The Walker Creek Terrestrial Restoration Project

Finding of No Significant Impact[1]
for
Environmental Assessment: DOI-BLM-OR-S060-2011-0012-EA

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United States Department of the Interior
Bureau of Land Management, Oregon State Office
Salem District, Tillamook Resource Area
Tillamook and Yamhill Counties, Oregon

Responsible Agency:	USDI - Bureau of Land Management
Responsible Official:	Karen Schank Field Manager Tillamook Resource Area 4610 Third Street Tillamook, OR 97141 (503) 815-1100
For Further Information, contact:	Andy Pampush Tillamook Resource Area 4610 Third Street Tillamook, OR 97141 (503) 815-1143

Introduction

The Tillamook Resource Area, Salem District Bureau of Land Management (BLM), proposes to implement forest management and restoration activities, which includes commercial timber sales, within the Headwaters Nestucca River 6th-field watershed of the Nestucca River watershed. The proposed action includes commercial density management thinning applied in a variable-spaced manner to approximately 575 acres of predominantly Douglas-fir stands, development of coarse wood structures such as large snags, large down wood and live trees treated to create complex crowns, and planting of shade tolerant native tree species in the understory. The action also includes maintenance and improvement of roads and culverts, treatment of approximately 45 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 variable spaced thinning and associated actions would be to create forest diversity on the landscape by creating conditions, and

[1] This section of the Walker Creek Terrestrial Restoration Project EA is the unsigned Finding of No Significant Impact (FONSI) for the project and is presented here for public review and comment. After a public comment period, the Tillamook Field Manager will consider comments received and if appropriate, will finalize and sign the FONSI.

introducing features, that would directly benefit spotted owls consistent with Late-successional Reserve, Spotted Owl Recovery Plan and Spotted Owl Critical Habitat objectives.

The area where the Walker Creek Terrestrial Restoration Project would occur is approximately 15 miles northwest of the town of McMinnville, Oregon. The project area includes BLM-managed lands within sections 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, and 26 of Township 3 South, Range 6 West, Willamette Meridian (WM), in Tillamook and Yamhill Counties, Oregon.

The EA and unsigned FONSI will be made available for public review from ***March 12, 2014*** through ***April 11, 2014***. The notice for public comment will be published in legal notices by the Headlight Herald newspaper of Tillamook, Oregon and the News-Register of McMinnville, Oregon. Comments received by the Tillamook Resource Area of the Salem District Office, 4610 Third Street, Tillamook, Oregon, 97141, on or before ***April 11, 2014*** will be considered in making the final decision for this project.

Finding of No Significant Impact

Based upon review of the Walker Creek Terrestrial Restoration 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 725 acres of BLM administered land (575 acres of density management and associated actions and 150 acres of coarse wood development treatments), along with actions occurring on various haul roads. These actions would affect about 6% of the 12,587 acre Headwaters Nestucca 6th filed 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 alternatives; none of the effects identified, including direct, indirect and cumulative effects, are considered to be significant and do not exceed those effects described in the RMP/FEIS.

Intensity. The following discussion is organized around the Ten Significance Criteria described in 40 CFR 1508.27. The discussions below apply to all proposed actions contained within the Walker Creek Terrestrial Restoration Projects Environmental Assessment.

1. Impacts may be both beneficial and adverse: The effects of the terrestrial restoration project are unlikely to have significant (beneficial and/or adverse) impacts *(EA Section 3)* for the following reasons:

Vegetation and Forest Stand Characteristics (EA section 3.3): Effects to these resources would not have significant impacts because:

- Most forest stand characteristics will be little affected. Canopy closure will remain moderately high, understory vegetation structure and variety will recover quickly after harvest, and all existing coarse wood will be retained. Nearly all large snags will remain standing and smaller snags that are felled or knocked over will be retained as down wood
- There will be an expected long term benefit as the underplanted trees develop into a second canopy layer.
- Residual tree growth will accelerate and very large trees will develop sooner than with no treatment.

- Additional created large coarse wood structures will contribute to greater stand complexity.
- Crown development of residual trees will be increased and include greater complexity.

Hydrology (EA section 3.2): 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 Nestucca River watershed because:

- There will be a very small expected decrease in the potential for recruitment of instream large wood from areas where 5-8% of instream wood recruits from, which is not expected to result in a measurable decrease in actual wood recruited to the stream, thus the project will maintain the current hydrological function of the project area streams.
- The project will directly input 30 large trees into small headwater streams that have potential to contribute large wood to larger streams.
- The project will accelerate the growth of trees in the outer portion of riparian reserves which will result in the potential for higher quality insteam large wood sooner if and when natural processes recruit wood to the streams.
- 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 Nestucca River downstream. Establishment of a second canopy layer 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 2.1.3.2) 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 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.

Threatened or Endangered Fish Species or Habitat, Magnuson Stevens Act Essential Fish Habitat and Species with Bureau Status (EA section 3.3): 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 instream features that are part of listed fish or Bureau status fish habitat (Oregon Coast coho, steelhead).
- The felling of 30 large conifers in headwater steams will have a direct benefit to hydrologic function and thus indirectly benefit listed and Bureau status fish.
- The establishment of shade tolerant conifers and subsequent development of multiple canopy layers 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.

Soils (EA section 3.4): 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 10% of the project area or less (which is within RMP standards [C-2 - C-9] which were analyzed in the RMP/FEIS), have been incorporated to specifically reduce soil compaction and displacement which in turn should reduce soil productivity loss associated with the project.

- The project results in a thinning which will retain most of the vegetation, root systems, and vegetative litter after harvest which is expected to respond vigorously to the increased light after harvest.
- 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.
- At least 25% and most likely at least 50% of the limbs and tops of the harvested trees will remain in site to contribute to soil stability and nutrient cycling.

Threatened or Endangered Wildlife Species, Habitat and/or Critical Habitat: (EA section 3.5) Effects to this resource would not have significant impacts because:

- The project will not affect the marbled murrelet because the only known potential nesting structures have been excluded from the project.
- The project will not affect spotted owls in the near term because surveys have shown that owls are not using the area and habitat conditions are such that they are not likely to be.
- Habitat for the northern spotted owl is currently dispersal habitat and will continue to function as dispersal habitat after harvest.
- In the long term, the project is expected to be higher quality suitable habitat sooner than if the project is not implemented.
- The project will also benefit late-successional forest processes that are not currently occurring.
- The project is expected to have a minor adverse effect in the short term (0-15 years) to spotted owl critical habitat by slightly reducing the already poor habitat for flying squirrels, the spotted owls primary prey item. Marbled murrelet critical habitat will not be affected in the short term. In the long term the project is expected to benefit critical habitat after 30-50 years which is many decades sooner than is expected if the project is not implemented.

Special Status (BLM 6840 Policy), SEIS Special Attention (Salem RMP), and Migratory Bird Treaty Act Wildlife Species and Habitat: (EA section 3.6) Effects to this resource would not have significant impacts because:

- All acres of the project area that required surveys have been surveyed. Known sites for red tree voles have been excluded from any project areas and are protected by 10 acre management areas. SEIS Special Attention (Survey and Manage) lichen species located during surveys will be managed by protection of the trees where they are found.
- Habitat quality for red tree voles is expected to decrease for the next 15 years and then improve faster than if no action were taken as the treated stands become more structurally complex.
- 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.
- There is little probability that the proposed action will adversely affect any migratory birds, bald eagle, or other Bureau Sensitive species.
- The project is not expected to adversely affect any bat species of concern identified in the Salem District RMP.
- The proposed action includes density management thinning which is known to increase species richness of migratory birds.

Recreation and Visual Resources (EA section 3.7): Effects to this resource would not have significant impacts because:

- The project will not change the types of recreation opportunities available and would only have minor effects for a few years (3-8). Recreation opportunity is expected to return to pre-project conditions within 8 years.
- Project design features have been incorporated to reduce potential conflicts with the motoring public using the Nestucca Backcountry Byway.
- Analysis for Visual Resource Management Classes I –IV was conducted and the project was found to adhere to visual resource management objectives for all classes.

Invasive, Non-native Species (Executive Order 13112): (EA section 3.8): Effects to this resource would not have significant impacts because:

- The current assemblage of invasive, non-native species are generally not tolerant of shade and should they emerge on disturbed site within the project area it is expected that they would not persist as the canopy becomes closed again.
- Project design feature that include equipment washing and monitoring is expected to keep new infestations of shade tolerant species from becoming established.

Special Status and SEIS Special Attention Plant Species and Habitat: (EA section 3.9): Effects to this resource would not have significant impacts because:

- All sites for Special Status and SEIS Special Attention plants that were located during surveys favor larger conifers and will be protected by reserving the trees they were found on and also by project design features that reserve the largest trees in the treatment units (diameter cut limits).

Air Quality, Fire Risk and Fuels Management: (EA section 3.10): 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 and trails. 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 3.11): 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.

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 restoration projects that include 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 although the Nestucca River, which the Nestucca Access Road is adjacent to and is a potential haul route for the proposed action has been determined to be eligible for inclusion as a recreational river under the National Wild and Scenic Rivers System. The Nestucca River is also located within the Nestucca River Area of Critical Environmental Concern (ACEC). The Nestucca Access Road has been in existence since before the designation of the Nestucca River ACEC and vehicle travel has not, nor is it expected to affect the relevant and important features for which the ACECs was designated. 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. Activities associated with the proposed coarse wood development outside of the density management units are designed to accelerate the development of some late-successional forest structural features and are not predicted to impact wetlands or riparian areas.

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 one comment letter 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 7 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 3 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 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 projects do not set a precedent for future actions that may have significant effects, nor do they 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 projects in the context of past, present and reasonably foreseeable actions (Section 3). A complete disclosure of the effects of the action alternatives is contained in Section 3 of the EA. Cumulative effects have been identified for Forest Vegetation Resources (EA Sections 3.1.4), Water Resources (EA Section 3.2.4) Fisheries Resources (EA Section 3.3.4) Soils Resources (EA Section 3.4.4) Wildlife Resources (EA Sections 3.5.4, 3.5.5, and 3.6.4), Recreation and Visual Resources (EA Section 3.7.4) Plants (EA Sections 3.8.4, and 3.9.4), Air Quality, Fire Risk, and Fuels (EA Section 3.10.4), and Carbon Storage (EA Section 3.11.4). 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 resources and none were found (Project Record Document # 49). 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 2.1.3.2).

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 expected to have a short-term negative impact on spotted owl dispersal habitat but have a long-term positive effect on spotted owl suitable habitat, which require informal consultation with the US Fish and Wildlife Service. There would not be any effects to marbled murrelets or their habitat. In accordance with regulations pursuant to Section 7 of the Endangered Species Act of 1973, as amended, informal consultation with the US Fish and Wildlife Service (USFWS) concerning the potential impacts of the Walker Creek Terrestrial Restoration Project upon the spotted owls and/or their designated Critical Habitat would be completed by including the projects (timber sales resulting from implementation of the Walker Creek Terrestrial

Restoration 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 changed 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 BLM determined that based on the potential for small inputs of sediment to Oregon Coast coho salmon habitat streams from timber haul and culvert replacement, and that there is a possibility of a slight reduction of wood recruitment potential to a coho habitat stream, that informal consultation with National Marine Fisheries Service is warranted (Section 4.2.2 of the EA). Consultation with the National Marine Fisheries Service on these potential effects of the proposed project on coho is underway and will be completed with project specific consultation (Section 7 Streamlined Consultation). Required assessment for Magnuson-Stevens Fisheries Conservation and Management Act Essential Fish Habitat for the proposed action is included in EA (Section 3.3.3 of the EA). Section 7 Endangered Species Act Consultation will be completed prior to the Field Manager authorizing any action.

10. **Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment**. The proposed 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, Oregon Scenic Waterways 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: _____ _____

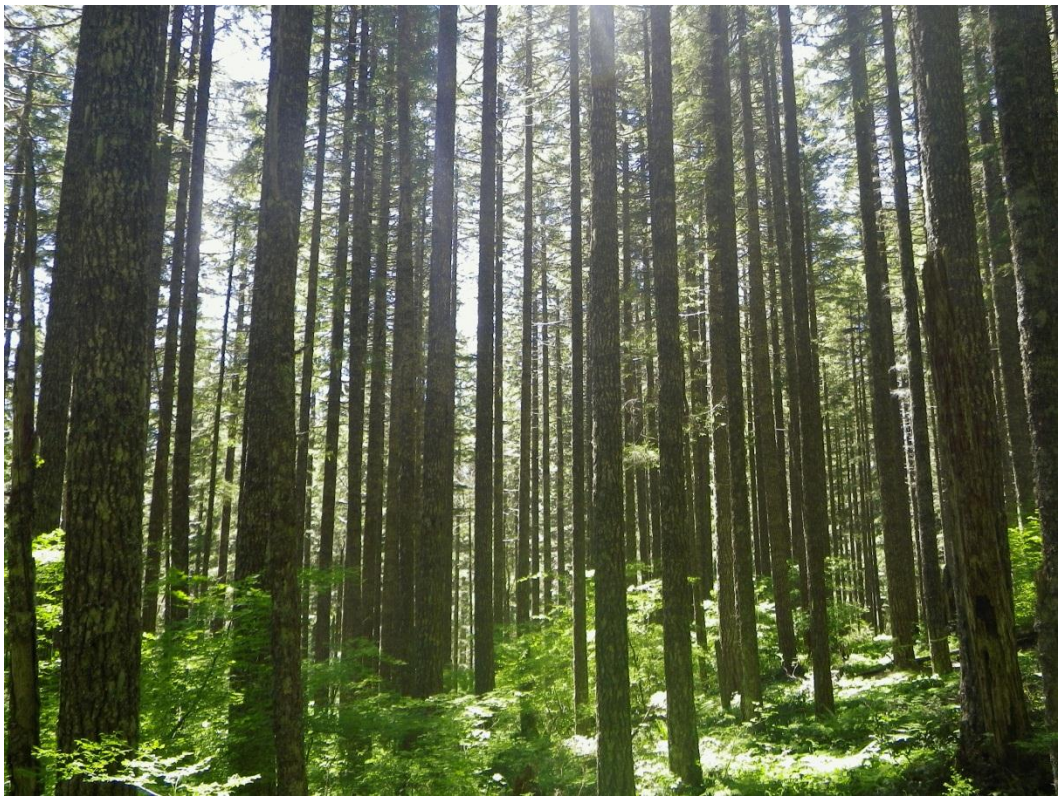
Karen M. Schank — Date
Tillamook Field Manager

Walker Creek Terrestrial Restoration Project
Environmental Assessment

Environmental Assessment Number DOI-BLM-OR-S060-2011-0012-EA
March 10, 2014

Salem District, Tillamook Resource Area
Tillamook and Yamhill Counties, Oregon

T. 3 S, R. 6 W sections 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, and 26 (W.M.)



Responsible Agency: USDI - Bureau of Land Management

Responsible Official: Karen M. Schank, Field Manager
Tillamook Resource Area
4610 Third Street
Tillamook, OR 97141
(503) 815-1100

For further information, contact: Andy Pampush, Project Leader
Tillamook Resource Area
4610 Third Street
Tillamook, OR 97141
(503) 815-1143

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/EA-14/017+1792

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WALKER CREEK TERRESTRIAL RESTORATION 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 terrestrial restoration project that includes the sale of timber within the Adapative Management Area, Late-Succesional Reserve, and Riparian Reserve land use allocations located within the Headwaters Nestucca River 6th-field watershed. 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 Walker Creek Terrestrial Restoration Project (hereafter also known as the Walker Creek 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

Northern spotted owl populations in Oregon's Coast Range have been declining precipitously in recent years (USFW, Spotted Owl Revised Recovery Plan 2011, p.A-6). Recovery Action 6 from the Recovery Plan recommends land managers in moist forests regions manage for spotted owl habitat by implementing silvicultural techniques in plantations, overstocked stands and modified younger stands to accelerate the development of structural complexity and biological diversity that will benefit spotted owl recovery (Recovery Plan p. III-19). The Recovery Plan also recommends that treatments should occur in stands older than 80 years of age in cases where long-term beneficial effects to spotted owls will be realized from enhancing within-stand structural diversity.

The Walker Creek Terrestrial Restoration Project proposes to carry out some of the recommendations from the Recovery Plan by changing the developmental pathway of selected overstocked forest stands, including stands over 80 years of age, in the southern portion of the Headwaters Nestucca subwatershed from one of poor current and future northern spotted owl habitat to a more resilient complex habitat that would contribute to the eventual recovery of the northern spotted owl. These overstocked stands occur across all land use allocations (AMA, Riparian Reserve, and Late Successional Reserves). This proposal would implement the objective from the Salem District's RMP to protect, manage, and conserve federally listed and proposed species and their habitats to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, and BLM special status species policies (Salem District 1995 ROD/RMP, P.28).

The Proposed Action is needed at this time because the stands being considered for treatment do not provide high quality habitat for the northern spotted owl and would still respond favorably to manipulation. These are the types of stands identified in the *Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management* (LSRA 1998) in the Core Landscape Zone where one of the objectives is to develop late-successional habitat in the mixed-seral areas adjacent to large interior blocks (LSRA p. 46).

Data analysis and field examinations by BLM staff have identified specific stands (see Figure 2) within the Walker Creek Activity Planning Unit where previous historical events (fires, grazing) and past forest management (thinning) have resulted in a stagnated, simplified forest condition that is relatively inhospitable to those wildlife species, particularly the spotted owl, that favor dynamic complex forest conditions such as those found in fully functioning late-successional and old-growth forests in the Pacific Northwest.

Treatments such as density management, wildlife structure creation and planting additional site-adapted native trees in the understory would be beneficial in redirecting the currently stagnated stand development to a more complex structure characteristic of older forests, increase the stand resiliency to the impacts of *Phellinus weirii* root disease where it is prevalent. The project would also provide a supply of timber for local mills consistent

with the Salem District RMP's strategy to manage BLM lands to maintain healthy, functioning ecosystems from which a sustainable production of natural resources can be provided (Salem District 1995 ROD/RMP, P. 4) and AMA objectives of …restoration and maintenance of late-successional forest outside of reserves, consistent with marbled murrelet guideline; retention of key structural elements of late-successional forest on lands subject to regeneration harvest; restoration and protection of riparian zones; and provisions of a stable timber supply (Salem District 1995 ROD/RMP, P. 19). It is important to remove most of the cut trees from the treated stands for several reasons: 1) not removing the cut trees could result in a build-up of Douglas-fir bark beetles in the down wood at levels that could cause an unacceptable level of mortality to the residual stand and stands outside of the project area (including on private lands) which could jeopardize the stands ability to reach the desired future condition; 2) the amount of ground covered by down wood would impede underplanting which could jeopardize the development of a multi-layered forest in the future; and 3) selling and removing felled timber above the level identified as currently necessary for ecosystem function from these O&C lands would contribute economic stability of local communities and industries.

1.2 Findings and 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:

- The Decision would document the selected alternative and the rationale for its selection.

1.3 Scoping

Internal Scoping:

In 2003 The Tillamook Resource Area conducted a planning effort with the purpose of prioritizing BLM lands within the Nestucca River 5th field watershed as to their suitability and potential for restoration treatments. The effort produced a working draft document known as *Strategic Activity Planning for the Nestucca Watershed*, dated October 2, 2003. The result of the effort was a relative ranking of the subwatersheds (also known as Activity Planning Units) within the Nestucca drainage from highest potential for treatment to lowest. The next steps are to use the results of the strategic activity planning effort and specifically work through the ranked Activity Planning Units (APU's) by looking at on-the-ground conditions and compare those conditions with the desired future conditions described in the Nestucca Watershed Analysis (October 1994) and the Late Succession Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area (LSRA). The final product is a report summarizing the planning issues and list of recommendations for potential projects that could be implemented to address resource issues.

The Walker Creek Activity Planning Unit, which ranked 4th of the nine subwatersheds assessed, is now included in the Headwaters Nestucca subwatershed as defined by Pacific Northwest Hydrography Framework and Natural Resources Conservation Service. The Headwaters Nestucca subwatershed also includes the Cedar Creek and Ginger Creek subwatersheds, which together ranked 3rd in the Strategic Activity Planning report and for which project evaluation, development and implementation has already occurred.

