reserves were assessed as to their potential development into high quality riparian forests. About 550 acres were found to be mostly simple structured single story, relatively homogeneous Douglas-fir forests, some with patches of hardwoods interspersed, which also have high crown to ground distances. These stands would be expected to continue with single story development for many decades as there is little evidence that an understory is present or where there are seedlings, the canopy is too dense to provide enough light for accelerated growth of the understory. Many of the acres do not have hemlocks or cedar in the overstory that could provide seed for the establishment of an understory tree layer. In the patches where hardwoods dominate, some of the older hardwoods are dying and not being replaced by other trees. Stands with high canopies can be susceptible to under-canopy warming during times when the sun is at lower angles, which can affect the overstory's ability to regulate temperatures, particularly in the summer. Those acres with single story stands without developing understories would not be expected to change much in terms of shade levels over the next several decades which may compromise these stands ability to provide thermal regulation to the near-stream environment.

The remaining approximately 275-300 acres are showing some current stand diversity in that there is a more diverse canopy with patchiness that is allowing some understory seedlings to respond to additional light. Some of these areas are infected with laminated root rot which is diversifying the canopy and providing new inputs of down wood, but a few of these patches are showing an inclination to be dominated by brush and hardwood trees for several decades. These acres would be expected to develop higher shade levels, and thus better thermal regulation, in the next several decades due to the developmental trend of a growing understory which would diversify into the mid-story over time increasing both primary and secondary shade.

Due to the geologic nature of the watershed with broad, relatively flat, ridges and benches dissected by quite steep, incised stream channels, there are appreciable amounts of trees sloughing into the channels of 1st and 2nd order streams providing good levels of in-stream wood. The current trend in nutrient filtering, surface and bank erosion, and channel migration would not be expected to change in the foreseeable future. Although development of a more structurally diverse and species rich forest is expected to be slow, requiring many decades, we expect that the No Action alternative would still meet the objectives of ACSO 8 by maintaining current conditions.

Proposed Action: No-harvest buffers would maintain the current extent of thermal cover available to streams. Thinned stands in Riparian Reserves upslope of no-harvest buffers would maintain a weighted average 63% canopy cover (range 50% – 74 %), sufficient to maintain secondary stream shade. Erosional processes would not be expected to be effected by the implementation of the Proposed Action using described PDFs and BMPs. No-harvest buffers and thinning unit boundaries drawn specifically to exclude steeper gradient wood source areas would maintain the current availability of trees most likely to be recruited into streams. By using a variable spaced, thinning from below prescription, all of the largest trees potentially able to contribute wood to streams from outside the no-harvest buffer would be retained.

In all treated stands the residual trees would grow at a faster rate than without treatment and result in larger trees sooner. The existing understory and/or planted trees would be expected to develop faster and thus be able to provide structurally important features such as additional secondary shade as well as develop the ability to moderate ground level air flow thus keeping conditions moister and cooler. The density management treatments would slightly reduce the current proportion of hardwoods in those units where hardwoods comprise an appreciable portion of the stand, but would maintain a good distribution of hardwoods including within the no-harvest buffers closer to streams. Maintaining hardwoods, and establishing and developing a shade tolerant understory and mid-story would provide more diverse allochthonous inputs (litter fall from overhanging vegetation) which can sustain more diverse aquatic communities. As the understory matures it would provide a seed source to recruit shade tolerant tree species into riparian areas which could help stabilize streambanks and contribute to the long term development of a sustainable large wood source for streams. More structurally diverse stands with more snags for example, could provide a more historically consistent disturbance regime resulting in more frequent inputs of wood to streams.

As a result, while the Proposed Action would slightly decrease *potential* wood recruitment from the outermost edge of the possible recruitment zone, it would not be expected to decrease *actual* wood recruitment to a hydrologically or biologically appreciable extent. The Proposed Action would thus meet the objectives of ACSO 8.