In the summer and fall of 2006 an interdisciplinary team evaluated the Walker Creek subwatershed and developed a report called the *Walker Creek Activity Planning Report* which contains a list of potential projects. The team also considered whether opportunities for commercial timber harvest were available in association with any restoration activities that may be available. The following resources were evaluated:

- Terrestrial wildlife habitat – particularly late-seral forest habitat
- Water quality
- Fisheries habitat
- Forest vegetation
- Botanical species – particularly special status species.
- Transportation network
- Recreation

The APU report identified 14 projects that could be implemented that would address deficiencies found in resource conditions. Of these, the Tillamook Field Manager has found nine projects that are potentially appropriate for implementation in whole or in part at this time. All or parts of four of these projects will be addressed by this Environmental Assessment. The remaining projects either have been, or will be addressed in other NEPA documents. The projects covered in this EA include:

- Commercial Density Management: In order to meet the RMP's wildlife and silvicultural objectives, approximately 575 acres of the 1,160 acres identified in the APU report would receive treatment. Through further detailed internal scoping, approximately half of the potential acres reviewed have been found to be unsuitable for commercial density management at this time for a variety of reasons. The reasons include: the timber not being commercially viable at this time (approx. 95 acres), current natural stand trajectory toward complex forest habitat is acceptable (approx. 265 acres), oversteepened, fragile slopes (approx. 60 acres), riparian no-harvest buffers to protect water quality and maintain stream wood recruitment potential (approx. 100 acres), red tree vole management areas (approx. 15 acres), infeasibility - too costly to reach without causing undue resource damage (approx. 20 acres).
- Density Management in Spotted Owl RPA (Reserve Pair Area): Density management thinning in dispersal habitat within the Kutch-Panther Reserve Pair Area to improve stand conditions for development of future high quality late-seral spotted owl habitat. Approximately 70 acres of the RPA would be thinned as part of the Walker Creek Density Management Project.
- Wildlife Habitat Enhancement in Mature Stands: Wildlife habitat structure creation would occur in conjunction with density management activities. Snags, topped/topped girdled trees, and/or down logs would be created in some stands that are approximately 120 years old that are adjacent to or near proposed density management units.
- Add Coarse Woody Debris to Riparian Areas and Stream Channels: As part of the Coarse Woody Debris and Wildlife Habitat Structure Enhancement actions associated with the density management project, a portion of the work would include felling approximately 30 larger trees into selected headwater streams to provided needed structure for sediment storage, wood routing processes and nutrient cycling that are important to ecosystem function in Oregon Coast Coho Critical Habitat. This work would also benefit terrestrial species and function by providing down wood cover for spotted owl prey species.

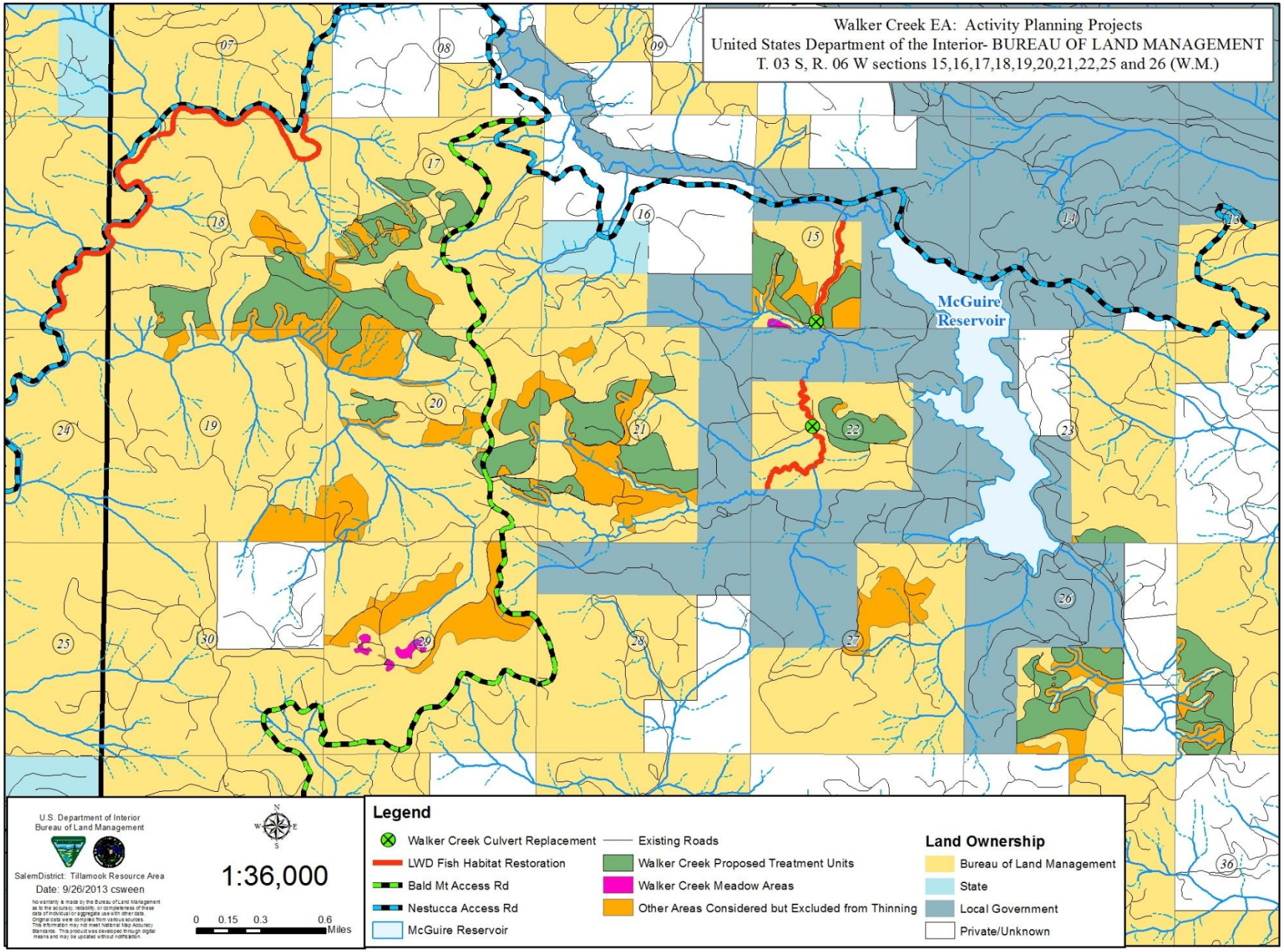
Projects from the Walker Creek Activity Planning Unit report that have already been implemented or will be implemented in the near future (funding secured) that are/have been covered by other NEPA documents.

- Stream Habitat Enhancement on the mainstem Nestucca River: This project was completed in 2012 by placing approximately 120 large trees in the Nestucca River channel between the Bald Mountain Fork and Ginger Creek tributaries (along the northern boundary of the Walker Creek Activity Planning Unit).
- Stream Habitat Enhancement Walker Creek Project: This project is funded and has been partially implemented. Placement of large wood pieces into the Walker Creek channel on BLM land in Section 22 of the planning area was completed in 2013 and the remainder of the project will be completed in 2014 by

placing large wood in Walker Creek in Section 15. NEPA analysis for this project is provided by the Salem District Aquatic and Riparian Restoration EA (March 2012).

- Large Fish Passage Culvert Replacements: This project replaced two large culverts on Walker Creek to address failing infrastructure and improve fish passage for coastal coho. This project was originally analyzed under the Nestucca Culvert Replacement or Removal for Fish Passage EA (September 2003) but is also covered by the analysis in the Salem District Aquatic and Riparian Restoration EA (March 2012).
- Continued Implementation of the Coastal Road Stabilization EA and the Road Maintenance project: Approximately 25 stream crossing or cross drain culverts were replaced in 2013 within the Walker Creek subwatershed. Some roads that would be used for the Walker Creek Terrestrial Restoration project would receive maintenance to bring them up to standards for timber haul in order to avoid infrastructure degradation and sediment runoff. A small amount of road would be fully decommissioned that would result in a reduction of road mileage within the Nestucca watershed.
- Meadow Maintenance/Restoration: Two Categorical Exclusion documents would be prepared to address issues with the maintenance and/or restoration of meadow habitat on Bald Mountain and at the Walker Flat ACEC sites. The Bald Mountain project would be implemented using Damaged Lands Funds and includes repairing rutting caused by OHV's and blocking OHV access to the meadow by installing boulders at likely access points and by securing the existing gate with a quality locking system. Work at the Walker Flat meadow would be done using youth crews to cut encroaching woody vegetation with hand tools. The boulders for blocking access to Bald Mountain have already been purchased and placement is expected to occur within two years. Funds are available for treatment in Walker Flat ACEC and treatment is expected to occur in the fall or winter of 2014.

Figure 1- Walker Creek Subwatershed Activity Planning Map



External Scoping:

External scoping (seeking input from people outside of the BLM) was conducted by means of a scoping letter for the Walker Creek Projects sent out to 15 municipal government agencies, nearby landowners, and interested parties on the Tillamook Resource Area mailing list on September 12, 2011. In addition, a description of the proposal was included in the Salem Bureau of Land Management Project Update for September 2011, which was mailed to more than 150 individuals and organizations.

One comment letter was received by Doug Heiken of Oregon Wild as a result of this scoping. A summary of the comments and the BLM responses are in Section 6 of this document. The scoping comment letter is available for review at the Tillamook Resource Area Office, 4610 Third Street, Tillamook, Oregon.

1.4 Proposed Action

The Tillamook Resource Area, Salem District Bureau of Land Management (BLM), proposes to implement forest management and restoration activities, which includes commercial timber sales, within the Headwaters Nestucca River 6th-field watershed. The proposed action includes commercial density management thinning applied in a variable-spaced manner to approximately 575 acres of predominantly Douglas-fir stands, development of coarse wood structures such as large snags, large down wood and live trees treated to create complex crowns, and planting of shade tolerant native tree species in the understory. The action also includes maintenance and improvement of roads and culverts, treatment of approximately 45 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 variable spaced thinning and associated actions would be to create forest diversity on the landscape by creating conditions, and introducing features that would directly benefit spotted owls consistent with Late-successional Reserve, Spotted Owl Recovery Plan and Spotted Owl Critical Habitat objectives.

1.4.1 Project Area Location and Vicinity

The Walker Creek Project area is approximately 15 miles northwest of the town of McMinnville, Oregon, in the Headwaters Nestucca River subwatershed of the Nestucca River watershed (Table1). The project area includes BLM-managed lands within sections 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, and 26 of Township 3 South, Range 6 West, Willamette Meridian (WM), in Tillamook and Yamhill Counties, Oregon, (Table 1).

The proposed project area is located on revested Oregon and California Railroad Lands (O & C Lands) within the Adaptive Management Area (AMA), Late Successional Reserve (LSR) and Riparian Reserve (RR) land-use allocations (LUAs). BLM-administered land, especially in the eastern 1/3rd of the proposed project area, is intermixed with private and City of McMinnville timberlands, creating an assortment of ownership patterns, (Table 2). With the exception of McGuire Reservoir and the Meadow Lake area, essentially all of the project area is forested and on the non-BLM lands used for timber management. The BLM lands are designated in Salem's 1995 Resource Management Plan for restoration of late-successional forest.

Table 1: Watershed, Subwatershed and Proposed Treatment Acres

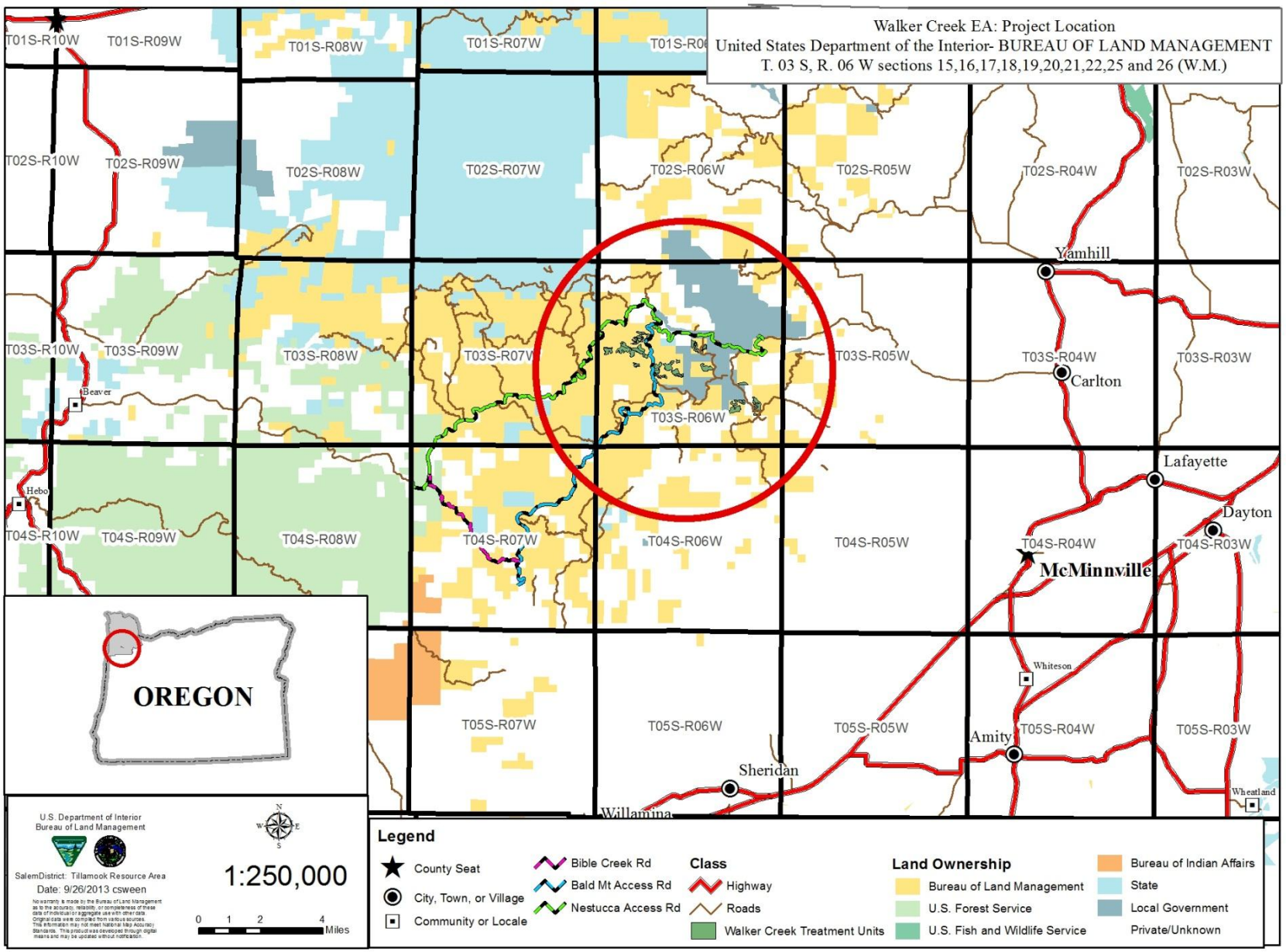
5th Field Watershed Name	5th Field Watershed Acres	6th Field Subwatershed Name	Total 6th Field Subwatershed Acres	Proposed Density Management Treatment Acres (est)	Percent of Subwatershed Area Treated
Nestucca River	164,822	Headwaters Nestucca River	12,587	575	4.5

Table 2: Land Ownership within the Headwaters Nestucca River Sixth-Field Subwatershed

Owner	Acres	Percent of Subwatershed
BLM	7,298	58
Private - Industrial	2,531	20
City of McMinnville	2,048	16
State	535	4
Private - Other	185	2

The Walker Creek Project has been developed out of planning efforts that were conducted 2006 as documented in the Walker Creek Activity Plan (December 2006) covering the southern portion of the Headwaters Nestucca River subwatershed with the northern boundary being the Nestucca River.

Figure 2 - Project Location Map



1.5 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 density management restoration 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*.

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

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

Information from the "Past and Current Conditions"(pp. 6 – 38) and "Desired Future Conditions" (pp. 60 – 62) found in the *Nestucca Watershed Analysis*, October 1994, has been incorporated into the development of the proposed thinning activities and into the description of the Walker Creek Projects EA's affected environment and environmental effects (*EA section 2.3*) and is incorporated by reference.

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

1.5.1 Survey and Manage Species Review

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

On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in *Conservation Northwest, et al. v. Rey, et al.*, No. 08-1067 (W.D. Wash.) (Coughenour, J.), granting Plaintiffs' motion for partial summary judgment and finding a variety of NEPA violations in the BLM and USFS 2007 Record of Decision eliminating the Survey and Manage mitigation measure. Judge Coughenour deferred issuing a remedy in his December 17, 2009 order until further proceedings, and did not enjoin the BLM from proceeding with projects. Plaintiffs and Defendants entered into settlement negotiations that resulted in the 2011 Survey and Manage Settlement Agreement, adopted by the District Court on July 6, 2011. Pertinent to the Walker Creek Terrestrial Restoration Project, the Settlement Agreement updated the 2001 Survey and Manage lists and incorporated the previously stipulated "Pechman Exemptions" which include:

A. Thinning projects in stands younger than 80 years old

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

On April 25, 2013, the Ninth Circuit Court of Appeals issued an opinion that reversed the District Court for the Western District of Washington's approval of the 2011 Survey and Manage Settlement Agreement. The case was then remanded back to the District Court for further proceedings. On February 18, 2014, Judge Coughenour granted, in part, injunctive relief that allows the BLM to proceed with developing and implementing projects under the terms of the 2011 Survey and Manage Settlement Agreement for projects that fall within one or more of the following categories of projects:

(1) Projects in which any Survey and Manage pre-disturbance survey(s) has been initiated (defined as at least one occurrence of actual in-the-field surveying undertaken according to applicable protocol) in reliance upon the Consent Decree (Settlement Agreement) on or before April 25, 2013;
(2) projects, at any stage of project planning, in which any known site(s) (as defined by the 2001 Record of Decision) has been identified and has had known site-management recommendations for that particular species applied to the project in reliance upon the Settlement Agreement on or before April 25, 2013, and
(3) projects, at any stage of project planning, that the Agencies designed to be consistent with one or more of the new exemptions contained in the Consent Decree on or before April 25, 2013.

The Walker Creek Terrestrial Restoration Project complies with Judge Coughenour's February 18, 2014 order because: 1) planning for the project began in August of 2011 (Project Record # 4) and relied on the 2011 Settlement Agreement for survey and manage guidance; and 2) the first surveys for S&M species occurred in December 2011(Project Record # 20). The Walker Creek Project relied on one of the "Pechman Exemptions" incorporated into the Settlement Agreement, *A.) Thinning projects in stands younger than 80 years old* to exempt 165 acres of forest stands proposed for treatment that are less than 80 years old as determined through stand exams which involved coring and aging dominant trees on sample plots.

The proposed density management of the remaining 410 acres of forest that are older than 80 years is <u>not</u> covered by Pechman exemptions and therefore has been surveyed using accepted protocols (terrestrial mollusks, botanical species, and red tree voles) using the updated 2001 Survey and Manage species list as agreed to in the 2011 Settlement Agreement.

Five active sites of the red tree vole (RTV) were found during surveys including two sites within the boundaries of units as originally proposed. All of the active RTV sites have been excluded from proposed units and consistent with RTV Management Recommendations, ten-acre management areas were developed around the sites with at least one site potential tree height distance from the nest tree to any proposed unit boundary (Management Recommendations for the Oregon Red Tree Voles, ver. 2.0, 2000). A number S&M lichen species were also located during surveys, all on the boles of conifer trees. Thirty-five sites of *Stenocybe clavata*, twenty-seven sites of *Chaenotheca chrysocephala*, one site of *Chaenotheca ferruginea*, one site of *Cheanothecopsis pusilla* and one site of *Hypogymnia duplicata* were found. Four of the five species are considered impractical to conduct pre-disturbance surveys for and therefore are assigned to S&M categories (categories B and E) that do not require pre-disturbance surveys but do require management of known sites. The Tillamook Resource Area botany survey contracts require that the surveyor provide a complete list of species found including *any* species that are included in the Survey and Manage mitigation program. Consequently, the contracted surveyor identified many sites (with verified

sample collections) of species that are considered impractical to survey for. Management recommendation and expert input indicate that site protection can be achieved by protecting the trees that the species occur on from direct logging damage.

1.5.2 Relevant Statutes/Authorities

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

- Oregon and California Act (O&C) 1937 – Requires the BLM to manage O&C lands for permanent forest production, in accord with sustained-yield principles. Management of O&C lands must also protect watersheds, regulate streamflow, provide for recreational facilities, and contribute to the economic stability of local communities and industries.
- Federal Land Policy and Management Act (FLPMA) 1976 – Defines BLM's organization and provides the basic policy guidance for BLM's management of public lands. 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.