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

No Action: 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 not be expected to have adverse effects on riparian dependent species. Research (Ares et al. 2009, Olson and Rugger 2007, Progar and Moldenke 2002) indicates that thinning treatments generally maintained habitat for native plant, invertebrate and invertebrate riparian-dependent species. Specifically, thinning was found to increase species richness of arthropods, and forest riparian buffers serve as refuge for both forest-upland and forest-riparian arthropod species. Thinning was also found to have minimal effects on most species of aquatic vertebrates including salamanders. Native plants were found to persist and increase in coverage after density management. Because the microclimate, as well as the structure and composition of the forest stand and understory vegetation would be maintained within the untreated buffer, habitat elements there would also be maintained. The treatment would also be relatively low intensity since it would only treat 3% of the acres within one site-potential tree height of streams therefore adjacent non-thinned areas should provide adequate refugia for riparian-dependent species. In the long term, the treatments would restore elements of structural diversity such as large trees and a diverse shade tolerant understory and mid-story to

the 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. The Proposed Action would thus be expected to meet the objectives of ACSO 9.

8. CONTACTS AND CONSULTATION

Contacts

Tribes, Individuals, Organizations, or Agencies Consulted

During a formal scoping period in May of 2014, contacts were made with 19 agencies, organizations, and individuals that may have interest in the East Fork Nehalem Project. For more information on internal and external project scoping, see section 1.2.

Also in May of 2014, letters were sent to the Grand Ronde and Siletz Tribes asking if the proposed East Fork Nehalem Timber Management Project would conflict with tribal interests in the area or if they had any specific concerns regarding the project. Neither Tribe responded to our letter.

Consultation

US Fish and Wildlife Service (USFWS)

The spotted owl would be affected by this project only through the modification of 392 acres of dispersal habitat which would continue to function in the same capacity after treatment (commercial and Riparian Reserve thinning) and the removal of 299 acres of dispersal habitat (regeneration harvest). There is a very low probability that marbled murrelets would be impacted as a result of disturbance.

Due to these potential impacts to the spotted owl, informal consultation with the U.S. Fish and Wildlife Service is warranted to assure compliance with section 7 of the ESA. Consultation would be completed programmatically within the appropriate year's (year of sale if the proposed action is selected) batched Biological Assessment in the "Light to Moderate Thinning" and "Regeneration Harvest" categories. Due to current forest conditions, the East Fork Nehalem subwatershed is considered deficient in spotted owl dispersal habitat. Treatments that would cause the loss of northern spotted owl dispersal habitat in areas where such habitat is currently insufficient for owl dispersal between blocks of suitable habitat, or where dispersal between blocks of suitable habitat may be limited post-treatment (as determined by the unit wildlife biologist), are generally not addressed by the above Biological Assessment. However, on January 1st, 2014 the North Coast Province Level 1 Consultation team determined that the geographic isolation of these affected BLM-administered lands created a low likelihood that this habitat currently facilitates owl dispersal between blocks of suitable habitat and therefore inclusion of the East Fork Nehalem Timber Management Project within the batched Biological Assessment was appropriate.

Due to the potential impacts to marbled murrelets, as unlikely as they are, informal consultation with the U.S. Fish and Wildlife Service is warranted and would be completed programmatically within the appropriate year's (year of sale if the proposed action is selected) Biological Assessment in the "Light to Moderate Thinning" and "Regeneration Harvest" categories. Although the Biological Assessment would normally require the use of daily time restrictions within the disruption distance (100m) of unsurveyed potential nesting structures, the level 1 Team (terrestrial) for the North Coast Planning Province reviewed and verified (October, 2014) that the proposed habitat modification (regeneration harvest, commercial and Riparian Reserve thinning) as well as an alternate haul route adjacent to unsurveyed trees containing potential marbled murrelet nesting structures would meet the intent of the above Biological Assessment, without using daily time restrictions.

National Marine Fisheries Service (NMFS)

No effects are anticipated to Oregon Coast coho salmon or its critical habitat due to design features that prevent impacts to stream morphology, water temperature, sediment transport to coho habitat, large wood routing, or modification of forests within coho habitat; therefore, no ESA consultation is warranted.

9. LIST OF PREPARERS

Table 30: List of Preparers

Resource	Name
IDT Leader/ Environmental Planner	Andy Pampush
Botany/ Invasive Plant Species	Kurt Heckeroth
Cultural Resources	Heather Ulrich/Fred Greatorex
Engineering	Joel Churchill
Fire/Fuels	Clint Gregory
Fisheries	Clay Ramey
Hydrology/ Water Quality	Clay Ramey/Chris Robinson
Logging Systems	Brian Christensen
Recreation/Visual Resources	Debra Drake
Silviculture	Clint Gregory
Soils	Chris Sween
Wildlife	Jessie Huck

Opportunity for Public Review and Comment

The EA and FONSI will be made available for public review from ***August 28, 2015 to September 28, 2015*** 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* newspaper of Scappoose, Oregon. Written comments should be addressed to Karen M. Schank, Field Manager, Tillamook Resource Area, 4610 Third Street, Tillamook, Oregon, 97141. Emailed comments may be sent to Andy Pampush at apampush@blm.gov.