Additional authorities and management direction are described in Table 18.

1.5.3 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 (see *EA section 1.3*). 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 Terrestrial Restoration Project area is within the Adaptive Management Area (AMA), Late Successional Reserve (LSR) and Riparian Reserve land use allocations (ROD/RMP p. 5; NWFP pp. A-4, A-5; EA section 1.3). The project area is also within the Upper Nestucca River Tier 1 Key Watershed (ROD/RMP p. 6). Additionally, those lands that are designated LSR are also Critical Habitat for both the spotted owl and the marbled murrelet, two bird species listed as threatened under the Endangered Species Act (ESA). Coastal coho salmon are also listed under ESA as threatened and Critical Habitat for coho includes the Nestucca River and portions of Walker Creek and Bald Mountain Fork tributaries within the proposed project area. The following ROD/RMP and NWFP objectives would apply to this project.

<u>Within the LSR land use allocation</u>

The management objectives for the LSR land use allocation are: development of old-growth forest characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition; and prevention of large-scale disturbances by fire, wind, insects and diseases that would destroy or limit the ability of the reserves to sustain viable forest species populations (Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (NWFP ROD/FSEIS), USDA Forest Service and USDI BLM, 1994, p. B-5). The Late-Successional Reserve Assessment for Oregon's Northern Coast Range Adaptive Management Area (LSRA) (USDA Forest Service and USDI Bureau of Land Management, 1998) identified the Walker Creek Terrestrial Restoration Project area as part of the Core and Corridor Landscape Zones. Lands within the Core Landscape Zone are contained in large blocks of contiguous land which is in federal ownership. The intended function of the Core Landscape Zone is to provide the genetic source for populations of late-successional species. The goals of the Core Landscape Zone are (LSRA pp. 44-46):

- Minimize fragmentation. Provide large, contiguous patches of late-successional habitat and maximize interior forest habitat;

- Increase connectivity and dispersal habitat within the large interior blocks and develop late-successional habitat in the mixed-seral areas adjacent to the large interior blocks.

Lands within the Corridor Landscape Zone are intended to provide connectivity to the surrounding LSR network, as well as adjacent state and private lands. This Zone is intended to provide refugia areas along travel routes for late-successional forest species which are dispersing to and from the populations in the Core Landscape Zone. The goals of the Corridor Landscape Zone are (LSRA pp. 44-46):

- Improve, create and maintain late-successional habitat connectivity and dispersal habitat across the assessment area, especially between Reserved Pair Areas;

- Increase late-successional habitat connectivity and dispersal habitat within the larger network of LSRs and with late-seral blocks on state and private lands outside of the assessment area.

<u>Within the AMA land use allocation</u>

The objectives in the Northern Coast Range AMA are to restore and maintain late-seral forest habitat outside of reserves, consistent with marbled murrelet guidelines, as well as provide a stable supply of timber (RMP p.19). In addition, there is an objective to develop and evaluate new management approaches to integrate and attain ecological and economic health, and other social values. There is also a guiding principle of permitting freedom in forest management approaches. Specific management goals identified in the RMP include:

- Design management activities around LSRs to reduce the risk of natural disturbances (ROD/RMP p. 20);
- Protect riparian areas in a manner comparable to that prescribed for other federal land areas. Desired conditions may be achieved in a manner different than that prescribed for other areas, and research projects may be conducted within riparian zones (ROD/RMP p. 20);
- Manage developing stands on available lands to promote tree survival and growth and to achieve a balance between wood volume production, quality of wood, and timber value at harvest (ROD/RMP p. 46);
- Provide a sustainable supply of timber and other forest products (ROD/RMP p. 46).

<u>Within the Riparian Reserve land use allocation</u>

For the Walker Creek 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 440 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 220 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 (ROD/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. (ROD/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 (ROD/RMP p. 9);
- Design and implementation of watershed restoration projects in a manner that promotes long-term ecological integrity of ecosystems (ROD/RMP p. 14);
- Minimizing disruption of hydrologic flow paths, including diversion of stream flow and interception of surface and subsurface flow(ROD/RMP p. 11);
- Minimizing sediment delivery to streams from roads(ROD/RMP p. 11);
- Maintaining effective shade for streams pursuant to BLM's TMDL agreement with the State of Oregon;
- Meeting all Aquatic Conservation Strategy (ACS) Objectives (ROD/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 AMA and LSR LUAs. 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 of 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 (ROD/RMP pp. 9-15, Appendix D-6, NWFP p. B-32).

<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 (ROD/RMP p. 62) and reduce environmental effects associated with identified existing roads within the project area (ROD/RMP p. 11) by:

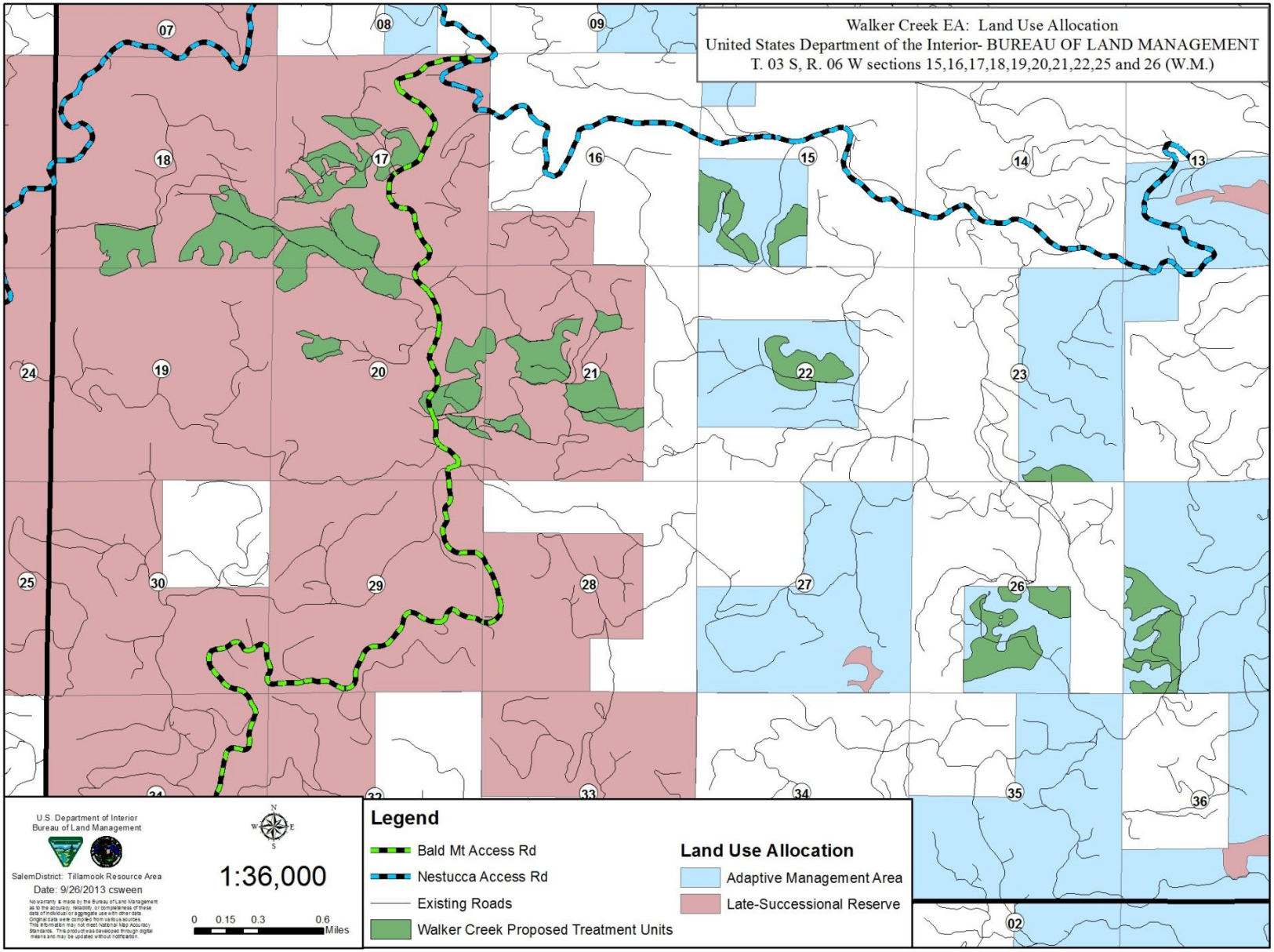
- Providing appropriate access for timber harvest, silvicultural practices, and fire protection vehicles needed to meet the objectives above;
- Perform road maintenance to prevent road deterioration or failure and to prevent road generated sedimentation that exceeds ODEQ standards.

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

- Minimizing disturbance of identified fragile sites;
- Applying best management practices during all ground- and vegetation-disturbing activities (see table 20 for list of BMP's).

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

Figure 3 - Map of Land Use Allocations - Walker Creek Planning Area



1.5.4 Revised Recovery Plan for the Northern Spotted Owl

The Walker Creek Project would meet objectives of the 2011 Revised Recovery Plan for the Northern Spotted Owl by adhering to the principles of adaptive management and active forest restoration. The following quote from the recovery plan captures the essence of the purpose of the Walker Creek Project – *"This Recovery Strategy requires action in the face of uncertainty. We agree with Carey (2007, pg. 345, 349): "(A)ctive management for ecological values trades short-term negative effects for long-term gains…Collaborative management must be willing to accept short-term impacts and short-term risks to achieve long-term benefits and long-term risk reduction; overly zealous application of the precautionary principle often is a deliberate, conscious management decision to forego long-term increases in forest health and resilience to avoid short-term responsibility or controversy." In other words, land managers should not be so conservative that, to avoid risk, they forego actions that are necessary to conserve the forest ecosystems that are necessary to the long-term conservation of the spotted owl. But they should also not be so aggressive that they subject spotted owls and their habitat to treatments where the long-term benefits do not clearly outweigh the short-term risks. Finding the appropriate balance to this dichotomy will remain an ongoing challenge for all who are engaged in spotted owl conservation."*

Specifically, the Walker Creek Terrestrial Restoration Project is consistent with or addresses the following Recovery Actions from the Recovery Plan:

- Recovery Action 6: *In moist forests managed for spotted owl habitat, land managers should implement silvicultural techniques in plantations, overstocked stands and modified younger stands to accelerate the development of structural complexity and biological diversity that will benefit spotted owl recovery.*

This recovery action also states "…In addition, LSR thinning in plantations older than 80 years of age should occur in cases where long-term beneficial effects to spotted owls will be realized from enhancing within-stand structural diversity." (Revised Recovery Plan for the Northern Spotted Owl, pp. III-19-20)

- Recovery Action 10 - *Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population.*

There are only about 30 acres of what would be considered "high value" spotted owl habitat within the Walker Creek analysis area and none of the proposed treatments would occur near that habitat. Additionally, the density management treatment would only occur in unoccupied stands of dispersal habitat.

- Recovery Action 16: *Federal, State, and local managers should consider long-term maintenance of local forest management infrastructure as a priority in planning and land management decisions.*

This project would help maintain local forest management infrastructure by making timber available to local processing centers through the sale of the thinned trees.

- Recovery Action 32: *Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service as described below to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees.*

The Walker Creek Project is consistent with Recovery Action 32 because there would not be any high quality complex habitat included in the density management thinning and that the objective of the project is to develop complex habitat sooner than if no treatment occurred. The project objectives include the establishment of an

understory canopy layer for vertical structural diversity and provisions for the maintenance and active development of decadence components.

1.5.5 Adaptive Management

The Tillamook Resource Area has implemented a number of density management projects since the inception of the Northwest Forest Plan. A regular monitoring program has been ongoing that includes revisiting old projects to see if project objectives have been or are being met. Two projects that have particular bearing on the Walker Creek Terrestrial Restoration project are the Muletail Density Management Project and the Willy's Elk Density Management Project which were both implemented under the 1995 RMP within the Nestucca River 5th field watershed.

The Muletail project was implemented in 1996 and involved thinning and re-thinning 60-90 year old stands of Douglas-fir to stem densities of 30, 50, and 70 trees per acre. Some wildlife enhancement treatments were done but, most importantly the project was underplanted with a mix of native tree species. Fifteen years later the understory is established (primarily with western hemlock) and, where the canopy cover is more open (30 and 50 tpa areas) the understory trees are beginning to reach into the mid-story level of approximately 30 feet above ground level and continuing to gain height growth. Also, in the more heavily thinned areas, limb elongation and epicormic[2] branching is readily evident, as is crown elongation caused by lower limbs being retained on reserve trees while height growth continues.

The Willy's Elk project, implemented in 2002, involved light to moderate density management of 80 – 90 year old stands of pure Douglas-fir, a portion of which was previously thinned. The prescription was intended to introduce variability to the stand at the stand scale and change the development trajectory from one of simple single layered stands to a more complex structure while accelerating the growth of reserved trees. No wildlife treatments were conducted and no underplanting was done. The results do not show any observed change in structural development after ten years. The reserved trees did accelerate in growth but there is little evidence that a second canopy layer is developing due to the lack of available seed source. The stands appear to be on course to stagnate again in the future as a single layer non-complex forest with little value to late-successional dependent species.

The difference in results between the Willy's Elk and Muletail projects pertaining to the development of complex forest structure are due to the active underplanting of shade tolerant native trees in Muletail and not Willy's Elk. Using the results of these monitoring efforts, the BLM designed the Walker Creek Project to change the stand development trajectory and set the stage for continued management toward the development of complex structured late-succession forest stands that are functioning as habitat for the spotted owl.

1.5.6 Desired Future Condition

Using our adaptive management experience and institutional knowledge of forest stand dynamics, we envision that in the next four or five decades the treated stands would exhibit complex structural diversity characterized by; 20-30 very large Douglas-fir overstory trees, several with complex crown features; 6-8 very large and several smaller snags per acre; several large down logs in various decay stages; multi-layer canopy of shade tolerant species that provide lower level shade and wind abatement to the forest floor and riparian areas; canopy gaps - where branch elongation and epicormic branching along the boles of trees is occurring on the edge trees while a hardwood component is also developing; and a well-developed brush layer with a patchy distribution. High mid-story occlusion and high canopy closure would be present and density independent mortality processes would be active throughout the stands while density dependent mortality may be starting to occur within the understory trees at which time the intermediate canopy layer would begin to contribute CWD.

[2] Branches that grow out of the main stem of a tree from buds produced under the bark, usually due to an increase in solar radiation on the stem.

The Walker Creek Terrestrial Restoration Project has been designed to start the process toward the desired future condition by opening the overstory stand enough to allow for underplanting and establishment of a shade tolerant conifer layer which is critical to the development of a future complex multi-layered canopy. This project would also immediately create an intermediate level of coarse wood and wildlife habitat structural components in the overstory, such as platforms of various sizes created by topped trees which would also introduce top-rot agents which could result in high quality hollow cavities.

The images below are 5 acre patches of 2010 LiDAR data from two areas within the Nestucca watershed that depict the difference between high quality late-successional/old-growth forest (Figure 4- Elk Creek), similar to the desired future condition, and a single story 87 year old Douglas-fir stand that is part of the Proposed Action (Figure 5 - unit 21-23, see cover photo). The Elk Creek stand is part of the Elk Creek Area of Critical Environmental Concern and is part of a former spotted owl core area.

Figure 4 – LiDAR of Elk Creek Late-Successional Forest (Desired Future Condition)

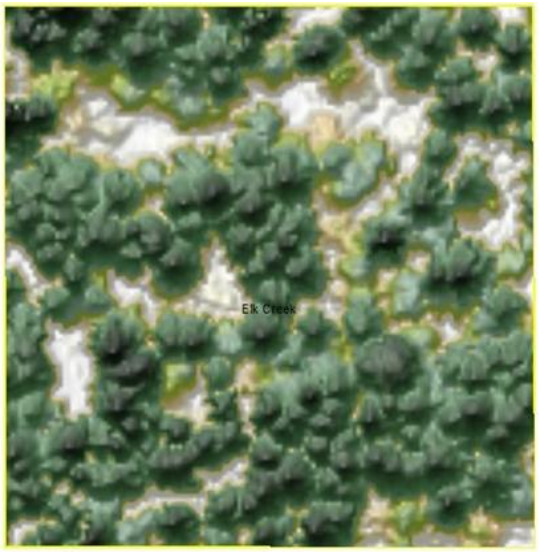
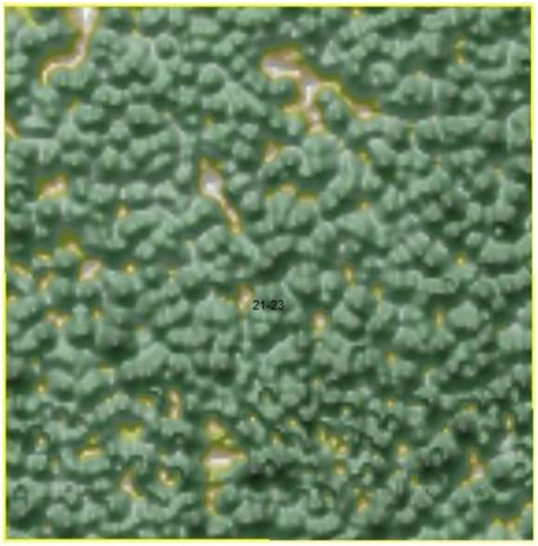


Figure 5 – LiDAR of Proposed Action Unit 21-23 (Current Condition)



The Elk Creek stand is typed as a 140 year old stand of Douglas-fir, redcedar and hemlock with an old-growth Douglas-fir overstory (3-4 old-growth per acre) which contains approximately 44 trees per acre varying from 10 to 256 feet in height, with 21 of the trees over 200 feet tall (dark green is taller, light color is shorter).

Figure 5 shows unit 21-23 of the Walker Creek project which was previously thinned in 1971 and currently contains approximately 110 dominant, co-dominant and intermediate trees per acre with heights varying from 113 – 173 feet. There are no shade tolerant species present in unit 21-23 and thus no conifer understory development.

A note about the LiDAR data: a nearest neighbor gradient tool was used to determine tree tips from the data, which works well for the dominant, co-dominant and intermediate trees that have distinctive tops in the overstory. Field observation shows that in the case where some of the tree crowns, especially of the smaller trees, are growing together or are growing into an adjacent larger tree that the LiDAR tool may not detect the top as a separate tree. Because the tool used to delineate tree tips is imperfect we believe that it may underestimate tree counts of smaller trees in denser stands but is still very accurate relative to tree heights. The LiDAR data shown here is for illustrative purposes only and was not used for developing specific harvest unit prescriptions.

2. ALTERNATIVES

2.1.1 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 1.6.3.3 below) that would minimize or eliminate the potential adverse effects of the Proposed Action.

2.1.2 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 terrestrial restoration actions would occur at this time. If this alternative were to be selected, the following items would not be done in the project area at this time: density management treatments; wildlife habitat structure development; underplanting shade tolerant trees, road construction, renovation, or maintenance in the Walker Creek sub-watershed area; and stream crossing projects such as culvert upgrades or removal, or large wood inputs to headwater streams.

Only normal administrative activities and other uses (e.g. road use, programmed road maintenance, harvest of special forest products on public land) would continue on BLM lands within the project area.

On private and State 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). Recent aerial photography indicates that there about 500 – 600 acres (7-8% of the subwatershed) of merchantable timber remaining on private lands within the southern portion of the Headwaters Nestucca subwatershed (which is generally coincident with the Walker Creek subwatershed). The remainder of the lands are either young plantations or non-forested (roads and reservoir). 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. 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. The FPA allows for removal of timber to a targeted basal area within the riparian management areas which could occur at the landowner's discretion. Road maintenance, rock quarrying and hauling of logs and rock would also occur on private lands in and near the project area.

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

2.1.3 Alternative 2: The Proposed Action

2.1.3.1 Proposed Treatments

The proposed action is the application of a variable-density thinning prescription to approximately 575 acres of 38- to 99-year-old, relatively dense, closed single-storied, even-aged, Douglas-fir-dominated stands with little or no shade tolerant conifer understory (Table 8). Stand ages referred to here are the projected stand ages at the time of treatment (beginning 2014), not the current stand ages. Stand ages were determined through stand exam procedures that included the coring and counting of rings of dominant trees that occur on the measure plots which were then averaged. The ages of the dominant trees within units tended to vary by ten years or less. There are no legacy trees (from the original stand) within any of the units. No old trees were encountered during stand exams or staff reconnaissance, or observed in aerial photos or LiDAR data. Treatments include thinning the Douglas-fir stand component while retaining what little hardwoods and other conifers are present, except in the younger stands where there is a more substantial component of western hemlock, some of which may be removed. Treatments would be designed to retain trees with complex crown architecture (useful for wildlife), structural

deformities, existing down wood and snags, and a component of trees in the suppressed and intermediate crown classes.

The objective of the variable-density thinning would be to create forest structural diversity on the landscape and create resilient, complex habitat for the northern spotted owl. The thinning would have the objective of opening the overstory canopy to establish an understory layer and to promote epicormic branching and complex crown development in the overstory trees. Most of the thinned areas would be underplanted with shade tolerant species to help develop a second canopy layer and reintroduce tree species diversity into the stands. Underplanting would average approximately 200 trees per acres planted with variable spacing targeting those areas where the trees have the best opportunity to survive and thrive such as areas with more light and/or less understory brush. Down wood, snags, and wildlife habitat structures would also be created in conjunction with the thinning. Over time these stands would be expected to develop into structurally diverse stands with multiple canopy layers and several age classes comprised of several conifer species.

Because the forest stands within Riparian Reserves also lack structural and ecological diversity, comprise a substantial area in Coast Range forests, and spotted owls are associated with riparian forests (McDonald et al. 2006, Glenn et al. 2004), the proposed treatments would be the same in the Riparian Reserves as in the areas outside of Riparian Reserves except that no gaps or openings of any kind (including *Phellinus weirii* treatments) would be created within the nearest one site potential tree distance from any stream (220 feet).

Both cable logging and ground–based logging methods would be used to accomplish the thinnings. Ground based harvesting systems would generally be restricted to average slopes 35% or less and areas without high moisture tables. Cable yarding would be used on all other lands.

Density Management Stands 80 years and older

There are 18 stands totaling 410 acres proposed to be treated in this category. These stands would be thinned from below (generally removing the smaller trees first – at the plot level) to various residual basal areas[3] with an upper diameter cutting limit where trees at the limit or larger are automatically reserved from harvest (Table 3). The diameter limit varies by unit and is based on the Quadratic Mean Diameter (QMD) of the stand plus 20% (LSRA p. 100-101). While the basal area target would ideally be reached across the whole stand, the prescription would actually be applied at the "plot" level. That is to say that the person marking the trees to be reserved would look at the basal area from where he/she is currently located while moving through the stand marking trees and not consider what the basal area is elsewhere in the stand. Using basal area to control stocking should result in with-in stand spacing and tree size variation because where trees tend to be smaller more trees would be removed to reach the target basal area. Conversely, where trees tend to be larger fewer trees would be removed to reach the basal area target (small trees contain less basal area than large trees). Under no circumstances would trees at or above the diameter cutting limit be removed to reach the target basal area so it is possible, and in some cases likely, that there would not be enough trees removed to reach the target basal area at the plot level. The result would be that in areas with fewer trees removed stand conditions would remain denser and, in areas of smaller diameter trees the residual stand would be more open post-harvest thus providing the anticipated variation. Existing down wood and snags would be retained for coarse wood.

[3] 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.

Table 3: Quadratic Mean Diameter, Cutting Limit, and Treatment Unit Acreage

Stand	QMD(inches)[4]	Diameter Cutting Limit (inches)[5]	Unit Acres (est.)
15-14	23.5	28	35
15-23	25.6	30	15
17-1	19.1	22	26
18-1	26.2	31	18
18-2	21.6	25	51
18-3	22.0	26	58
18-4	21.2	25	29
20-4	27.5	33	2
20-5	20.4	24	9
20-7	21.9	26	3
20-8	21.9	26	18
20-9	28.3	33	14
20-10	22.6	27	11
21-4	25.0	30	9
21-5	19.5	23	26
21-8	28.6	34	7
21-23	20.3	24	41
22-1	19.9	23	36

The following is an example of how the prescriptions would be implemented using one of the proposed units to illustrate the concept of thinning from below using basal area control with a diameter cutting limit.

Unit 20-4 is a stand with an origin of the year 1915 and currently has an estimated 83 trees per acre and a basal area of 344 sq. ft./acre. The proposed prescription would thin from below to a residual basal area of 233 sq. ft./acre with a diameter cutting limit of 33" DBH. This means all trees 33"dbh and greater would be reserved regardless of the prescription. Trees with features desirable to wildlife would also be favored to leave.

A tool often used to measure basal area is an angle gauge or basal area prism. Basal area prisms and other similar tools are calibrated by Basal Area Factor (BAF). The prism is used to determine if a tree is counted "in" or "out" of a variable plot. The plots are known as "variable plots" because the prism counts trees "in" based on the diameter size of the trees being measured on the plot. Small diameter trees need to be near the center of the plot to be counted in, whereas a large tree may be quite far from the plot center and still be counted in, thus the "size" of the plot varies from tree to tree. All of the trees around the plot are looked at through the prism to determine if they are in the plot or not. A BAF of 40 on a prism applies 40 sq. ft. of basal area to trees that are counted "in". For example if 8 trees are counted at a given location using a basal area factor of 40 then the basal area at that

[4] The diameter of the tree corresponding to the mean basal area of the stand
[5] The diameter at breast height where all trees at or above the limit are reserved from harvest.

location would be 320 sq. ft. (8x40=320). The basal area is expressed relative to the land area; in this case, sq. ft. per acre.

Using a basal area prism with a basal area factor of 40 in unit 20-4 would result in counting 8 or 9 trees per plot on average (320 to 360 sq. ft.). The prescription calls for a residual basal area after harvest of 233 sq. ft. which equates to most plots having 5 to 6 count trees (200 to 240 sq. ft.). This would be true in all cases if the stand was uniform in diameter sizes and all trees are smaller than the cutting diameter limit. However approximately 33% of the trees in unit 20-4 are over the diameter cutting limit and therefore automatically reserved. If, for example, the 40 BAF angle gauge counted 8 trees on a plot and 7 of them were over the diameter cutting limit, then only the one smaller tree would be removed and the reserve basal area on that plot would be 280 sq. ft. A situation like this is likely to occur in all units due to the fact that stands are not perfectly uniform and homogenous in tree sizes. It is important to note that as a stand is marked, the basal area is targeted at the "plot" level somewhat continuously and not averaged over the whole unit. That is, there would not be areas where more than the target basal area would be removed to make up for areas where less than the target was removed. These areas of higher density due to presence of trees larger than the diameter limit would help create the desired patchiness in the thinning. In general the basal area target would be met by marking the biggest, healthiest trees and/or trees desirable to wildlife.

Density Management Stands less than 80 years old

The units under 80 years old would be thinned from below to a desired basal area except in areas where *Phellinus weirii* (a root disease that causes mortality in Douglas-fir, the true firs and to some degree western hemlock) is especially prevalent. There are four units totaling about 165 acres that are less than 80 years old and all have QMD's below 20". As is the case with the older stands, thinning from below generally means removing the smaller trees at the plot level, except that in these younger stands there would not be a diameter cutting limit (not required in stands less than 80 years old per the LSRA, Appendix I.2. p. I-9).

There are about 45 acres where *Phellinus weirii* is especially prevalent occurring in one to seven acres patches where treatments would include leaving approximately 20 trees/acre at relatively wide spacing of the highly susceptible species (Douglas-fir and grand fir) along with retention of any existing hardwoods and less-susceptible conifers. These areas would be underplanted with disease-resistant western redcedar and red alder. The *Phellinus weirii* treatment prescription would not occur within a one site tree slope distance of any stream (approximately 220 feet) regardless of *Phellinus* infection level. Existing down wood and snags would be retained for coarse wood. Relatively open areas around landings would also be planted with shade-tolerant conifers (also see the Project Design Features section below).

Table 4: Estimated Acres by Land Use Allocations and Logging Systems for Proposed Treatment Units.

AMA Treatment (acres)	**LSR Treatment (acres)**	**TOTAL UNIT AREA (acres)**	**Logging Systems (acres)**	
			Ground-based	*Skyline*
220	355	575	375	200
Harvest Acres in Riparian Reserves				
Within the First Site Potential Tree Height (220')		*Within the Second Site Potential Tree Height (220'– 440')*		
135		38		

n addition to density management, other activities are included in the proposed action to facilitate or enhance the thinnings and redirect the treatment areas toward the Desired Future Condition. These include: road work, timber sales, creation of coarse woody debris and wildlife structures, underplanting of shade tolerant tree species, and site preparation and fuels treatments.

Road Work

A summary of the anticipated road work is in Table 5. Overall, there would be a net reduction in road mileage in the project of approximately 0.2 miles as a result of implementing the Proposed Action.

Table 5: Summary of Road Work for the Proposed Action

NEW CONSTRUCTION[1]	
New Natural Surfaced Road Construction Temporary (undisturbed ground)	*1.5 miles*
New Natural Surfaced Road Construction Temporary (previously disturbed ground)	*1 miles*
RENOVATION[1]	
Renovation/Decommission – Natural Surface, not currently decommissioned. • Reopen - then full decommission = block, waterbar, pull culverts, decompact, plant/seed	*0.2 miles* (counts toward reduction of miles in watershed)
Renovation/Decommission – Natural Surface currently decommissioned. • Reopen - then full decommission = block, waterbar, pull culverts, decompact, plant/seed	*0.5 miles*
Renovation/Stabilize – Gravel Surface • Reopen – stabilize = block, waterbar, pull culverts	*0.3 miles*
Renovation/Permanent – Gravel Surface (main system roads) • Renovation = blading/grading, brushing, rocking, culvert replacement, ditch cleaning, etc.	*18.0 miles*

[1] 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 2.5 miles of new natural-surface temporary road construction would occur over 15 separate segments (widely distributed in 6 different Sections) averaging approximately 900 feet, with the longest being approximately 1300 feet long. Approximately 150 acres of the proposed action area would be accessed by new road construction. Of the 2.5 miles of new construction, 1.5 miles would be constructed on undisturbed ground and the remaining one mile would be constructed on previously disturbed ground, which includes skid trails and about 700 feet of OHV trails. All new 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 2100 feet of construction within Riparian Reserves. Seven hundred (700) feet of the construction, in three segments, is within the first site potential tree height (220') of streams, two of which round around intermittent headwater streams just inside of the reserve on previously disturbed ground (OHV or old skid trails) and one that crosses an intermittent stream on an old skid trail associated with a previous thinning. The remaining 1400 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.

Upper Nestucca OHV Trail System

There are approximately 3.5 miles of designated OHV trails that are part of the Upper Nestucca OHV Trail System within the proposed density management units. Many of these trails are located on old skid trails used for the thinnings in the 1960's and 70's. It is expected that approximately 1.25 miles of the OHV trails within the units may be used as designated skid trails in ground based treatment units and that about 700 feet of trails would

be used as temporary roads (see above) to be returned to trail status at the completion of harvest. In unit 20-9 a new temporary road would be constructed in the southern portion of the unit and at the completion of harvest decommissioning would be bring the road down to OHV trail system standards. In order to not add trail mileage to the system another trail segment within the same unit that would be used as a skid trail would be fully decommissioned, blocked to further OHV use and removed from the trail system. Both the new construction and the deleted trail are approximately 950 feet long as measured by GIS. All other OHV trails that are used for harvest purposes would be returned to trail status at the completion of harvest by blocking to full size vehicle use while still allowing for OHV use (approximately 50" wide).

Road Renovation

Approximately 19 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, 0.2 miles would be used and then fully decommissioned after use, which would result in a net reduction of existing road. Four–tenths (0.4) miles would be reopened (currently decommissioned) and then fully decommissioned after use and 0.3 miles would be used and then stabilized after use. The remaining 18 miles of road to be renovated are rocked and would remain open following renovation.

Culvert work includes installing 12 new culverts and replacing 8 existing culverts. One of the culverts is in a live 1st order stream (stream with running water), one is on an intermittent stream and the other 18 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 6: Culvert Work for the Proposed Action

Section	Road Number	Culvert Number	Crossing Type	Proposed Activity
17	3-6-17.1	C1	Cross Drain	Install New Culvert
18	3-6-17.1	C2	Cross Drain	Install New Culvert
18	3-6-17.1	C3	Cross Drain	Install New Culvert
18	3-6-17.1	C4	Cross Drain	Replace Existing Culvert
17	3-6-17.2	C5	Cross Drain	Replace Existing Culvert
17	3-6-17.2	C6	Cross Drain	Replace Existing Culvert
17	3-6-17.5	C7	Cross Drain	Install New Temporary Culvert
20	3-6-20.2	C8	Cross Drain	Install New Culvert
20	3-6-20.2	C9	Cross Drain	Install New Culvert
20	3-6-20.2	C10	Cross Drain	Install New Culvert
20	3-6-20.2	C11	Cross Drain	Install New Culvert
20	3-6-20.2	C12	Cross Drain	Install New Culvert
17	3-6-20.2	C13	Stream Crossing	Install New Culvert
18	3-6-20.2	C14	Cross Drain	Replace Existing Culvert
15	3-6-15.4	C15	Intermittent Stream Crossing	Install New Temporary Culvert – One Operating Season Only – Remove before Wet Season
22	3-6-15.3	C16	Cross Drain	Install New Culvert

Section	Road Number	Culvert Number	Crossing Type	Proposed Activity
22	3-6-15.3	C17	Cross Drain	Replace Existing Culvert
22	3-6-22.1	C18	Cross Drain	Replace Existing Culvert
22	3-6-22.1	C19	Cross Drain	Replace Existing Culvert
22	3-6-22.1	C20	Cross Drain	Replace Existing Culvert

Road Decommissioning

In addition to the natural-surface new road construction, approximately 0.2 miles of natural-surface renovated road would be decommissioned resulting in a slight reduction of permanent road mileage within the Nestucca Watershed. Decommissioning would consist of removing stream-crossing culverts if present, de-compacting the surface, water barring, seeding or planting with native species, and restricting OHV use. Restricting OHV use may include the strategic placement of gates, boulders, logs, root wads, or other types of earthen barriers.

Timber Sales

The forest stand thinning portions of the Walker Creek Terrestrial Restoration Project would be implemented through the sale of timber according to 43 CFR Subpart 5401. The BLM estimates that there would be two to four sales resulting from the Proposed Action. The earliest sale could be as soon as fiscal year 2014 and the latest could be as late as 2017 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.

Figure 6 – Map of the Proposed Treatments and Culvert Work

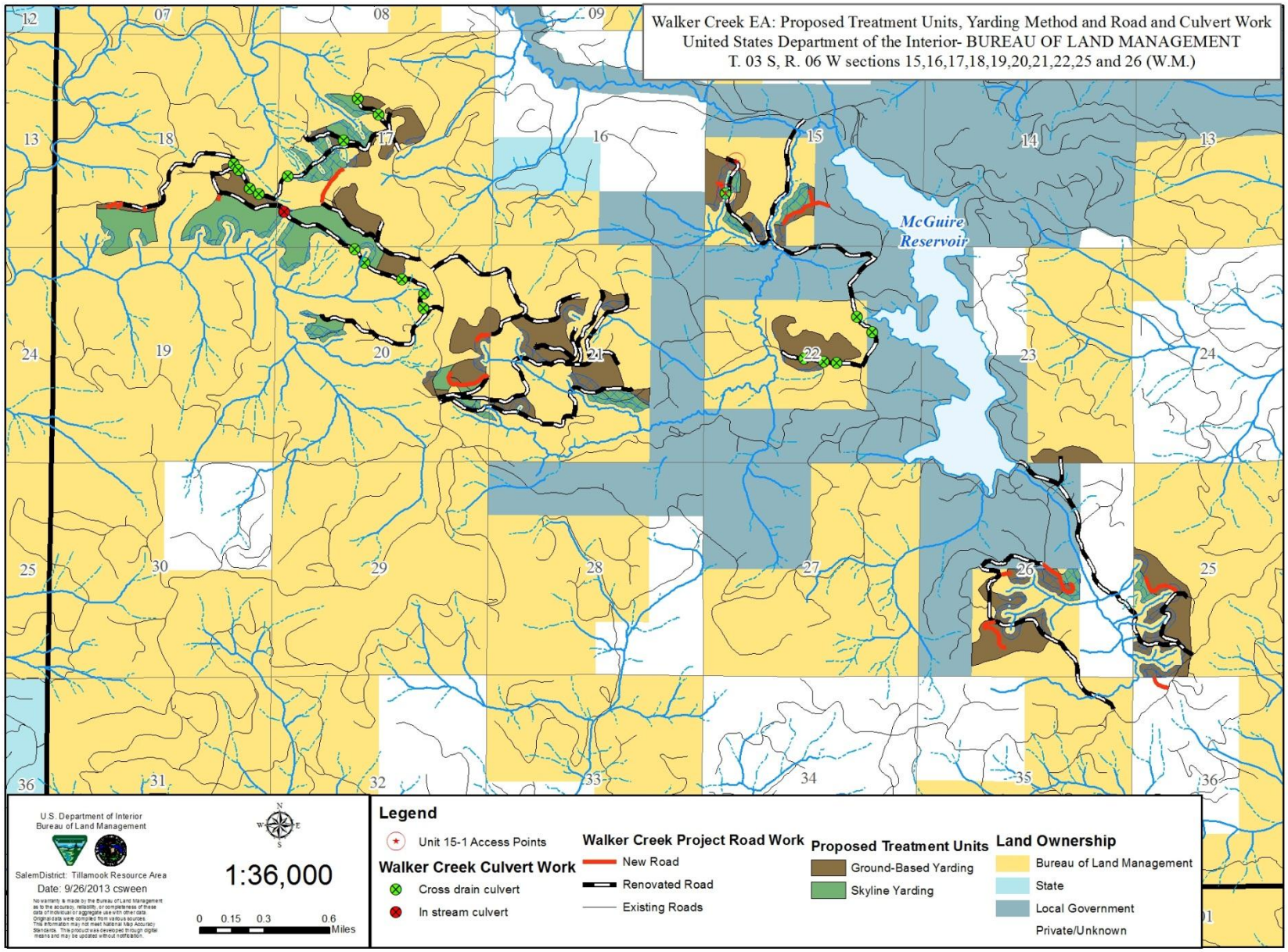
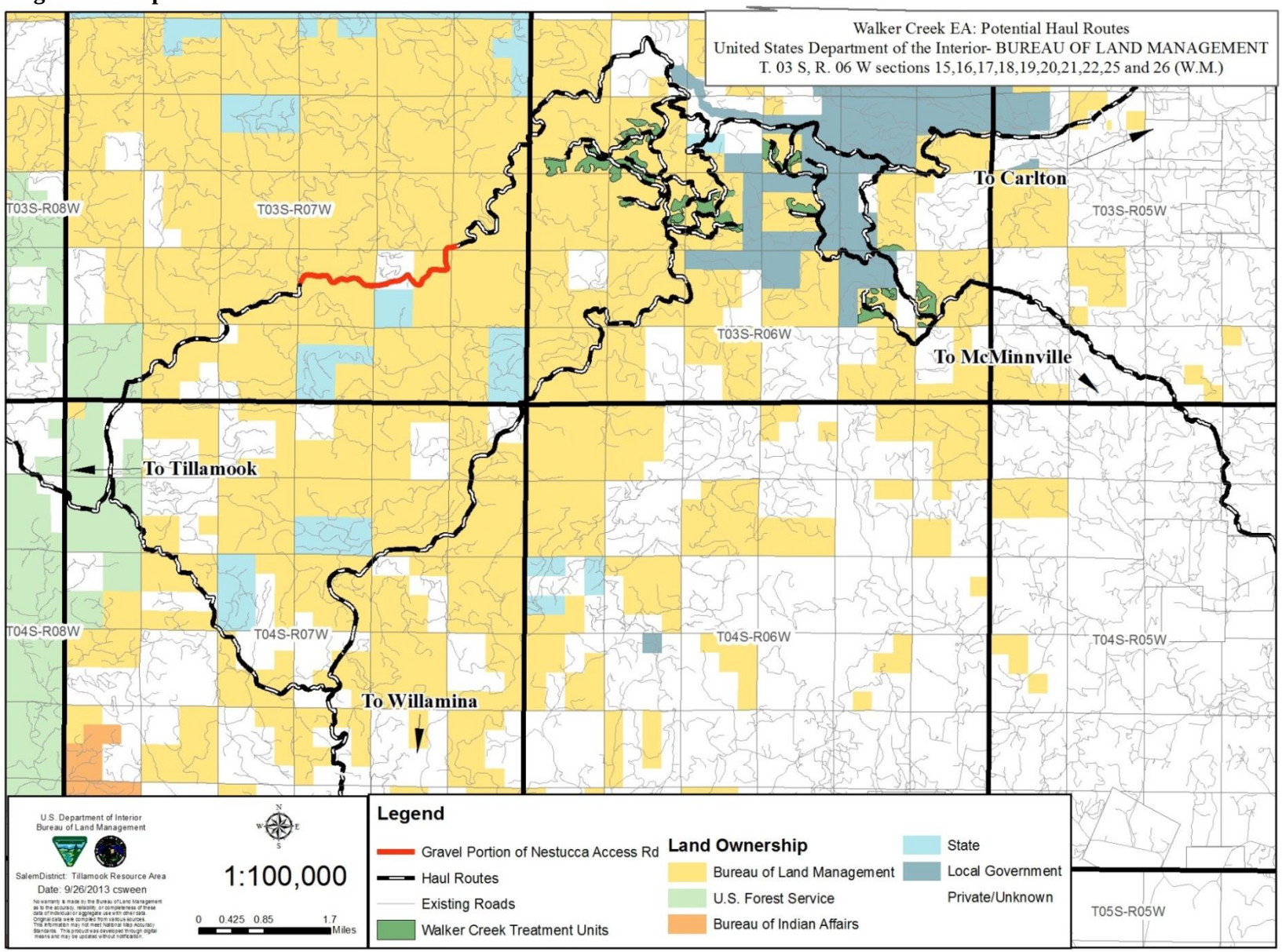


Figure 7 – Map of Potential Haul Routes



Coarse Woody Debris and Wildlife Habitat Structure Enhancement

Density Management Stands 80 years and older:

Due to the past stand histories that include fires, homesteading, and grazing from the mid to late 1800's into the early part of the 1900's, and past thinnings in the 1960's and 70's, there is very little legacy of the original stands left on the landscape. There are some small patches of medium sized snags that are a result of more recent density independent mortality such as laminated root rot and a recent bark beetle event that are currently contributing a small amount of foraging and denning habitat in the Headwaters Nestucca subwatershed.