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Opportunity for Public Review and Comment

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10. ADDITIONAL SUPPORTING DATA

Water Quality Management Plan

Introduction

Water Quality Management on BLM-administered lands that are covered under the East Fork Nehalem Timber Management Project EA is based on the site specific application of Best Management Practices (BMPs) and disclosed as Project Design Features (PDFs).

Best Management Practices

Best Management Practices are required by the federal Clean Water Act, as amended, to mitigate the potential for non-point source pollution. Non-point source pollution is from pollutants detected in concentrated water (e.g. stream or lake) from a wide range of forest management activities on federal lands administered by the Bureau of Land Management (BLM). BMPs are the primary methods for achieving Oregon's water quality standards.

In 2008 during the Western Oregon Plan Revision process, the BLM reviewed and updated existing BMPs based on implementation and effectiveness monitoring, field experience, and new science. These revised BMPs represent the BLM's most current set of BMPs. The revised BMPs (as contained in Appendix I of the Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management, 2008) are available for use when designing individual projects and for water quality restoration planning activities. Use of the revised BMPs is considered a plan maintenance action of the 1995 Salem District ROD. Plan maintenance actions occur continuously but must be documented so that the change and field manager concurrence are evident. The 2009 Salem District Annual Program Summary was used to communicate this plan maintenance action to the public. The 2009 Salem District Annual Program Summary is available for review at http://www.blm.gov/or/districts/salem/plans/salemrmp.php. In 2011 the BLM's Oregon/Washington State Director issued Instruction Memorandum No. OR-2011-074, which directs the incorporation of updated BMP's to reduce sediment delivery from BLM roads in Oregon as a RMP Plan Maintenance action. The list below reflects these Plan Maintenance changes.

BMPs are site specific and the implementation of the BMP is tailored to the "on the ground" conditions. The overall goal is not to strictly adhere to the wording of the BMP, but rather to implement the intent of the prescribed BMP. The following BMPs are site specific applications to forest management activities undertaken by the East Fork Nehalem Timber Management Project Environmental Analysis on the Tillamook Resource Area.

Table 31: Best Management Practices

BMP No.	Practice Technique
General Construction	
R1	Locate roads and landings on stable locations that minimize sediment delivery potential to streams (e.g., ridge tops, stable benches or flats, and gentle-to-moderate side-slopes). To the extent workable, avoid unstable headwalls, and steep channel-adjacent side slopes.
R2	Where practical to do so, plan routes to limit new road construction, including stream crossings, within riparian management areas.
R3	Considering topographic and safety constraints, locate roads so as to lower cutbank heights and cutbank slope angles, where ditchlines could deliver run-off directly to stream channels.
R4	Locate roads and landings outside of jurisdictional wetlands.

R6	Locate landings in areas with low risk for landslides.
R7	Locate excavated material disposal areas outside Riparian Management Areas, floodplains, and unstable areas that could transport sediment to water bodies.
R9	Limit road and landing construction, reconstruction, or renovation activities to the dry season, generally from May to October. When conditions permit operations outside of the dry season, keep erosion control measures concurrent with ground disturbance to the extent that the affected area can be rapidly stormproofed if weather conditions deteriorate.
R14	Where deemed necessary, use temporary sediment containment structures to contain runoff from construction areas (e.g. silt fencing, retention ponds, etc.).
R16	Complete construction activities prior to fall rains. Prevent erosion in areas with direct connectivity to streams by stabilizing exposed soil materials.
Surface Drainage	
R29	Divert road and landing runoff water away from headwalls, unstable areas or stream channels.
R38	Armor drainage dips to maintain functionality in areas of erosive soils that are subject to rapid erosion by runoff.
Stream Crossings	
R44	Install all crossings during the low flow period, generally from June 15 to September 15.
R45	Size culverts, bridges, and other stream crossings for the 100-year flood event including allowance for bed load and small floatable debris without exceeding capacity or diversion. Match culvert width with bankfull channel width.
R47	Construct the stream crossing approach to minimize fill volumes and sediment delivery potential.
R48	Locate culvert placement on a well-defined, unobstructed, and straight reach of stream. Where a bend in the channel cannot be avoided, or would have less impact than moving the road elsewhere, place the alignment of the culvert with the upstream channel and armor the discharge side of the culvert into an erodible bank.
R49	Where workable, install culverts in intermittent channels at the natural stream grade.
R51	Use containment and filtering techniques such as bladder barriers, silt curtains etc., if diversion is not possible. Place sediment controls along and immediately downstream of the in stream work.
R57	Stabilize fill material over stream crossing structures immediately after construction has been completed, normally before October 15.
R61	Limit the use of mechanized equipment to stream bank areas or temporary platforms when installing or removing structures. Avoid driving of mechanized equipment in the stream channel except in the area that is necessary for the installation and removal of in channel structures.