In order to be consistent with the planning guidance contained in the LSRA (pg. 96 – table 24) approximately 12-13 average sized trees per acre remaining after harvest (the range for the different units is from 4 to nearly 16 per acre), beyond what coarse wood is already present, would need to be converted to snags, down wood or live trees with mechanical damage that may result in mortality or complex crown architecture to approximate the average levels found in natural stands of similar age within the northern Coast Range (LSRA p.94). Because the proposed action would be the final thinning entry for these stands, Strategy #1 from the LSRA was used along with recent stand exam data to develop the target level of coarse wood of approximately 3200cf./ac. The cubic foot volume of the average tree remaining after harvest for each unit was used to determine how many trees would be needed to reach the target level of 3200 cf./ac.

The proposed action seeks to balance the need for down coarse wood, snags, and trees with wildlife structures with concern for bark beetle damage to residual trees, economics, and future stand structure by creating approximately half of the deficit CWD and structure habitat during (through normal harvest operations) and directly after harvest, and after five years, creating the remaining CWD and structure habitat after assessing any new natural inputs. Generally the treated stands would have 55 – 78 trees remaining after harvest which is enough to accommodate converting the needed trees to coarse wood. However there are about 105 acres where, in order to meet silvicultural objectives for a more open canopy to establish an understory layer, the residual tree density would be such that there would be fewer than 55 trees per acre remaining (about 25 of those acres would have about 45 trees per acre remaining). Consequently, in order to assure that adequate trees remain to meet the future needs for snags and coarse wood, approximately 1/2 of the coarse wood structures targeted for those units would be created in adjacent or nearby stands of the same age or older as provided for in the LRSA (LSRA pg. 93). The units with fewer than 55 post-harvest trees per acre would require the conversion of 9-10 trees per acre with an average QMD of 30" to meet the target. Therefore about 520 trees would be treated in adjacent or nearby stands. For this purpose five areas totaling approximately 150 acres were selected where the treatments outside of harvest units would occur. Additionally, this treatment would also include falling some of the required trees into selected headwater stream areas that are potential source areas for large wood recruitment to coho salmon critical habitat (see Figure 10). All or part of this work may be completed prior to the timber sale harvests as opportunity arises.

The CWD and habitat structures would be created using a variety of techniques that would result in various levels of large down wood, large snags and topped live trees (topped live trees may persist indefinitely while providing platforms and introducing cavity creating top rot that could benefit flying squirrels, red tree voles, spotted owls and other wildlife). Trees that are cut or topped during harvesting and are left due to diameter cut limit restrictions or for other reasons would count toward the goal, as would any inputs occurring from wind events or other mortality within the first five years. Most coarse wood treatments would occur in groups in order to mimic small forest gaps that would provide heterogeneity to the canopy as well as the forest floor.

Density Management Stands less than 80 years old:

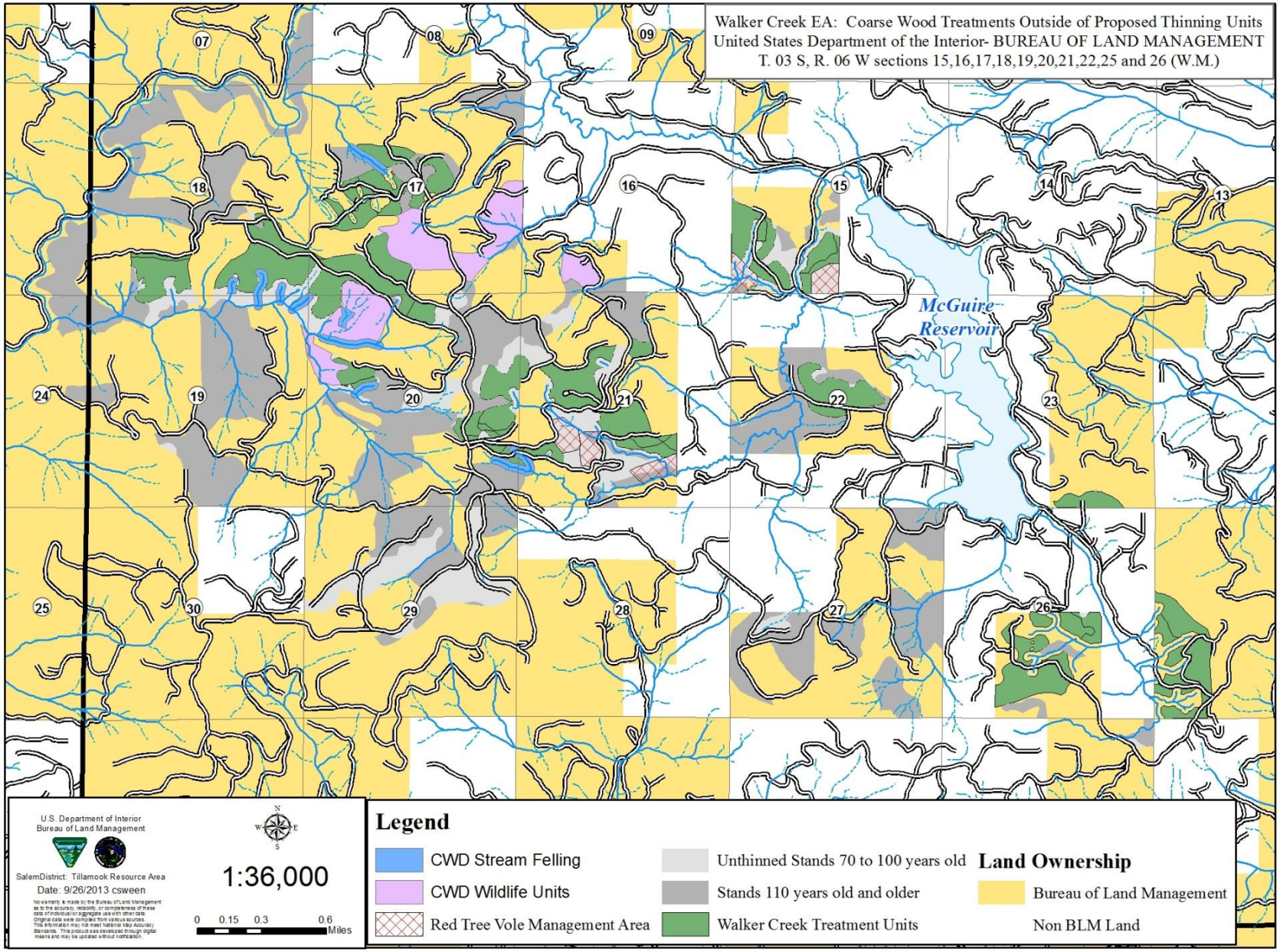
Three of the proposed harvest units totaling about 135 acres are comprised of stands that are about 60-65 years old. The Proposed Action would be an intermediate thinning of these mid-seral stands. Guidance from the LSRA indicates that these types of stands would naturally have about 1200 ~ 3800 cf. of snags and down wood. Currently these proposed units have CWD volumes ranging from about 1900 cf. to 2500 cf., over 90% of which is in the more advanced decay classes which will not persist much longer on the landscape. We expect that natural

stands would have a high proportion of the CWD in more advanced decay stages because it would be residual from the previous stand but there should also be some new CWD associated with density related mortality which may now be occurring.

LSRA Strategy #2 would be employed in order to provide a pulse of new CWD to the stands after thinning. Strategy #2 seeks to provide a moderate pulse of CWD at the time of thinning while growing the rest of the stand to larger size before more CWD is introduced. Thus, a total of four trees/ac. that are at least 20" in diameter would be converted to CWD, two to be down logs and two to be standing snags or live topped trees.

For those proposed harvest units less than 50 years old, no CWD work would be conducted at this thinning entry since, practically speaking, the stands do not contain trees large enough to make quality CWD.

Figure 8 – Map of Coarse Wood Treatment Units (outside of proposed thinning units)



Underplanting

An important objective of the project is to initiate an understory by underplanting the thinned stands with shade tolerant conifers such as western hemlock and western redcedar which would have the added benefit of reintroducing tree species diversity into the stands. There are 410 acres of stands that are 80 years old or older all of which are single-story Douglas-fir stands with high stocking, closed canopies and very little understory development. Developing a second tree layer would greatly improve the ecological function of the stand in the long term and indirectly contribute to the recovery of the spotted owl.

After harvest each unit would be evaluated for planting opportunities. The evaluations would look at available light for the understory and the amount of slash present. The number of trees planted per individual acre is expected to vary depending on the site conditions but should average about 200 trees per acre over the total units.

With the exception of the areas heavily impacted by *Phellinus weirii*, those stands that are less than 80 years old currently have some level of hemlock present and have adequate seed source for seeding after thinning and therefore would not be planted after harvest. In those areas where thinning to control *Phellinus weirii* would occur, disease resistant species such as western redcedar would be planted.

Site Preparation and Fuels Treatments

Site preparation and fuel treatments would play an important role in post-harvest underplanting. Treatment strategies would be implemented to reduce both the potential for wildfires and for site preparation in density management thinning units, in *Phellinus weirii* pockets, at landings, and along roads. Whole tree yarding is preferred in all units which would help consolidate some of the fuels at the landings thus achieving both site preparation and fuel reduction at the same time. Even if whole tree yarding occurs it is expected that as much as 50% of the limbs and tops would remain in the units due to breakage during timber falling and yarding operations. If whole tree yarding does not occur or heavy slash still remains after completion of the sale a number of alternate treatment techniques may be used such as hand piling and burning or lopping and scattering. Machine piling would occur only from roads and would only involve piling of material less than 6 inches in diameter. The piles would then be burned or possibly removed for biomass fuel production if the purchaser chooses to do so.

Slash and other logging debris within 25 feet of all roads that are planned to be left open after the sales are completed would be piled and burned or scattered out into the unit beyond 25 feet (see project design features below).

2.1.3.2 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 20.

The design features are organized below by benefiting resource.

Desirable Stand Features, Diversity, and Protection

- In stands 80 years old and older all trees with diameters greater than or equal to the unit specific diameter cutting limits would be reserved from harvest (may be cut for operational purposes but not removed - LSRA pp. 100-101) These trees would count toward post-harvest CWD targets (see *Coarse Woody Debris and Wildlife Habitat Structure Enhancement* section above).
- Leave trees would generally include the healthiest trees but would also include some suppressed and intermediate crown class trees as well as damaged trees that have high intrinsic wildlife habitat potential.
- In the stands over 80 years of age generally only Douglas-fir would be harvested, all other species would be reserved to preserve species diversity, unless in road rights-of-way, landings or yarding corridors.

- In stands less than 80 years of age western hemlock would only be cut in *Phellinus* pockets and in portions of stands where it is the dominant species. Western hemlock would be favored to leave over Douglas-fir.
- Hardwoods would not be cut unless they are in road rights-of-way, landings or yarding corridors.
- Reserve tree marking would be based on basal area targets at the "plot" scale (approximately the 1/10 acre) which should allow reserve tree spacing to vary by as much as 25% in order to promote variable density.
- To the extent practicable retain and protect from damage non-merchantable understory trees, especially shade tolerant conifer species during logging and site preparation.
- Approximately 45 acres of thinning treatment to control *Phellinus weirii* would be implemented in stands younger than 80 years of age located mostly in Section 25 in the AMA. The 45 acres would be made up of smaller (1 to 7 acre) patches. Treatment of the designated *Phellinus weirii* treatment areas would be as follows:

  - An average of 20 trees per acre would be retained. Unless needed to meet the 20 trees per acre retention level, all Douglas-fir and grand fir less than 30 inches dbh, inside the designated area and within 30 feet of the flagged boundary would be harvested to reduce the potential for disease to spread through root contact.
  - The designated *Phellinus weirii* root disease treatments would not be occur within 220 feet of streams or marbled murrelet potential habitat (not known to be present).
  - The treatment areas would be planted with disease-resistant tree species, primarily western redcedar or hardwoods including red alder and bigleaf maple.

- Underplanting of shade tolerant conifer species would occur in all treatment units over 80 years old. Planting would be variable based on site conditions following harvest but would include the planting of at least 200 trees per acre at various spacing.
- Site preparation for underplanting the portions of the thinned areas to be planted would include brush cutting, and lopping and scattering of logging slash to the extent needed to plant the areas. Piling and burning would only occur in higher fire risk areas, such as along roads and *Phellinus weirii* treatment areas.
- 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 including landing areas and 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.

<u>Coarse Woody Debris (Snags and Down Wood)</u>

- Retain green trees with defects that are desirable to wildlife such as cavities, platforms, mistletoe infection (very rare) and dead, forked or broken tops, etc.
- During harvest, all existing coarse 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 24" dbh and 30' in height would be protected from damage by reserving the nearest four surrounding trees unless it conflicts with the prescription for the *Phellinus weirii* treatment areas.
- During coarse wood/ wildlife structure treatments only Douglas-firs would be treated; they would range in size from approximately 22-32 inches dbh (except as noted below for treatments outside of harvest units). Trees targeted to be felled or converted to snags would have live crown ratios generally less than 30% and smaller than average crown spread. Selected trees targeted for within-live-crown treatments may have longer crowns in order to more favorably respond to the treatment. Within the prescribed diameter range, an approximately equal number of trees would be selected larger and smaller than the average dbh of 27 inches. The largest healthiest dominant trees within an area would not be treated.
- Trees would be selected both singly and in small clumps of 3-5 trees. At least 75% of treated trees would be in clumps.
- Trees would be felled in a manner to avoid hitting decay class 3 and 4 down wood larger than 24" in diameter.

- Treatments would be conducted in such a way as to assure there would be no damage to potentially suitable spotted owl or marbled murrelet nest trees, or any tree containing a suspected nest of a bird or mammal, or any tree with desirable habitat features such as hollow cavities or decay.
- Created snags, snag-topped trees or felled trees would generally not be located within approximately 150 feet of a drivable road or a property line boundary where BLM land abuts non-federal ownership. This would reduce the potential for the creation of a safety hazard and/or the likelihood that the material would be stolen or sold as firewood.
- Coarse woody debris treatments applied in the Riparian Reserves would extend down to the stream channel. Trees in this area would be selected so that stream shading would not be affected.
- Trees would be felled into active stream channels only during the ODFW in-stream work window (between July 1 and September 15) unless a waiver is obtained from Oregon Department of Fish and Wildlife (ODFW).
- In treatment areas outside of proposed harvest units:

  - The average dbh would be 30" with a range for selection of 26-34 inches dbh.
  - If an active red tree vole nest that could not be seen from the ground is encountered while climbing to accomplish a treatment, contractors would descend the tree without implementing the treatment, mark and record the tree location, and notify appropriate personnel. No treatments would be conducted within 120 feet of the newly discovered red tree vole nest tree (118 feet is the radius of a one acre circle). Treatments may resume beyond 120 feet from the newly discovered nest tree.
  - Surveys for Special Status and Survey and Manage plant species (2011 S&M Settlement Agreement list) would be conducted prior to any tree felling and/or habitat alteration.

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

- 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. In certain areas where LiDAR data shows higher debris flow potential associated with the streams in the vicinity of Oregon Coast coho Critical Habitat, the no-harvest buffer would be wider, i.e. the area would be excluded from the unit in order to assure that as much wood as possible could be delivered to streams in the event of a slope failure.
- There are no known wetlands within any of the treatment areas but if during layout any are discovered we would maintain a minimum one tree wide no-harvest buffer on the outer edge of unmapped wetlands less than one acre. This requirement may be achieved by leaving reserve trees along the edge of the wetlands; excluding these areas from the treatment units would not be required.
- To protect water quality, trees would be felled away from all no-harvest buffers within the treatment units. If a cut tree falls into a no-harvest buffer, the portion of the tree within the buffer would remain in place.

<u>Harvesting Operations: Criteria Common to All</u>

- 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.
- 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 except where full suspension is required (slopes 65% or greater).
- The use of all ground based equipment would be limited to dry periods when soils are most resistant to compaction.

- 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.
- 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 expected that during Douglas-fir felling and yarding that considerably more than 25% would become detached through normal operations and left on site).
- 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 left on site to augment coarse woody debris levels, and every effort would be made to protect the trees from theft.
- 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.
- All logging and construction equipment that would be used off of existing roads would be cleaned of dirt, grease, vegetation or any other material that may spread noxious weed seeds 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.
- Hauling of timber, rock and large equipment on Bald Mountain Road between the project area and Gilbert Creek Road (towards Willamina, Oregon) would be limited to weekdays between Memorial Day and Labor Day to reduce the possibility of road conflict with recreational users in the area. The Authorized Officer may grant a waiver on a case-by-case basis.
- Implement the Traffic Safety Plan, dated June 6, 2013 developed by the Tillamook Resource Area for the Hoag Pass Projects. This plan specifically addresses potential haul associated with Walker Creek, Hoag Pass and Cedar Creek Projects. The plan includes signage recommendations listed in the *Manual on Uniform Traffic Control Devices* published by the US Department of transportation.

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

Trees may be felled by hand or by self-propelled mechanical harvester. If a harvester is used the equipment used would be:

- Boom mounted with a minimum reach of 20 feet using a single grip rotating harvester head.
- 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.
- Harvester 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.
- Skid trail widths would generally average 12 feet wide.
- 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 10% 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.
- In unit 15-14 a temporary culvert and crossing would be placed in an intermittent stream channel to facilitate ground based harvesting. The culvert at this specific crossing would be in place only for the one logging season and then removed and the channel restored to a free flowing condition. The culvert would not be in place over the winter. See Figure 6 for location.

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 10% area of impact as for ground based yarding above.
- 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.

Cable Yarding

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. There would be no cable yarding of logs over any streams in the Walker Creek Project.

- 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.
- If the skyline must pass through a riparian no-harvest buffer then the skyline would remain stationary after initial elevation in order to minimize the potential for canopy damage associated with line whip (no logs would be yarded through the riparian no-harvest buffer).
- Prior to and during winter rains, cable yarding corridors that are oriented in the direction of stream channels within Riparian Reserves would be water-barred and have slash placed over them to help protect water quality.

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.

- Newly constructed landings would have clearing limits and impact areas kept to the smallest size necessary to reasonably conduct harvest operations, generally approximately a 50 foot diameter ground disturbance area. These types of landings would count toward the 10% ground compaction limit criteria.

- Use of landings on existing landings and roads would not count toward the 10% 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. 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 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 220 feet of streams (BMPs R1, R2, R3, and R4).
- All new road construction and renovation would avoid larger, complex structured trees to the extent practicable.
- Natural-surface roads would be winterized at the end of each operating season prior to the start of the fall rainy season by water barring and blocking the roads to vehicle traffic (BMPs R42, R80, and R85).
- All natural surface roads and landings 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 R42, R50, R83, and R84).
- 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 R42, R50, and R85).
- 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 cleaned ditches; placing sediment trapping materials such as straw bales, wattles and/or bark filters in ditches or other places where sediment could be transported (BMPs R32, R45, R62, R63, and R91)
- 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 R11, R13, and R14).