R 65	Limit the installation and removal of temporary crossing structures within the prescribed work period where possible. Follow practices under the Closure/Decommissioning section for removing stream crossing drainage structures and reestablishing natural drainage configuration.
R66	Use structures that would withstand 100-year flow events e.g., concrete, well anchored concrete mats, etc. on permanent crossings.
R71	Apply durable rock surfacing to withstand expected loads and traffic volume, and season of use.
Road Use and Dust Abatement	
R72	For winter hauling implement structural treatments such as: adjust frequency of cross-drain spacing, install sediment barriers or catch basins, apply gravel lifts or asphalt road surfacing at stream crossing approaches and clean and armor ditchlines.
R73	Suspend timber hauling during wet weather when road run-off delivers sediment at higher concentrations than existing conditions in the receiving stream.
R75	Wash equipment at sites with no potential for runoff into waterbodies, floodplains, or wetlands.
Maintenance	
R80	End-haul sloughed or excavated materials to a stable site outside of Riparian Reserves with no potential to reach water bodies, wetlands and floodplains.
R83	Avoid blading and shaping of road surfaces during the wet season, generally October 16 to May 31.
Road Stormproofing	
R87	Storm proof open or older roads with continued use, but infrequent maintenance. Storm proof new temporary roads, if over-winter.
R88	Suspend stormproofing work if rain saturates soils to the extent that there is potential for movement of sediment from the road to the stream.
Road Closure and Decommissioning	
R89	Decommission new roads not included in the permanent road system upon completion of use.
R90	Close roads not needed, but not recommended to be fully decommissioned. When this measure is used by itself, it applies only to roads that do not significantly reroute hill slope drainage, involve stream channels, or present slope stability hazards.
R91	Place woody material or other appropriate barriers to discourage off-highway vehicle use on decommissioned roads, unless specifically designated for this use
R93	Remove stream crossing culverts and entire in-channel fill material during low flow (generally, June 15 to September 15) prior to fall rains.

R94	Place excavated material from removed stream crossings in a stable location where it would not reenter the stream. If necessary, place sediment and erosion controls around all stockpiled material.
R96	Construct oversized waterbars or cross ditches that will remain functional on each side of stream crossings.
R97	Apply erosion control, such as seeding and mulching, to all hydrologically connected road related bare soil surfaces, where erosion could occur, including stream banks and stream-adjacent side slopes following culvert removal. Place sediment trapping materials such as straw bales and jute netting at the toe of stream-adjacent side slopes following culvert removal. Complete seeding and mulching erosion control work by October 15 of each year. When straw mulch or rice straw mulch is used; require certified weed free, if readily available. Mulch shall be applied at no less than 2000 lbs. /acre. Vegetative cuttings, shrubs and trees may be considered as needed for erosion control. Planting of shrubs and trees should occur during the winter dormant season.
R98	Implement measures to reduce the level and depth of soil compaction, including ripping or sub soiling to an effective depth; generally to 16-24 inches. Treat compacted areas including the roadbed, landings, construction areas, and spoils sites.
R99	Pull back unstable road fill and either end-haul or recontour to the natural slopes.
R100	Suspend decommissioning activities if rain saturates soils to the extent that there is potential for movement of sediment from the road to the stream.
Cable Yarding	
TH 3	Where workable, require full suspension over flowing streams, non-flowing streams with erodible bed and bank, and jurisdictional wetlands.
TH 5	Where slopes exceed 60 percent along stream channels, yard with full suspension, or one-end suspension using seasonal restrictions. Yard remaining areas using one-end suspension.
TH6	Implement erosion control measures such as waterbars, slash placement and seeding in cable yarding corridors where the potential for erosion and delivery to water bodies, floodplains and wetlands exists.
Ground-Based Harvesting	
TH7	Exclude equipment from riparian management area retention areas (60 feet from the edge of the active stream channel for fish bearing and perennial streams, lakes and ponds, and 35 feet for intermittent streams), except for road crossings, restoration, wildfire, or similar operational reasons.
TH 8	Exclude ground-based equipment on hydric soils.
TH 9	Plan use on existing and new skid trails, to be less than 12 percent of the harvest area.

TH 10	Limit width of skid roads to what is operationally necessary for the equipment.
TH 11	Ensure one-end suspension of logs; e.g. integral arch on all conventional ground-based yarding equipment.
TH12	Restrict ground-based harvest and skidding operations to periods of low soil moisture when soils have resistance to compaction and displacement.
TH 13	As a first priority, use ground-based equipment on existing compacted surfaces.
TH14	Limit conventional ground-based equipment to slopes less than 35 percent.
TH16	Designate skid trails where water from trail surface would not be channeled into unstable areas adjacent to water bodies, floodplains, and wetlands.
TH18	Apply erosion control practices to skid roads and other disturbed areas with potential for erosion and subsequent sediment delivery to water bodies, floodplains, or wetlands.
TH21	Block skid roads that intersect haul roads at the end of seasonal use.

11. PUBLIC COMMENTS TO EXTERNAL SCOPING AND BLM RESPONSES TO COMMENTS

Doug Heiken
Oregon Wild

Summary of Oregon Wild Comments: Oregon Wild sent a 73 page document which included comments, recommendations, references, and links that focused around certain main themes. Comments that are not pertinent, or are clearly outside of the scope of the East Fork Nehalem Timber Management Project have not been included below. The comments addressed below capture the content and intent of the main themes as well as we can determine.

- *Avoid road construction. Road construction causes serious adverse effects on soil, water, and habitat. There are already too many roads out there. Some portion of the landscape needs to be left untreated to protect soil, dense habitat, snag recruitment etc. Just include inaccessible areas in the untreated portion of the landscape.*

  BLM Response: The Proposed Action would reuse existing roads to the extent possible. Where new construction is necessary an effort would be made to use existing disturbed areas such as old skid trails and railroad grades. With the exception of two small spurs, all other new construction would be temporary which should limit the long term impacts to primarily soil productivity at the site. Temporary roads are not expected to affect water quality or wildlife resources for the reasons described in EA section 2.2, p. 12.

- *Avoid regen harvest. There is not ecological need for early seral habitat. There is too much of that already, especially on non-federal lands. Regen harvest has serious adverse effects on late successional habitat values that remain very diminished in the northern Oregon Coast Range. Regen will also remove too many snag recruitment trees and result in a significant and long-last* (sic) *"snag gap."*

  BLM Response: Regeneration harvesting is a legitimate and necessary treatment in landscapes where production of timber supply to meet economic needs is a priority. The Salem District RMP allows for and encourages regeneration harvest to keep acreage in the Matrix land use allocation productive (RMP Appx. D-1), while also providing for some important ecological functions. The Matrix LUA also has an objective to provide early successional habitat (RMP p. 20). Generally the Matrix lands in the East Fork Nehalem subwatershed are not allocated to be managed to produce late-successional forest, but what little late-successional forest that does exist is protected from harvest. None of the stands proposed for regeneration harvest contain late-successional forest. The project area contains snags commensurate with what would be expected in landscapes with similar histories (EA p. 64) Additional green trees would be reserved to fill a potential snag gap for the next several decades (EA p. 40).