Special Status Species

- All of the proposed treatment units have been thoroughly examined by a wildlife biologist. Examination has found one potential marbled murrelet habitat tree located along the road in unit 18-2. A no-harvest buffer of at least 60 feet would be placed around this tree or any other potential habitat trees that are subsequently discovered during project layout. If any other potential habitat trees are subsequently discovered they would not be felled or damaged for any purpose and a 60 foot or greater buffer would be placed around those potential murrelet habitat trees as well. No openings *(i.e.*, $\geq$ 0.25 acre in size) within a distance equal to one site-potential tree height of potential murrelet structure would be created.
- If any marbled murrelet sites are discovered during operations (as per the Pacific Seabird Group Marbled Murrelet Technical Committee protocol) they would be protected by a 0.5-mile radius buffer on all contiguous existing and recruitment habitat on federal lands.
- Survey and Manage surveys were conducted on all acres where stands are 80 years old or older. All known sites that are included on the appropriate list at the time of any timber sale Decision would be protected according to management recommendations for those species. Depending on species, protection of the site may vary from protecting individual trees from harvest (such as for certain lichen species) to maintaining

small reserve patches to protect the microclimate at the site. Red tree vole known sites have already been excluded from harvest units and are protected with 10 acre management areas.

Invasive / Non-Native Plants

- Prior to entering the project area each work season, or before returning to the watershed after leaving it, any heavy machinery (with the exception of log trucks and pickup trucks used for daily personnel travel) would have all dirt and adhering vegetation removed by power-washing.
- Post-harvest monitoring of treatment areas would be done 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 and best management practices. Monitoring for invasive non-native plant species would also occur outside of the project area at the Walker Flat ACEC located in the vicinity of unit 15-14. Monitoring at the Walker Flat ACEC occurs now and would be ongoing.
- 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.

Cultural Resources

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

Recreation and Access

- Designated OHV trails that traverse through treatment areas would be posted "Closed" to OHV use during harvest and log hauling activities and for approximately one dry period after timber harvest is completed to minimize fire risk.
- The Grassy Flat OHV staging area would be posted "Closed" to OHV and camping use during project activities. Following project activities, the staging area would be cleared of any debris and repaired if any damage has occurred.
- Designated OHV trails within the Upper Nestucca OHV Trail Systems (sections 17, 20, and 21) would be cleared of all logging debris and repaired if damaged after logging operations have been completed. Unauthorized trails would not be cleared.

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

- Site preparation would occur as needed in harvest units that would be planted. Site preparation may include slashing, lopping and scattering of brush and slash, brush cutting, piling, and/or hand piling and burning.
- Woody debris greater than six (6) inches in diameter would not be piled.
- Machine and landing piles would only be constructed within twenty-five (25) feet of designated roads and landings. Equipment used in the construction of machine or landing piles would remain on the roads or landings.
- All piles designated for burning, including hand, machine, and landing piles would be located as far as possible from reserved trees to minimize damage.
- Burning of piles is only expected to occur along roads that remain open to the public after harvest and in *Phellinus weirii* patches where thinning occurred to control the spread of the disease (generally units in section 25)
- Lopping and scattering of fuels in high risk areas (generally along roads) would be incorporated where fuel loading is relatively heavy but not heavy enough to warrant burning.

- Where pile burning is prescribed, piles would be covered with .004 mil. thick black polyethylene plastic. The plastic shall not exceed one hundred (100) square feet in size and would be placed and anchored to help facilitate the consumption of fuels during the high moisture fall/winter burning periods.
- A Prescribed Fire Burn Plan would be written and signed by the Authorized Officer prior to any prescribed burning activity.
- Burning would be conducted in accordance with the Salem District RMP, Oregon State Implementation Plan and Oregon Smoke Management Plan as administered by the Oregon Department of Forestry and would comply with the provisions of the Clean Air Act. It would be conducted under good atmospheric mixing conditions to lessen the impact on air quality in Smoke Sensitive Receptor Areas.
- Utilization of small diameter slash for firewood or energy production from biomass would be incorporated where appropriate. If biomass removal occurs in lieu of prescribed burning only logging debris accessible from existing roads and landings and is less than 6 inches in diameter would be available for removal.

Seasonal Restrictions (See Table 7 for a summary of seasonal restrictions)

Seasonal restrictions are intended to prevent or minimize negative impacts that could occur as a result of project implementation during the typical Pacific Northwest wet season. The dates given generally coincide with the typical wet season but frequently there are periods during the "wet" season that may be dry enough to allow some project activities to occur without negative impacts beyond those analyzed. In these cases activities outside of the seasonal restriction may be allowed at the BLM's discretion. The same would be true for unusually wet periods during the "dry" season, at which time activities would cease.

- All road decommissioning, construction, maintenance and renovation would occur during the dry season (generally June 1 through October 15). All work required in live streams (culvert replacement or removal) would be limited to the ODFW in-stream work window (July 1 to September 15) (BMPs R61, R65, and R87).
- Except for units 18-2, 18-3, and cable yarding portion of 17-1 all yarding and hauling would be restricted to periods of low soil moisture, generally June 1 through October 15. (TH12).
- In units 18-2, 18-3, and cable yarding portion of 17-1 yarding and hauling would be allowed year round at the discretion of the BLM providing that no detrimental environmental effects or infrastructure damage is occurring. The rationale for year round operations is that these units are a short distance from pavement along rocked roads high on the slope with very few stream crossings (small first order). Once on pavement the expectation is that haul would remain on pavement (no wet weather haul would be permitted on the gravel portion of the Nestucca Access Road).

Table 7: Seasonal Restrictions Incorporated into the Walker Creek Terrestrial Restoration Project

	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC	
Activity	1	15	1	15	1	15	1	15	1	15	1	15	1	15	1	15	1	15	1	15	1	15	1	15
Ground-Based Yarding & Harvesting																								
Cable Yarding - except units 18-2,18-3, and cable yarding portion of 17-1																								
Cable Yarding units 18-2,18-3, and cable yarding portion of 17-1	Subject to BLM approval, cable yarding would be permitted year round as long as environmental and infrastructure degradation is not occurring																							
Road Construction, Renovation & Decommissioning																								
Log Hauling – except units 18-2,18-3, and cable yarding portion of 17-1																								

Log Hauling units 18-2,18-3, and cable yarding portion of 17-1	Subject to BLM approval, hauling would be permitted year round as long as environmental and infrastructure degradation is not occurring

Dates are approximate – Restrictions would be dependent on actual weather conditions
Shaded Areas are restricted periods

2.1.4 Alternatives Considered But Not Analyzed In Detail

Density Management Only in Stands Less Than 80 Years Old

Based on comments received from Oregon Wild, the IDT considered an alternative in the Walker Creek Project that limited density management thinning to only stands that are less than 80 years of age. During the Activity Planning Process the IDT looked at all available stands up to 110 years old (approximately 1,165 acres) within the Walker Creek (Headwaters Nestucca) 6th field subwatershed and evaluated them based on their potential to develop into complex forest habitat without intervention. The forest stands proposed for treatment were specifically found to be lacking the components of complex forest and, based on experience with older stands in the vicinity of the proposed action do not show any propensity to develop into complex forest in the foreseeable future without treatment.

The 2011 spotted owl recovery plan identified past habitat fragmentation and on-going loss of habitat as important contributing factors to the spotted owls continuing decline in the Oregon coast range province. The Recovery Plan also recognized that it may be necessary to treat stands older than 80 years of age, consistent with Northwest Forest Plan objectives, to benefit spotted owls by improving habitat. The Purpose and Need for the project grew out of the need to intervene at this time to boost the proposed stands in the southern portion of the Headwaters Nestucca subwatershed in a different direction. Specifically, the stands over 80 years of age are most lacking in structural complexity and there is a short window of time to use silvicultural methods to effectively change the trajectory. By eliminating over 400 acres of the project area that are specifically identified in the Purpose and Need as being in need of treatment, and limiting activity to the approximately 165 acres of stands less than 80 years old, the project would not meet the purpose and need for action.

The objectives of the project are also to develop late-successional habitat in the Core Landscape Zone as defined in the LSRA where provisions for large contiguous patches of late-seral habitat and maximization of interior forest habitat are called for. All of the stands that are 80 years old or older are within the Core Landscape Zone and are not currently, nor without treatment are they likely for some time, to contribute high quality late-seral habitat that is beneficial to the spotted owl. None of the stands less than 80 years old are within the Core Landscape Zone. Avoiding treatments of these stands in the Core Landscape Zone would not meet the purpose and need for action.

Considering that the Purpose and Need for action would not be met by limiting density management actions to those stands less than 80 years old, the alternative was not analyzed in detail.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

This section of the EA describes the current condition and trend of the affected resources and the environmental effects of the alternatives on those resources. The interdisciplinary team of resource specialists (IDT) reviewed the elements of the human environment, required by law, regulation, Executive Order and policy, to determine if they would be affected by the proposed action (BLM Handbook H-1790-1: p. 137), [40 CFR 1508.27(b)(3)], [40 CFR 1508.27(b)(8)] (EA section 3.13), as well as the issues raised in scoping (EA section 1.3).

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 lands buffereing McGuire Reservoir that are managed to maintain water quality in the reservoir, which is a source of drinking water for the city of McMinnville. We expect forest management and related activities would continue to occur on non-federal lands. Timber harvest would continue to occur on a 35-50 year rotation following Oregon State Forest Practices Act rules (FPA). Recent aerial photography indicates that there about 500 – 600 acres (7-8% of the subwatershed) of merchantable timber remaining on private lands within the southern portion of the Headwaters Nestucca subwatershed (which is generally coincident with the Walker Creek subwatershed). The remainder of the lands are either young plantations or non-forested (roads and reservoir). 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 Nestucca River 5th Field Watershed That May Have Bearing on the Walker Creek Terrestrial Restoration Project

- The Cedar Creek Projects: In March of 2011 the BLM issued a decision to perform density management restoration thinning on approximately 500 acres of 30-55 year old conifer forest, create up to five snags per acre, perform road maintenance work, develop a rock quarry and perform in-stream restoration work in the Nestucca River in the vicinity of Cedar Creek. In 2013 the density management thinning was sold and the rock quarry was developed. A portion of the associated road work has also been completed. The Cedar Creek Projects are in the northern portion of the Headwaters Nestucca 6th field subwatershed, north of the Nestucca River.

- The Hoag Pass Projects: In August of 2006 the BLM issued a Decision to perform density management restoration thinning on approximately 840 acres of 30-97 year old conifer forest including associated road maintenance, perform fish and wildlife habitat enhancement through the creation of coarse wood features (up to 8/acre), including the felling of trees into selected stream segments, and remove hardwood trees along several haul roads that are causing maintenance issues. The Hoag Pass Projects area is adjacent to the Walker Creek subwatershed to the southwest and includes the Jane Creek and Fan Creek drainages which are within the Elk Creek-Nestucca 6th field subwatershed.

- Nestucca Backcountry Byway Project: The BLM is actively developing the proposed action to perform maintenance and improvement to the Nestucca Backcountry Byway which would potentially widen and pave a 2.6 mile section of the Nestucca Access road, replace multiple culverts, repair chronic road failures along selected portions of the Byway and improve signage along the Byway. The Nestucca Access Road as well as the Bald Mountain Access Road are part of the Backcountry Byway and may be used by the

Walker Creek Project for timber hauling. Although no Decision has been made, funding is available for portions of the proposed work and could happen within the next five years if a decision is made.

The resources potentially affected by the Walker Creek Terrestrial Restoration Project are described in the following sections: Vegetation and Forest Stand Characteristics; Hydrology; Threatened or Endangered Fish Species or Habitat, Magnuson Stevens Act-Essential Fish Habitat, and Species with Bureau Status; Soils; Threatened or Endangered Wildlife Species, Habitat and/or Critical Habitat; Special Status (BLM 6840 Policy), SEIS Special Attention (Salem RMP), and Migratory Bird Treaty Act Wildlife Species and Habitat; Recreation and Visual Resources; Invasive, Nonnative Species (Executive Order 13112); Special Status and SEIS Special Attention Plant Species and Habitat; Air Quality, Fire Risk and Fuels Management; and Carbon Storage, Carbon Emissions and Climate Change. The general extent of the analysis area for each resource is described in the Affected Environment section for the topic.

3.1 Vegetation and Forest Stand Characteristics

3.1.1 Affected Environment

The analysis area for vegetation and forest stand characteristics is comprised of the south half of the Headwaters Nestucca 6th field subwatershed with the north boundary being the Nestucca River which is essentially the same area as that covered by the Walker Creek Activity Planning process in 2006. The area encompasses 7,380 acres, of which the BLM manages 63%. Twenty-four percent of the land is owned by McMinnville Water and Light and is managed for timber production and water quality (includes the 250 acre McGuire Reservoir), 12% is owned by private industrial concerns and 1% is managed by Oregon Dept. of Forestry. Of the non-BLM lands only about 550 acres are currently of harvestable age; the rest is young plantation. Forty-one percent of the forest on BLM lands is less than 40 years old, 15% is between 40 and 80 years old, 19% is between 80 and 110 years old, and the remaining 25% is older than 110 years old. Fewer than 30 acres of the stands in the analysis area are 130 years old or older, mostly occurring in a narrow strip along the Nestucca River.

The BLM lands in the southern portion of the Nestucca Headwaters subwatershed are characterized by a patchwork of older stands approximately 75 to 120 years old, developed as a result of repeated fire from human activity in the late 1800's and early 1900's, most likely followed by periods of grazing and homesteading, and young plantations resulting from clearcut harvesting between the 1960's and 1990's. Much of the older forest acreage (approximately 70%) were commercially thinned in the 1960's and 70's which removed complex structural components such as shade tolerant understory and mid-story trees, large snags, old-growth remnants, large merchantable down wood, and other trees with defect such as broken tops and cavities. These stands were thinned fairly lightly to improve tree growth while keeping the site fully stocked with the anticipation of a future regeneration harvest of high quality timber. With the listing of the spotted owl and implementation of the Northwest Forest Plan in the mid 1990's objectives for the lands covered by the Walker Creek Project changed from regeneration harvest treatments to restoration of late-successional forest. The result is that today these stands are uniform, single canopy stands consisting almost exclusively of Douglas-fir. This uniformity exists across land use allocations. The stands in the Late Successional Reserve and Adaptive Management Area are indistinguishable from the stands in the adjacent Riparian Reserves. Because of this, the discussion throughout this section will not differentiate between land use allocations.

The proposed action would perform density management treatments on about 575 acres of stands between 40 and 100 years old, or about 12% of the BLM land in the analysis area (8% of the total acres). Planning began with the Walker Creek Project by reviewing about 1165 acres of forest stands that are between the ages of about 35 and 110 years during the Activity Planning process to determine the potential for stand improvement through density management (see figure 2).

In Douglas fir stands west of the Cascade Range the mature forest stage typically begins between 80 and 140 years of age, depending on site conditions and stand history (NWFP ROD pg. B-2, B-3). Within the Nestucca watershed and perhaps all of the northern Coast Range, Douglas fir stands do not begin to exhibit the complex

structural features of mature forest until at least 130 years of age if not older. Thinned stands are even less likely to exhibit mature forest structural features since the less valuable species have been removed resulting in the loss of shade tolerant mid story trees and decadent old-growth, other defective trees, and merchantable down logs. In old-growth Douglas-fir stands in the central Oregon coast range, Poage and Tappeiner (2002) and Tappeiner et al. (1997) found that the overstory of these stands developed at low densities (averaging approximately 35-48 trees/acre) with rapid initial growth rates, extended initiation periods, and wide age variability. Pollock et at. (2005) also found that riparian stands often develop in a much more open structure, such that stem exclusion is much less common and understory vegetation usually is present throughout the development of the forest.

In the analysis area, western hemlock, noble fir, and western redcedar still exist but only in isolated patches. Very few trees of these species are mature and thus there is a very limited seed source in the subwatershed other than for Douglas-fir. The lack of these shade tolerant species within these fully stocked Douglas-fir stands has created an understory that consists almost entirely of a simple brush layer. Despite very high stand densities, there is very little tree mortality occurring. The stands also have very little mid-story structure characterized by epicormic branches on the overstory trees and the presence of shade tolerant understory trees, resulting in stands with very high volumes per acre but little structural diversity, consequently they do not exhibit mature forest structure.

Stands 80 years and older – 410 acres

Stand Exam Data pertaining to the stands proposed for treatment are shown in Table 8. For the most part, these stands are currently overstocked as indicated by Curtis Relative Densities (RD[6]) well above 55, the approximate density level where growth is expected to slow and, in younger stands with many stems, where competition-related mortality may begin to occur.

Generally the stands proposed for treatment tend to be single story, dense canopy Douglas-fir stands with no second canopy layer developing. Even those nearby stands over 110 years old, which are by RMP direction, too old to thin, do not exhibit late-successional characteristics. Some stand exam data was gathered for stands that appeared to be typed older than they looked with the view that they could also be considered for thinning but were found to be approximately 120 years old and yet looked little different than the adjacent 80 year old stands. While Relative Density is a very useful tool for assessing the growth and yield potential of forest stands it should be noted that stands can vary quite widely in their ability to resist mortality at high densities, as appears to be the case in the Walker Creek subwatershed.

The crown closure in these stands ranges from 79 to 90% but due to the height of the trees there is enough side light to support a fairly dense brush layer. The average height in these stands ranges from 111' to 162'. The canopies of these stands are high above ground level and there is little to no epicormic branching occurring. Relative Densities are very high ranging from 65 to 90, and would suggest that there should be mortality associated with these high densities but does not appear to be occurring where instead the stands are exhibiting a stagnated state with slowed growth. Any mortality that has occurred in the overstory appears to be from density independent factors such as *Phellinus weirii*.

Stands Less Than 80 years old – 165 acres

[1]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 intense competition. Other common ways of communicating density in a forest stand include trees/acre, basal area/acre, average spacing and crown or canopy closure.

There are four stands that fall into this category but they are substantially different from (and not near) the stands over 80 years old. These stands are primarily comprised of Douglas-fir but do have substantial western hemlock and redcedar components. They are overstocked with RD's ranging from 64 to 83 and currently are going through stem exclusion in the denser Douglas-fir patches. The result is that these stands have many 4" to 7" DBH snags. The crown closure in these stands range from 85 to 93%. The canopies tend to be very tight and the ground has little brush due to the lack of light. These stands are single story with all the trees competing for the available light.

Table 8: Current Stand Parameters from 2008 Stand Exam Data

Unit	Year of origin	Trees/Ac. ≥7 in. Diameter at Breast Height (4.5 ft.) (dbh)	Basal Area[1] (sq. ft.)	Quadratic Mean Diameter[2](QMD) (in.)	Curtis RD[3]	Ave. Ht (ft)	Crown Closure %	Species composition by Basal Area[4]
15-14	1928	111	335	23.5	69	144	82	DF 99%, RA 1%
15-23	1927	93	331	25.6	65	160	79	DF 100%
17-1	1915	182	364	19.1	83	132	89	DF 100%
17-2	1975	309	259	12.4	74	83	90	DF 81%, RA 7%, WH 12%
18-1	1923	100	374	26.2	73	153	83	DF 98%, WH 2%
18-2	1930	129	328	21.6	71	128	85	DF 99%, RA <1%
18-3	1935	125	330	22.0	70	143	83	DF 96%, RA 4%
18-4	1931	135	329	21.2	71	136	83	DF 100%
20-4	1915	83	344	27.5	66	162	80	DF 97%, RA 3%
20-5	1921	179	406	20.4	90	141	90	DF 100%
20-7	1930	161	421	21.9	90	146	90	DF 97%, RA 3%
20-8	1930	129	334	21.9	71	132	83	DF 99%, WRC 1%
20-9	1923	82	355	28.3	67	161	78	DF 99%, RA 1%
20-10	1923	138	385	22.6	81	130	87	DF 100%
21-4	1920	96	327	25.0	65	155	76	DF 97%, RA 3%
21-5	1934	167	346	19.5	78	130	87	DF 100%
21-8	1915	85	380	28.6	71	145	80	DF 100%
21-23	1920	149	334	20.3	74	134	84	DF 100%
22-1	1933	170	368	19.9	82	111	88	DF 100%
23-1	1953	324	302	13.1	83	83	93	DF 89%, WH 11%
25-1	1950	189	255	15.8	64	106	85	DF 85%, RA 8%, WH 6%, GF 1%
26-12	1947	194	322	17.4	77	123	89	DF 77%, WH 15%, RA 5%, WRC 3%

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

Forest Health

Laminated root rot caused by the native fungus *Phellinus weirii* is a root disease that is especially widespread

throughout the southeastern portion of the project area (mostly in the 60-65 year old stands in section 25) but is also found to a much lesser degree in other units. Disease centers generally occur throughout the southeastern units in well-defined discrete pockets ranging from about 1 to 7 acres in size as well as in a diffuse pattern where groups of one to several trees are affected throughout the infested area. In the western portions of the project area root rot occurs in a widely scattered diffuse pattern. 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 red cedar is tolerant or resistant; and all hardwoods are immune (Hadfield et al. 1986). Because the disease decays 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. Laminated root rot is the most important snag and down wood creating agent within the analysis area. Douglas fir bark beetles also contribute to coarse wood development by attacking trees that are stressed by other agents such as drought, laminated root rot, windthrow damage etc.