- *Avoid logging in stands over 80 years old. Stands >80 years have all the building blocks and self-organizing processes allowing them to develop on their own. Mature forests store carbon to help mitigate global climate change and they provide habitat for marbled murrelets and spotted owls (which need additional conservation of suitable habitat so they can co-exist with barred owls).*

  BLM Response: The proposed action would include the harvest of 73 acres of forest that would be 80 years old or older by the time we expect the last timber sale would be sold in 2018. Currently 27 of those acres are exactly 80 years old in the year 2015, based on stand exams. The remaining acres would become 80 over the next three years. None of the stands proposed for harvest have attained the structural features and character of mature stands such as slowed height growth and crown expansion, heavy limb formation, expanding stable gaps, and saplings developing in the understory (EA p. 67), nor are they suitable habitat for spotted owls, marbled murrelets, or red tree voles (EA pp. 16, 17, 94). Harvesting these stands that would be 80-83 years old would have the same effects as harvesting other mid-seral stands that are less than

80, therefore we elected not to restrict harvest in those stands. All growing forests store carbon. We modelled the proposed action (all of the acres of harvest, not just those that may be 80 years old) for effects to carbon sequestration and storage (EA p. 21) and found that after about 35 years the growth of the residual and planted trees, coupled with the carbon stored in products developed from the proposed action, resulted in levels of carbon sequestration and storage similar to the No Action alternative after the same time period. Because climate change is inherently a global issue and the temporary, relatively tiny, contribution from the proposed action is not practically measurable on the global scale, it is likewise not practical for us to determine the effect the proposed action would have on climate change, if any.

- *Avoid logging near streams. Recognize the significant and long-lasting trade-offs associated with logging near streams. Logging in Riparian Reserves will violate the ACS by retarding attainment of dead wood objectives both instream and in the upland portion of the Riparian Reserves.*

BLM Response: The proposed action would not harvest near streams. No-harvest buffers of at least 60 feet on intermittent streams and 100 feet on perennial streams would be placed on all streams. McDade et al. (1990) finds that over 90% of instream wood originates from within 100 feet of the stream (EA p. 13). Additionally, we are thinning, not clearcutting, outside of these no-harvest buffers which means that the largest trees in the stands would remain on the landscape. Any reserve trees that are cut for operational purposes within Riparian Reserve harvest areas would also be required to be left on site to augment down wood resources. We do not feel that our proposed treatments would violate the Aquatic Conservation Strategy.

- *Seek and find the optimal mix of treated and untreated areas. Logging captures mortality and deprives the future stand of snags and down wood. Substantial areas need to be left untreated in order to mitigate for extensive past and ongoing logging.*

BLM Response: It is not the purpose of NEPA to develop plans for landscape management (i.e. "find the optimal mix"), but rather to assess what the impacts those plans may have on the quality of the human environment.

- *Conduct surveys for rare and uncommon late successional species. This is not just a duty created by the survey and manage program. NEPA also requires surveys in order to fulfill its mandate for informed decision-making.*

BLM Response: Surveys for terrestrial mollusks and botanical species were completed on all proposed harvest acres. No target mollusk species were found, and only one S&M lichen was found, which would be managed by excluding the site from harvest treatments. None of the stands proposed for treatments is suitable habitat for spotted owls, marbled murrelets, or red tree voles, so no surveys for those species were necessary.

- *Avoid logging in two-aged stands where there is an older cohort, or at least provide a generous buffer around legacy trees that may provide habitat for marbled murrelets and red tree voles and are sensitive to canopy disturbance.*

BLM Response: None of the stands proposed for harvest is composed of two-aged stands (EA. pp. 61-62) The few legacy trees that exist within the vicinity of harvest units would be excluded from the units by at least 330 feet (EA p. 47).

- *Make sure that the NEPA analysis highlights trade-offs. That's what it is for. If the NEPA analysis makes this project sound like it has nothing but positive effects on the environment it will be a disservice to the public and the decision-maker it is supposed to inform.*

  BLM Response: The EA clearly states that there will be negative effects associated with the proposed action (EA pp. 60-116), as well as some positive effects.
- *Given the importance of flying squirrels to the diet of the spotted owl, managers must ensure that thinning does not significantly reduce the flying squirrel population, but recent evidence shows that thinning does in fact lead to a multi-decade decline in the number of flying squirrels. The agencies must leave significant untreated skips in order to mitigate for this significant adverse effect.*

  BLM Response: Our analysis shows that thinning and density management may have negative consequences on flying squirrel populations in the area, possibly for several decades (EA pp. 97-99). Our project would affect about 5.5% of forest stands in the EF Nehalem subwatershed analysis area that may be suitable habitat for flying squirrels. Perhaps most importantly, the consequences of reduced potential flying squirrel populations are nearly irrelevant where spotted owls are concerned based on lack of spotted owl suitable habitat, existing sites, and the low likelihood that spotted owls may even disperse through the subwatershed (EA pp. 96-99).