Shrub Layer

The most abundant understory species are sword fern, dwarf Oregon grape, salal and vine maple. Understory shrub development varies inversely with the amount of overstory canopy closure. The understory is often well developed where openings occur. Openings related to *Phellinus weirii* are typically dominated by vine maple. Where the dense overstory canopy consists of relatively young, short trees, such as in Unit 17-2, the understory vegetation is sparse. Western hemlock and western redcedar are the only conifer understory species found within any of the proposed units. There are very few that occur in the stands over 80 years old but do occur at higher densities in the younger stands. Red alder is the most common hardwood species found in the units proposed for treatment (see table 8).

Coarse Woody Debris

Snag and down wood data was gathered at the same time as live tree data using the BLM's EcoSurvey stand exam program. The sample design for EcoSurvey is intended for efficient and accurate data collection of standing trees which includes snags. However, snags do not occur on the landscape at the same rate nor are they distributed uniformly like live trees and therefore the statistical sampling error for snags is quite high. Down wood data was collected by transect intersect method as an added feature to EcoSurvey. Down wood is very patchy in nature and is difficult to accurately sample therefore sample error for down wood can vary considerably. The data presented below is the only data available and is most likely overstated based on field review, but nevertheless remains useful for comparing natural stands to the proposed action units. 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.

Stands 80 years and older:

Levels of coarse woody debris (includes both snags and down wood) in natural Coast Range stands over 80 years of age are variable but average about 3,200 cubic feet (cf.) per acre (LSRA table 22, 1998). As a result of stand history and past management, the proposed harvest units have been found through stand exam to have a weighted average of about 1,040 cf. in them, nearly all of which are in late decay stages (92%) which will not persist much longer. Currently only about 25% of the CWD volume in those units exists as snags which can be characterized as follows: a portion of these snags are larger diameter, short, highly decayed "stubs" that may have vegetation established on them. Other snags are small diameter (<14"), short to moderately tall, moderately decayed and

unstable, which may have resulted from competition related mortality. And the last general type of snag are larger, relatively tall and range from somewhat sound to moderately decayed, which resulted from disease mortality. This last type of snag is most likely to develop in stands over 80 years old, regardless of treatment.

Stands Less Than 80 years old:

Currently there is a weighted average of about 2,013 cf. of coarse woody debris in the proposed treatment units that are less than 80 year old. Ninety percent of the CWD is in the form of down wood of which 90% is in the more advanced decay stages. Of the 10% of CWD that are snags, 88% are small hard snags mostly resulting from competition related mortality as well as laminated root rot infection. Comparatively, natural Coast Range stands 25 to 79 years of age contain an average of between 2,300 cf. and 7,600 cf. of CWD per acre. The high end of the range is mainly due to having many large legacy structures remaining from a somewhat recent disturbance such as fire or large scale windthrow events. For perspective, 7,600 cf. of wood per acre would equate to 31 trees, 30" in diameter and approximately 170' tall, per acre.

3.1.2 Environmental Effects Alternative 1: No Action

Stands 80 years and older

Under this alternative, no density management or coarse wood/wildlife structure creation 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 continue to increase to even higher levels over the next 25 years. The current weighted average Basal Area (BA) of the stands over 80 is 347 and the weighted average BA of the stands over 80 projected forward in ORGANON 25 years is 389. This shows a 12% increase in basal area over the next 25 years. Table 8 shows the current BA by stand and Table 9 shows the BA of each stand grown forward 25 years in ORGANON. As the level of competition among the trees remains high, crown development (live crown ratio, crown expansion, and branch growth) will decrease, diameter growth rate would continue to be slow. Occasional density independent mortality would occur but not at an appreciable rate. These stands would not be expected to develop complex forest structure characteristics for a century or more. This is due in part to the lack of available seed source for shade tolerant species and also because the dense canopy would be expected to persist as is for many years to come.

Stands Less Than 80 years old

These stands would continue to develop into a more uniform forest as density dependent mortality continues to affect the Douglas-fir. Snags created from suppression mortality would be small (4 to 7" DBH) and persist for only a short time (generally less than 10 years). The existing understory hemlock and redcedar would continue to grow slowly and may in some cases decline in vigor and lose epinastic control (the ability to maintain leader growth and thus height growth). 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. 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. In the absence of thinning or some other form of canopy disturbance, projections are for the density levels of the stands to generally continue to increase to even higher levels over the next 25 years. The current weighted average Basal Area (BA) of the stands under 80 is 298 and the weighted average BA of the stands under 80 projected forward in Organon 25 years is 355. This shows a 19% increase in basal area over the next 25 years. Table 8 shows the current CRD by stand and Table 9 shows each stand grown forward 25 years in ORGANON.

In *Phellinus weirii* root disease centers where less susceptible species (species other than Douglas-fir and grand fir) are not filling in, centers 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 infection centers appears to be vine maple or bigleaf maple dominated openings containing short term increases of coarse

wood as trees die or blow over followed by a declining trend in coarse wood as tree growth is limited to hardwoods or brush. The shrub density in many of these disease centers would preclude establishment and growth of understory conifer trees. Therefore, these root disease centers, while contributing to the overall diversity of the stands, would be trending toward developing into complex early seral conditions for several to many decades.

In summary, under the No Action alternative there would be the continued preponderance of developmentally simple forest structure within the analysis area for the foreseeable future. Also the prevalence of *Phellinus weirii* would continue to expand and continue to add to the reduction of conifer forest in the eastern portion of the analysis area

Table 9: Estimated stand conditions 25 years after implementing selecting Alternative 1 as projected by ORGANON

Unit	Trees/Ac.	BA (sq. ft.)	QMD (in.)	Curtis RD	Crown Closure %
15-14	95	384	27.3	73	81
15-23	85	381	28.7	70	78
17-1	137	394	23.0	82	69
17-2	215	338	17.0	82	90
18-1	91	420	29.0	78	82
18-2	113	385	25.0	77	85
18-3	106	378	25.6	75	82
18-4	111	377	25.0	75	83
20-4	80	373	29.2	69	79
20-5	150	424	22.8	89	89
20-7	114	430	26.3	84	87
20-8	108	381	25.4	76	83
20-9	78	398	30.6	72	78
20-10	113	413	25.9	81	85
21-4	69	344	30.2	63	73
21-5	126	389	23.8	80	85
21-8	83	404	29.9	74	79
21-23	104	372	25.7	73	80
22-1	122	406	24.7	82	86
23-1	244	342	16.0	86	92
25-1	160	319	19.1	73	86
26-12	164	374	20.5	83	89

3.1.3 Environmental Effects Alternative 2: The Proposed Action

One way to look at change in growth rate is to examine the differences in the Basal Area (BA) demonstrated in Tables 8, 9, 10, and 11. According to ORGANON, the weighted BA of all stands increases from 328 sq. ft./ac currently to 375 sq. ft./ac in 25 years if the stands are left untreated; a 14% increase over the next 25 years. After thinning the weighted BA of all stands would be 229 sq. ft./ac and increase to 291 sq. ft./ac in 25 years. This shows a 27% increase in basal area from the thinned stands over 25 years. The result is that the trees remaining after thinning would expand in basal area at nearly twice the rate (93% increase) than if the stands were not thinned. This increased basal area growth rate equates to considerably larger trees grown in a shorter period of time.

<u>Stands 80 years and older</u>

The current weighted average Basal Area (BA) of the stands over 80 is 347 sq. ft./ac and the weighted average BA after the proposed thinning is completed would be 246 sq. ft./ac. The thinned stands over 80 projected forward in ORGANON 25 years have a weighted average BA of 302. sq. ft./ac. The stands over 80 showed an increase in BA of 12% when they are grown out for 25 years with no treatment and increase in BA of 23% with treatment over the same time period. This works out to a 92% greater increase in basal area in the thinned stands compared to unthinned stands over 80 years old. Table 8 shows the current BA by stand, Table 10 displays the predicted harvest unit conditions immediately after harvest and Table 11 shows each thinned stand grown forward 25 years in ORGANON. .

Stands Less Than 80 years old

The current weighted average Basal Area (BA) of the stands younger than 80 is 298 sq. ft./ac and the weighted average BA of these stands after the proposed thinning is completed is 203 sq. ft./ac. The thinned stands projected forward in ORGANON 25 years have a weighted average BA of 274 sq. ft./ac. The stands younger than 80 years old showed an increase in BA of 19% with no treatment and increase in BA of 35% after treatment when they are grown out 25 years. These younger stands had an 84% greater increase in basal area in the thinned stands verses unthinned stands over the 25 year period. Table 8 shows the current BA by stand, Table 10 displays the predicted harvest unit conditions immediately after harvest and Table 11 shows each thinned stand grown forward 25 years in ORGANON.

Interestingly, ORGANON showed that the stands 80 years old and older showed a better response to thinning than the younger stands (92% to 84%).

All Stands in the Project Area

Emphasis on retaining species other than Douglas-fir would increase the relative diversity of species, maintain a seed source for understory trees and improve the general resiliency of the stands to insects, disease and other disturbances (2.2.3.3 Project Design Features pgs 33-34). Because of the large numbers of Douglas-fir in the stands now, it is expected that it would remain the major species. Leaving trees with considerable damage such as cavities, broken tops, etc. would conserve trees useful to wildlife. Leaving trees below the diameter limit of various sizes would keep some intermediate and suppressed trees in the stand. The introduction of shade-tolerant conifer species into these stands that would eventually develop into a second canopy layer would create a more complex forest than would occur without thinning and underplanting. Implementing guidelines for treating *Phellinus weirii* pockets, including the planting of the larger openings (unit 25-1) with seedlings immune or resistant to the disease, would result in a reduced spread of the disease and increased vegetation species diversity and structure.

Immediately following harvest there would be more sunlight reaching the brush layer, forest floor, and also the boles (stems) of many of the remaining trees. The additional sunlight would be patchy due to the uneven distribution of tree crowns. Some trees' crowns would become isolated from adjacent trees while others would remain in contact with neighboring trees. The brush layer would have suffered some crushing of woody vegetation and disturbance of root systems, especially in the ground-based harvest areas. Fuels treatment and site preparation prior to underplanting would also reduce the height and density of the brush layer. We expect based on experience, that the brush layer will recover to pre-harvest levels within a few years (5 or less) at which time it may be necessary to control some of the understory vegetation to foster underplanted tree seedling survival. Depending on the harvest system employed we expect that a portion of the existing coarse wood on the forest floor 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 coarse wood levels vary considerably from unit to unit, is not evenly distributed and the level of disturbance would be different for different harvest methods. The post-harvest input of fresh woody debris, both small sizes from slash and branches and large woody debris from both the harvest operation and coarse wood development treatments would offset much of the loss of existing coarse wood associated with harvesting.

See Table 11 for predicted unit parameters 25 years after implementing Alternative 2.

Table 10: Estimated conditions outside designated *Phellinus* patches, immediately following harvest as projected by ORGANON[1,2]

Unit	Trees/Ac.	BA (sq. ft.)	QMD (in.)	Curtis RD	Crown Closure %
15-14	57	242	27.9	46	67
15-23	48	247	30.9	44	65
17-1	69	219	24.1	45	68
17-2	143	158	14.2	42	74
18-1	61	268	28.4	50	69
18-2	76	233	23.7	48	72
18-3	63	231	25.9	45	67
18-4	63	231	26.0	45	67
20-4	45	233	30.8	42	63
20-5	58	196	24.9	39	63
20-7	66	296	28.7	55	77
20-8	58	225	26.8	43	66
20-9	47	266	32.1	47	65
20-10	57	241	27.9	46	67
21-4	49	265	31.4	47	65
21-5	78	255	24.6	51	73
21-8	49	286	32.8	50	66
21-23	65	256	27.0	49	69
22-1	64	260	27.2	50	73
23-1	150	193	15.3	49	79
25-1	97	180	18.5	42	71
26-12	84	218	21.8	47	73

[1]ORGANON is a growth and yield model created by Dr. David W. Hann at Oregon State University. It is used to help develop silvicultural prescriptions.

[2] The various unit parameters presented in the table represent the prescriptions for thinning outside of the designated *Phellinus weirii* patches.

The expected effects 25 years after treatment would include:

- Redirecting the current stand developmental trajectory away from increased uniformity and towards a more complex structure characteristic of older forests..
- Increased growth rates of the reserved trees which would lessen the time it takes to develop the large trees, snags and logs characteristic of late-successional forests.
- Generally increased crown ratios, crown widths, epicormic branching and limb development (branch size, length) of the residual trees with some of the dominant trees beginning to exhibit massive complex crowns.
- Increased windfirmness and stability of the residual trees.
- Decreased mortality of the smaller-sized trees over the next 25 years following treatment compared to the untreated stands.
- By retaining tree species other than Douglas-fir, underplanting portions of most units with shade tolerant species and by planting disease-resistant conifers and hardwoods in areas infested with *Phellinus weirii* root rot, the current and future impacts from this disease should be reduced, and the species diversity and structural complexity should be increased.
- Thinning primarily from the Douglas-fir component to increase the relative proportion of the other species would also increase the general species diversity of the units.

- The contrast between the harvest areas and untreated portions of stands would increase spatial diversity at the subwatershed scale.
- The establishment of an understory canopy layer through underplanting portions of most units with shade-tolerant conifers which would increase horizontal and vertical diversity throughout the stands. Eventually as the shade tolerant species mature they would provide a seed source to other nearby areas that were not treated.
- Survival of the trees planted in the understory is anticipated to be patchy (60 to 70% of the stand should have some level of understory) due to light and moisture availability. Growth rates of the planted trees that survive would vary based on each trees micro site environment. In 25 years it is expected that the understory would be made up of shade tolerant species ranging in height from 5' to 40'.
- The stands under 80 years old have a component of shade-tolerant tree species in the overstory and the thinning would stimulate natural regeneration of trees in the understory.
- Growth of understory shrubs and herbs would increase especially in areas of reduced crown density due to variable spacing of the thinning.

Table 11: Estimated unit conditions outside of designated *Phellinus weirii* patches, 25 years after implementing Alternative 2 as projected by ORGANON

Unit	Trees/Ac.	BA (sq. ft.)	QMD (in.)	Curtis RD	Crown Closure %
15-14	55	299	31.6	53	68
15-23	47	304	34.4	52	65
17-1	69	284	27.6	54	71
17-2	123	266	19.9	60	81
18-1	58	317	31.6	56	68
18-2	69	297	28.2	56	73
18-3	60	288	29.6	53	69
18-4	61	292	29.5	54	69
20-4	43	263	33.4	46	62
20-5	58	242	27.7	46	65
20-7	61	337	31.9	60	75
20-8	57	283	30.2	51	68
20-9	47	313	35.0	53	65
20-10	56	297	31.2	53	68
21-4	46	291	34.0	50	63
21-5	74	321	28.2	60	74
21-8	49	311	34.3	53	65
21-23	62	312	30.3	57	71
22-1	64	327	30.5	59	74
23-1	142	265	18.5	62	82
25-1	88	249	22.7	52	75
26-12	80	286	25.5	57	77

Coarse Woody Debris

The ORGANON program was used for modeling growth and yield of the forest stands for each alternative. One of the ORGANON outputs is tree mortality by stems and volume over time. Unfortunately we have found that ORGANON and also other stand modeling systems (FVS) have not accurately modeled the treatment stands based on observed conditions both within the stands currently and within adjacent 120 year old stands, possibly because most of the stands have previously been thinned. ORGANON and FVS both modeled considerable

mortality before treatments were applied that is clearly not evident in on the ground. The problem lies in the models' reliance on relative density to trigger mortality. The stands proposed for treatment exhibit relative densities much higher than the models are calibrated for yet they do not exhibit density dependent mortality. Virtually all of the observed mortality is from density independent factors such as isolated laminated root rot infections and a recent bark beetle outbreak which resulted in small clusters of snags but, when averaged over the whole stand result in only one or two snags per acre. We have adjusted the models to more accurately reflect the current condition (accept high relative densities without much mortality) but still do not have confidence that any snag outputs over time would accurately reflect actual changes over time for these particular stands. Therefore, we provide a qualitative analysis of effects to snags and course woody debris based on existing literature, research, and our own experience with past projects. .

In parts of the treatment stands less than 80 years old there is some density dependent mortality occurring in patches of Douglas-fir and we expect that thinning would result in the "capturing of mortality" to an unquantifiable degree. We expect that the loss of snag production for the next several decades would be from small size classes (4"-10") which would result in the loss of very little volume of snags.

In the treatment stands older than 80 years there would be an expected loss of snag potential from density independent factors simply because there would be fewer stems on the landscape subject to those mortality factors. Again it is not possible to accurately estimate the potential loss because the modeling programs tend to use density as the primary mortality driver while these older stands are beyond the stem exclusion stage and are mostly subject to density independent mortality which is much more difficult to model due to site specific factors and stand histories. While there would be some level of lost snag production until the understory develops to a degree to begin contributing coarse wood, density independent factors would still be at work causing new snags to develop over time. After treatment there would be a weighted average of about 61 overstory trees per acre remaining, which is 30 – 40 more than would be expected in an old-growth stand similar to the Desired Future Condition described earlier.

Snags and down wood occur naturally in unevenly distributed patches across the landscape. Twenty-two percent of the analysis area contains stands over 80 years old that are not proposed for treatment while the proposed action would treat 8% of the analysis area. Available data on large snag (>19.7") distribution in unharvested coast range forests indicate that while 62% of the area would have 1-8 snags/ac., only about 5% would have at least 18 snags/acre (DecAID; Mellen-McLean, et al. 2009). For snags 10 inches or less, 80% of the area had at least 8/acre and 8% of the area had at least 36 small snags/acre. With the exception of two units (17-2 and 23-1), the proposed action stands are beyond the ability to effectively produce snags 10 inches or less due to larger average size of the trees. Considering that the majority of natural unharvested stands have fewer than 12 snags/acre and that large snags persist longer than small snags (DecAID; Mellen-McLean, et al. 2009), we expect that the rest of the stands would continue to have the ability to produce snags larger than 19.7" through density independent mortality (including active snag creation) at levels commensurate with those found in unharvested coast range stands while maintaining 20-30 overstory trees/acre similar to the desired future condition. The development of a second canopy layer is critical for the development of smaller snags that cannot be provided for currently and we expect that after three or four decades the understory tree layer would begin to produce small snags as competition mortality would become more active.

The no-harvest buffers placed on all streams within the treatment areas coupled with the reservation of all trees larger than the unit specific diameter cutting limits would provide nearly all of the coarse wood potential needed for ecological stream function (McDade et. al. 1990) by allowing natural mortality functions to continue over time.

3.1.4 Cumulative Effects

The direct effects of the density management thinning, (immediately after harvest and for a few years after), the creation of coarse wood structures, and the felling of trees into selected streams would be localized and restricted to the action areas. There are two reasonably foreseeable future BLM projects that would affect the forested stands on BLM lands in the analysis area. These two projects were also designed to improve the condition of

vegetated stands. The expected long term effects (30 years or more) of improved forest stand complexity and ecological function in the Walker Creek subwatershed, coupled with the expected improvement resulting from the Cedar Creek and Hoag Pass Projects would have a positive cumulative effect on the overall function of late-successional reserve lands and spotted owl critical habitat the upper Nestucca River watershed by providing more acres of complex forest than would occur without treatment.