- *Barred owls — The threatened spotted owl faces a significant new threat in the form of the barred owl which has recently invaded the range of the spotted owl, uses and* (sic) *similar habitat, and uses many of the same food sources. Hundreds of thousands of acres of suitable owl habitat that were assumed in the NW Forest Plan to be available for spotted owl nesting, roosting, and foraging are now occupied and defended by territorial barred owls to the exclusion of spotted owls. There is an urgent need to protect additional suitable owl habitat (and reduce the loss of existing habitat) in order to increase the likelihood that threatened spotted owls can coexist with newly invading barred owls instead of facing competitive exclusion.*

  BLM Response: Barred owls are common in the EF Nehalem analysis area. There are no known spotted owl sites in the same area. There are only 265 acres of suitable spotted owl habitat in the analysis area (1.3% of the analysis area) and the proposed project would not remove any of it.

- *Large accumulations of dead wood are essential for meeting objectives for fish & wildlife habitat, water quality, and carbon storage. Past and ongoing forest management has greatly reduced the prevalence of large snags and dead wood. Northwest Forest Plan standards for dead wood are based on an outdated "potential population" methodology which greatly underestimates the amount of snags and down logs needed to meet the needs of a variety of species associated with dead wood.*

  BLM Response: The effects to snags and down wood resulting from the proposed action are disclosed in section 6.1.2 of the EA on pp. 79-83 and the effects to wildlife that use snags and dead wood on pp. 101 - 103. We used the science that supports the DecAID snag and dead wood advisor to inform our analysis and compared our current and expected future conditions to available literature on forest stands similar to those that would be affected by the proposed action.

Andy Geissler
American Forest Resources Council

- *AFRC has voiced our concern over the long-term sustainability of the timber supply on BLM land and how the current management culture is affecting this supply. The difficulty that the BLM has had implementing any treatment that successfully regenerates a stand of mature timber has resulted in an unbalanced age-class distribution across the Forest, particularly on the Matrix allocation, and has left a void in stands in the 0-20 year age class.*

BLM Response: We recognize this imbalance and have designed this project to address, at least in part, the age class disparity on Matrix lands within the East Fork Nehalem subwatershed. We have limited ability to more fully address age class imbalance because many of the Matrix stands in the Tillamook Resource Area are not in a condition that would warrant regeneration harvest based on the criteria in our Resource Management Plan.

- *We would also like the BLM to consider using language from the O&C Act in their purpose & need. "Manage lands for permanent forest production in conformity with the principles of sustained yield" and "To distribute timber receipts to O&C counties" comes right off the O&C Act.*

BLM Response: The Purpose and Need for the East Fork Nehalem Timber Management Project acknowledges our obligations under the O&C Act to supply a source of timber to support the stability of local communities and industries. Our legal mandate to comply with the O&C Act is contained in the Salem District Resource Management Plan (1995) which directs our activities. The East Fork Nehalem project is designed to meet the multiple mandates of not just the O&C Act, but the Endangered Species Act, Clean Air Act, Clean Water Act, and the National Historic Preservation Act as well.

- *We encourage the BLM to focus their Riparian Reserve treatments on a variety of native habitats. Often the management of these reserves gets focused only on late-seral habitat, so we would like the BLM to keep options open to meet all aspects of the ACS. Utilization of gap cuts to promote early seral habitat in the reserves, treatments to diversify all areas of the reserve, and prescriptions that account for the full range of objectives that the ACS mandates should be considered.*

BLM Response: The Aquatic Conservation Strategy (ACS) objectives are very focused on the near stream and in-stream environments. Forest stand management that could affect stream conditions must be carefully considered to minimize or avoid impacts to such factors as stream temperature, stream dynamics that are influenced by large wood, and water quality that is affected by sediment. Unfortunately there is little empirical data and a wide range of opinions as to what types and intensities of actions could occur in Riparian Reserves nearer to the streams without causing undo negative impacts. Some of the East Fork Nehalem Project units are fairly close to habitat for the ESA listed Oregon Coast Coho which limits our options for stand management activities that may cause negative impacts even if they are minor or transitory. We evaluated all of the Riparian Reserves in the East Fork Nehalem Project area and are treating those that appear to be the most in need of management to further diversify and promote development of late-successional forest conditions. We did not consider gap treatments in the Riparian Reserves due to the potential for increasing stream temperature by removing shade and the reduction in in-stream wood potential.

- *We would like the Tillamook Resource Area to consider allowing the use of multiple types of ground based equipment such as fellerbunchers off designated skid trails to allow for an efficient logging operation.*

BLM Response: To the extent that our planning documents allow, we have considered harvesting operations in as broad a way as possible. Restrictions generally pertain to limiting soil compaction on any given unit to 12% or less, limit soil erosion by limiting ground based operations to dry seasons and slopes 35% or less, and managing potential sediment runoff from landings. We have attempted to consider these restrictions in a more condition based light rather than having hard and fast cut-off dates and specifically limiting types of equipment (EA pp. 43-45).

- *Though some of the proposal area is planned for cable harvest, there are opportunities to use certain ground equipment such as fellerbunchers and processors in the units to make cable yarding more efficient. Allowing the use of processors and fellerbunchers throughout these units can greatly increase its economic viability, and in some cases decrease disturbance by decreasing the amount of cable*

corridors, reduce damage to the residual stand and provide a more even distribution of woody debris following harvest.

BLM Response: As noted above, to limit soil erosion concerns and to be consistent with our Best Management Practices, we only allow ground-based harvesting equipment on slopes that average 35% or less. If a purchaser felt that it would be beneficial to use ground-based equipment in units with 35% or less slopes in conjunction with cable harvesting, that may be considered as long as the total area that becomes compacted is 12% or less of the unit.

- *The ability to yard and haul timber in the winter months will often make the difference between a sale selling and not, and we encourage the BLM to continue to look for ways to accommodate this.*

BLM Response: Our analysis shows that wet weather hauling on gravel roads that cross streams in the vicinity of ESA listed coho salmon would result in negative impacts that may be deleterious to coho. However we did look for opportunity to provide winter operations and determined that approximately 55 acres of the project includes cable harvesting units that could be operated on, including hauling, during all times of the year without adverse effects to coho; and another approximately 40 acres that could be operated on during dry weather-like conditions at any time of the year without adverse effects to coho.

- *Removing culverts, waterbarring, and closing a rocked road to vehicular traffic is a relatively inexpensive practice that would leave the roadbed intact for future use. We encourage the BLM to carefully consider the future management needs and added costs of fully decommissioning roads throughout their landscape. AFRC believes that constructing a road today, then obliterating it, and then rebuilding that same road in 20 years is a waste of time and money.*

BLM Response: The construction of 2.7 miles of temporary natural surfaced road over 24 segments, and 0.2 miles of rocked road in 4 segments would occur with this project (EA p. 36). We do not plan to "obliterate" the natural surfaced roads but rather fully decommission them (we would decompact the surface but would not require re-contouring to original grade). The rocked road would be decommissioned by blocking and waterbaring. We believe the cost of constructing and decommissioning the natural surfaced roads would not be appreciably different than constructing new rocked permanent roads that are then put in storage after harvest. Culverts would need to be removed and the roads blocked regardless of road type; and while there would not be the cost of subsoiling the rocked permanent road, there would be the initial cost of rocking the road. Consequently we feel that temporary natural surfaced roads are the best option for management considering other resources that are negatively affected by additional roads on the landscape (wildlife, sediment, illegal dumping).

David Hill
Public Works Director – Columbia County Road Department

- *As manager of the County Roads in Columbia County, and with concern for the impact that logging trucks have on our County Roads, I assume that the loaded logging trucks from the harvest of timber from these sections would use Scappoose – Vernonia County Road, Pittsburg County Road, and perhaps Schaeffer and Apiary County Roads. It is acceptable to plan on using these roads for your harvest, and we would appreciate any support in obtaining Title II funds or any other funds available for maintenance and improvements to these roads.*

BLM Response: The public is invited to submit applications for Title II funds under the Secure Rural Schools and Community Self-Determination Act extension in 2015. The BLM is supportive of applications which are consistent with the Act and Title objectives. A news release will be issued when the Salem District begins accepting applications for 2015 funds.

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