3.2 Hydrology

The hydrologic issues addressed in this analysis are how the proposed action would affect:

- Instream large wood
- Stream temperature
- Stream sedimentation
- Stream discharge and peak discharge

Stream morphology in the analysis area including scour and deposition, substrates, pool frequency and depth, and the availability of side channels and off channel habitats at the reach scale (hundreds of feet), are all substantially affected by instream large wood. Stream hydrologic function in the analysis area at the subwatershed scale is also driven in large part by instream large wood.

Stream temperature and sedimentation are ecologically important water quality components that support the beneficial uses of the subwatershed. Aspects of the proposed action including road work and timber harvest have the potential to effect stream temperature and sedimentation thus those water quality variables are included in this analysis. Most forest management activities have little effect on other water quality parameters including chemical contamination, nutrients, bacteria, and dissolved oxygen (US EPA 1991).

Project area streams are cold, turbulent and well oxygenated, and are relatively free of bacteria. Project actions are not expected to introduce any organic material, or animal and human wastes into any stream. Since the proposed forest management activities are unlikely to have substantial effects to these water quality parameters, they are unlikely to limit beneficial uses. Therefore, water quality parameters other than stream temperature and sediment are not included in this analysis.

Stream discharge (the volume of water in a stream) can change as a result of timber harvest and other modifications of the stream network and water flow paths including road work.

The analysis area for direct, indirect, and cumulative effects is the 6th field Headwaters Nestucca River subwatershed. This scale was used because it was large enough to assess the cumulative effects of the proposed action but small enough to avoid diluting evidence of adverse effects.

3.2.1 Affected Environment

<u>Landscape Setting</u>

All proposed harvest units and gravel and natural surfaced roads, with one exception, are located in the Headwaters Nestucca 6thfield subwatershed, a subset of the Nestucca River 5thfield watershed. Approximately 1 mile of the High Heaven Road, including one small perennial stream crossing, is located in the Panther Creek 6thfield subwatershed, a subset of the North Yamhill River 5thfield watershed east of the proposed treatment area. Essentially all of the land in the analysis area is forested and is used for forestry.

The Headwaters Nestucca 6th field subwatershed contains approximately 12,587 acres and is not typical of the patterns of federal land ownership seen in the Northern Coast Range of Oregon. The subwatershed has BLM ownership in mostly contiguous blocks unlike the usual checkerboard pattern seen on BLM lands in western

Oregon. Approximately 58% (7,290 acres) of the subwatershed is managed by the BLM where management objectives are the restoration of late-successional forest.

The proposed project is located in rugged, densely vegetated, mountainous terrain of the northwest Oregon Coast Range. The area has wet, cool winters, warm, dry summers and relatively mild temperatures throughout the year. Elevations in the subwatershed range from 1,300 feet to 2,860 feet. Precipitation is heavy, averaging about 100 to 120 inches annually, most of it coming as rain during November through February. Snow is likely at higher elevations in most years. All of the project area is within the transient snow zone susceptible to rain-on-snow events (>1200 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 mean 2-year precipitation event is high for coastal watersheds, at approximately 4.5 to 6 inches in a 24-hour period (estimated at: http://www.nws.noaa.gov/ohd/hdsc/noaaatlas2.htm).

Beneficial Uses (Oregon DEQ – Clean Water Act)

The most sensitive beneficial uses which could potentially be affected by project activities are municipal drinking water, cold-water fisheries (including salmonid habitat), and other aquatic life. The City of McMinnville draws part of its municipal water from McGuire Reservoir, an impoundment on the upper mainstem Nestucca River located at river mile 49. The City of McMinnville also has municipal water rights on Walker Creek but currently does not draw any water from there. There are no other known public or private domestic uses within 10 miles downstream of the project area.

The analysis area is within a BLM Tier 1 Key Watershed. By definition, Tier 1 Key Watersheds contribute directly to the conservation of at-risk anadromous salmonids and are believed to have high potential for restoration. The management actions/directions for these watersheds include reducing existing road mileage and implementing watershed restoration (1995 Salem District ROD/RMP, pgs. 6 & 7). The BLM has decommissioned segments of several dozen roads within the Nestucca River watershed and implemented numerous fish habitat enhancement and road improvement projects.

Description of Project Area Aquatic Resources

There are approximately 8.5 stream miles within 200 ft. of the proposed timber harvest units. Most of these are small headwater streams. The major stream systems in the analysis area are the mainstem Nestucca River downstream of McGuire Reservoir (5th order), Bald Mountain Fork (4th), Walker Creek (4th), a large, unnamed (3rd order) tributary of Walker Creek, and the upper Nestucca River (3rd and 4th order) mostly upstream of the McGuire Reservoir (see Figure 10 for a map illustrating the major streams in the analysis 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.

The Nestucca River, from the McGuire Dam tailwater downstream to the top of a steep chute near Cedar Creek, has a very low (1%) gradient, substrates comprised of fine silts and organics and runs through the area once occupied by Meadow Lake, an impoundment that drained after its dam failed in a winter storm in 1962. The steep chute on the Nestucca River is a cascade over and through large boulders and is in excess of about 10% slope. The Nestucca River downstream of the confluence of Cedar Creek is characterized by alternating hillslopes and terraces. Stream gradients of the Nestucca River in the vicinity of the proposed action average 2% with the dominant stream features being rapids, riffles and scour pools. Large wood volume in the Nestucca watershed including the Headwaters Nestucca 6th field is substantially lower than under historical conditions, however compared to current large wood volumes in other Coast Range watersheds, the Nestucca has moderate to high volumes of large wood (ODFW AQI 2006). Fish habitat restoration projects in the subwatershed including the addition of large wood have been implemented over the past 20 years. A project adding 120 logs to the Nestucca River was begun in 2011 and completed in the summer of 2012.

Bald Mountain Fork is hillslope constrained and an origin and transport reach hemmed by very- to extremely steep and often unstable, hillslopes. Stream gradient in the lowest 1.5 miles averages 4 - 6 % but increases with increasing distance from the confluence with the Nestucca River. In these lower reaches, landslides, large trees

undermined from streambanks and debris torrents from tributaries have created a complex channel with large wood and sediment deposits and irregularly spaced pools and riffles. Aquatic inventory data were collected from a 14, 642 foot reach of Bald Mountain Fork in 1997 (ODFW and BLM 1997). That survey found an average active channel width of 11 feet, prevalent bedrock, an overall average gradient of 9% and that rapids were the dominant habitat type, with few pools (14.7 channel widths between pools). Large, old pieces of in-stream, pool-forming wood are abundant in this stream segment (Bio-Surveys, LLC 2004). Key pieces of large wood were available at a rate of 3 pieces per 330 feet which met ODFW's "desirable" condition benchmark. In the headwaters of Bald Mountain Fork, the existing pool-forming, key pieces of large wood are predominately pieces of very large fir and cedars that have been in the streambanks and channel for many years (decades), though windthrow associated with ~20 year old clear cuts has contributed large Douglas fir to several reaches. Some of those old, large structural pieces are beginning to fail and the material that they've aggraded is being mobilized. The riparian corridor paralleling the stream appears in places to have been filled with alder stands which have now come and gone. Some alder logs from the now largely gone riparian stand are still in the channel. There is very little current recruitment of large conifers to the stream though there is some, very little, recruitment of young conifers on the streambanks. Approximately 57 acres of very steep (>80%) slopes adjacent to Bald Mountain Fork were removed from the proposed project due to concerns that logging activity could trigger slides into the stream.

Walker Creek and a 3rd order tributary to the upper Nestucca River above the McGuire Reservoir are alluvial (Rosgen "C1"and "C6" type channels). The channels are low gradient (<2%) and slightly entrenched surrounded by stream terraces and floodplains. Silts, clays, and fine organic material are the dominate substrates. Walker Creek has inadequate levels of large wood due to past river- and forest management activities. This has resulted in fewer deep, complex pools, reduced channel complexity and reduced capacities to sort and store gravel.

The most common types of streams in the project area are small headwaters. They are composed of colluvial and step-pool channel types. The colluvial channels are primarily 1st order channels with mostly gentle slopes (<6%) below seeps and small springs. Their low flows are usually not sufficient to move and sort coarse material. Substrates are primarily derived from the surrounding hillslopes. Recent habitat data have been collected from 4 project area unnamed tributaries by the Aquatic and Riparian Effectiveness Monitoring Program (AREMP) under the Northwest Forest Plan. The 4 reaches surveyed are representative of low gradient, colluvial headwater stream habitats in the project area. The 4 had average bankfull widths of 11.3 ft. (6.6 to 15.8 ft.), with an average of 77% shade. The step pool channels are typically larger, moderately entrenched, have low sinuosity, and moderately steep- to steep gradients (4 to 15%). Their substrates are gravel or cobble dominated. Bankfull width measurements of 8, mostly step-pool-type stream reaches scattered throughout the project area averaged 10.8 ft. (4.5 to 17.6 ft.).

Particularly around the small, headwater streams in the analysis area, the forest stand extends to the edges of streams. These dense upland stands are shaded enough that in combination with the absence of seed sources for shade tolerant tree species, prevent the natural reestablishment of an understory. These stands are also structurally homogeneous and have low rates of mortality and coarse wood recruitment (which is instream wood, if it falls in a stream). Parts of the natural disturbance regime that ordinarily create coarse wood, like windthrow, are not as prevalent in project area stands in large part because of stands' structural homogeny and density; because individual live trees and snags are sheltered from the wind by the dense stand of similarly sized trees all around them. The result is that small scale disturbances (for example now-gone old-growth trees falling and in turn toppling 2 other trees and damaging several others that would grow with "deformities" or later die and become snags, or windthrow of intermediate sized trees) may occur less frequently than they would have historically, resulting in less coarse wood, snags, or if they fall into streams, instream large wood (see section 3, Affected Environment section of this EA for a more comprehensive description of project area upland stands). Thus, in addition to the effects past timber harvest and fires in the analysis area have had on reduced levels of coarse wood, the current homogeny of stands also contributes to the maintenance of low levels of coarse wood.

Streams in the analysis area with inadequate levels of large wood tend to develop simple, incised channels, can become sources of fine sediment to higher order streams, and do not provide high quality habitat for aquatic animal species.

Relevant Hydrologic Issues

Instream Large Wood (Aquatic Conservation Strategy (ACS) Objectives 1, 3, 5)

Instream large wood is critical in forming and maintaining structurally complex and biologically productive stream habitat in the Coast Range including the project area. Instream large wood influences channel morphology at the reach scale (hundreds of feet), by affecting: scour and deposition of bedload, which in turn affects substrate distributions and pool frequency and depth, the presence and accessibility of side channels and off-channel habitats, and cover. At the subwatershed scale, higher order streams recruit large wood and bedload from lower order streams which in turn affects channel morphology on down the stream network.

Past timber harvest, valley floor road construction, homesteading, fire and other management actions such as stream cleaning within the action area have reduced levels of instream large wood. Large wood volume in the Nestucca watershed is substantially lower than under historical conditions, however compared to current large wood volumes in other Coast Range watersheds, the Nestucca River has moderate to high volumes of large wood with 49 key pieces per mile and an overall wood volume of 65.9 m^3 per mile; reflecting a "desirable" condition by ODFW benchmarks (ODFW/BLM 2006) but does not meet the 80 key pieces per mile habitat quality benchmark indicated in the Analytical Process for ESA Consultation for fish species within the Northwest Forest Plan area(USDA Forest Service *et al.* 2004).

Many of the project area 1st and 2nd order streams have not accumulated much large wood since their last debris torrents, including the tributaries to Bald Mountain Fork. As a result, those streams are not storing gravel that would be available to erode into Bald Mountain Fork at some point in the future. The majority of the large wood in Bald Mountain Fork itself has been in the stream channel for decades. Many of the key pieces were derived from very large cedars. Many of the key pieces and jams appear to be towards the end of their functional lifespans; the structures are beginning to fail. As structures fail, the gravel that they have accumulated is scoured and mobilized downstream.

In most reaches, there has been little recent recruitment of large wood, though in other reaches, windthrow associated with ~20 year old clear cuts on the opposite streambank has contributed large Douglas fir to the stream. Many of these riparian areas held red alder stands that have senesced and left a gap in the canopy directly above and adjacent to streams.

Headwater basins on private lands in the analysis area are clear cut harvested without any stream buffers which negatively effects stream channel morphology in those reaches. Streams from private lands in the analysis area do not have any large wood in them which simplifies reach scale stream complexitiy, characterized by few pools, uniform velocities, and little gravel for hyporheic flow. Arguably more importantly, because most of the streams draining from private lands are small headwater streams, is that the stream network function of those headwaters, to store and eventually recruit large wood to lower order streams, is lost. The result is that higher order stream reaches can also lack deep pools, gravels, and complex channels that spread high flow out and slow it down.

Stream Temperature (ACS Objective 4)

Stream temperatures in the analysis area are mainly influenced by the extents of primary and secondary shade zone cover. As shade levels decrease, the likelihood and magnitude of stream temperature changes in response to changes in shade increases. The primary shade zone is the area above a stream that receives sunlight during the middle of the day (USDA Forest Service, USDI Bureau of Land Management 2010); the time period of greatest sun exposure and thus potential warming. The secondary shade zone is the area outside of the primary zone that provides stream shade during the rest of the day. Recent research (Janisch *et al.* 2012) has suggested that there may be a positive relationship between the abundance of gravel substrates in streams and decreased sensitivity to water temperature change following logging. Gravel accumulations in streams in the Coast Range are associated with instream large wood.

In 2002, the Oregon Department of Environmental Quality (ODEQ) established Total Maximum Daily Loads (TMDLs) for temperature, sediment and bacteria in the Nestucca River downstream of Powder Creek (at least 15 river miles downstream of the project area). While not all streams within the Nestucca River watershed are overly warm, the TMDLs apply to all water bodies within the watershed.

The temperature TMDL is aimed at keeping water temperatures in the Nestucca River below 64°F (or below 55°F during fish spawning seasons, November to January; based on a 7 day moving average of daily maximum temperatures). Different tributaries down the length of the Nestucca River contribute water with different temperatures. Most of the tributaries in the Headwaters Nestucca 6th field contribute water considerably cooler than 64°F. Summer stream temperatures were measured at 2 locations in the Headwaters Nestucca 6th field during 2012. Seventy-nine days of measurements (from July 3, 2012 to September 19, 2012) were obtained (HOBO Onset Water Temp Pro v2). Temperature was measured in the Nestucca River, immediately downstream of the mouth of Walker Creek, and again immediately downstream of the mouth of Ginger Creek, about 3.5 river miles downstream from Walker Creek. Just below the Walker Creek confluence, the average 7 day max was 58.5°F (7 day max ranged from 52.8° - 63.4°). Below the mouth of Ginger Creek, the average 7 day max was 57.2°F (7 day max ranged from 54.3° - 60.6°) indicating that the waters in the Nestucca Headwaters subwatershed are well within the TMDL.

At the project area scale the temperature TMDL requires that land managers achieve "system potential vegetation" along all perennial streams through restoration or protection because stream shade is the most influential driver of stream temperature. The DEQ and BLM expected that "shade targets" would be achieved over time, from several years up to several decades (DEQ 2002). A BLM study found that on BLM lands along the upper Nestucca River, the effective shade level is only slightly below the modeled system potential effective shade (Mico 2007). Recent habitat data have been collected from 4 project area unnamed tributaries by the Aquatic and Riparian Effectiveness Monitoring Program (AREMP) under the Northwest Forest Plan. The four reaches surveyed are representative of the low stream order, low gradient types of stream habitats in the project area and have an average of 77% shade.

Walker Creek and most of its tributaries are well shaded on BLM lands, though flow through cleared forests on private lands. Reaches of Bald Mountain Fork and some if its tributaries originating in proposed timber sale units are missing much of their potential canopy from the primary shade zone, above and directly adjacent to the stream channel. These reaches had riparian large cedars and alder stands. The cedars are the current large wood component of Bald Mountain Fork and the alder stands have matured and are falling apart to the point where they leave a gap above the stream between the streambanks and where the upland fir stand begins, in many cases halfway or more through the primary shade zone. Approximately half of the slopes on the southern, north-facing walls of the canyon that makes up the Bald Mountain Fork subwatershed, were clear cut in the 1970's, 80's and 90's. Riparian buffers including large Douglas fir were left and have blown into or across Bald Mountain Fork, lessening stream shade but providing a contemporary large wood component.

Headwater basins on private lands are clear cut harvested without any stream buffers which negatively effects stream channel morphology and increases water temperatures in those reaches. Streams from private lands in the analysis area do not have any large wood which simplifies reach scale habitat, characterized by few pools for cover, uniform velocities, and little gravel. They also have no shade other than that provided by slash deposited into channels. Arguably more importantly, because most of the streams draining from private land are small headwater streams, is that the stream network function of those headwaters, to store and eventually recruit wood and gravel to lower order streams, is lost. The result is that higher order stream reaches can also lack deep pools and gravel that can insulate streams from temperature increases.

Stream Sedimentation (ACS Objectives 3, 4, 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). Sedimentation can reduce aquatic animal productivity, species diversity and morphological variability, which

further reduces production and diversity. Headwater reaches with excessive sediment become sediment source areas for downstream reaches.

The Nestucca River, upstream of Powder Creek (which includes the analysis area), has been subject to a sediment and habitat modification TMDL since 2002 (ODEQ 2002), as a result of sedimentation caused by past land management activities. The sediment TMDL requires that system potential vegetation be achieved to help stabilize stream banks and defines desirable sediment conditions as those where sediments and fines comprise no more that 20% of the area of riffles and glides (ODEQ 2002). The segment of the upper Nestucca from Ginger Creek to Cedar Creek (a reach between the confluences of the project area streams Bald Mountain Fork and Walker Creek) is dominated by cobble, boulder and gravel substrates with 16% fines in riffles (ODFW and BLM 2007). Recent habitat data have been collected from 4 project area unnamed tributaries by the Aquatic and Riparian Effectiveness Monitoring Program (AREMP) under the Northwest Forest Plan. The 4 reaches surveyed are representative of low order, low gradient types of stream habitats in the project area, well above the distribution of Coho. Lower gradient stream reaches tend to have higher percentages of fine sediment than steeper project area streams (Mico 2007). The 4 streams had substrates that averaged 49% silt or sand, with a bedrock or gravel component. A BLM study in 2004-2005 found that throughout a portion of the watershed that included the project area, 39 sample sites on 3rd and 4th order streams had an average of 9.25% sand and fines in riffles (Mico 2007).

Concentrations of fine sediment in the upper Nestucca and most reaches of its tributaries in the project area are lower than the TMDL benchmark of 20% (Mico 2007). ODEQ believes that most current sources of sedimentation are at lower elevations in the watershed (downstream of the project area) and that the upper Nestucca has "recovered substantially [from past sedimentation] . . . and targets for instream fine sediments are currently met" (ODEQ 2002).

Road and stream crossings can contribute sediment to streams from the road prism, including the road surface, erosion from cut banks (on the uphill side of roads) and fill slopes (on the downhill side of roads), and roadside ditches. Ditchlines in the analysis area often connect to streams because stream channels are found in so many of the lowest topographic features in a given area. There are approximately 45 existing stream crossings on unpaved roads in the analysis area. About half of these culverts are currently in poor or fair condition. The proposed action includes installing 11 new cross drains and replacing 9 existing culverts and cross drains. Eighteen of the 20 are cross drains to drain ditch lines during wet weather.

Based on field visits, some of the roads that would be used in the project, show evidence of surface rutting, undersized or poorly functioning culverts, inadequately spaced cross drains, nonfunctioning ditches, and unstable cut-banks and fill slopes. Each of these road features taken individually could contribute sediment to streams via increased volume, velocity and thus turbidity of surface runoff. When these factors occur coincidently as they tend to, their effects are more likely to be realized.

Turbidity in project area streams tends to be extremely low during the summer dry season (around 1 nephelometric turbidity unit), relatively high during the first few fall/winter storms, returning to a low turbidity, clear condition between substantial rain events during the wet season.

Stream Discharge and Peak Discharge (ACS Objective 6)

Stream flows in the analysis area closely parallel the precipitation pattern. Peak flows generally occur during the heaviest precipitation months of December through February. Bankfull events generally occur annually. Low flows occur during the dry months of July to October.

Forest management activities such as timber harvest and road building can increase the volume and timing of stream flows, including peak flows. A substantial portion of the precipitation in a forest is taken up by trees during evapotranspiration (~20% in the analysis area). Timber harvest can increase stream discharge by removing trees from the forest that would otherwise draw water up out of the soil. Roadside ditches can extend stream networks by capturing water from road surfaces and roadside seeps and conveying that "extra" water into streams;

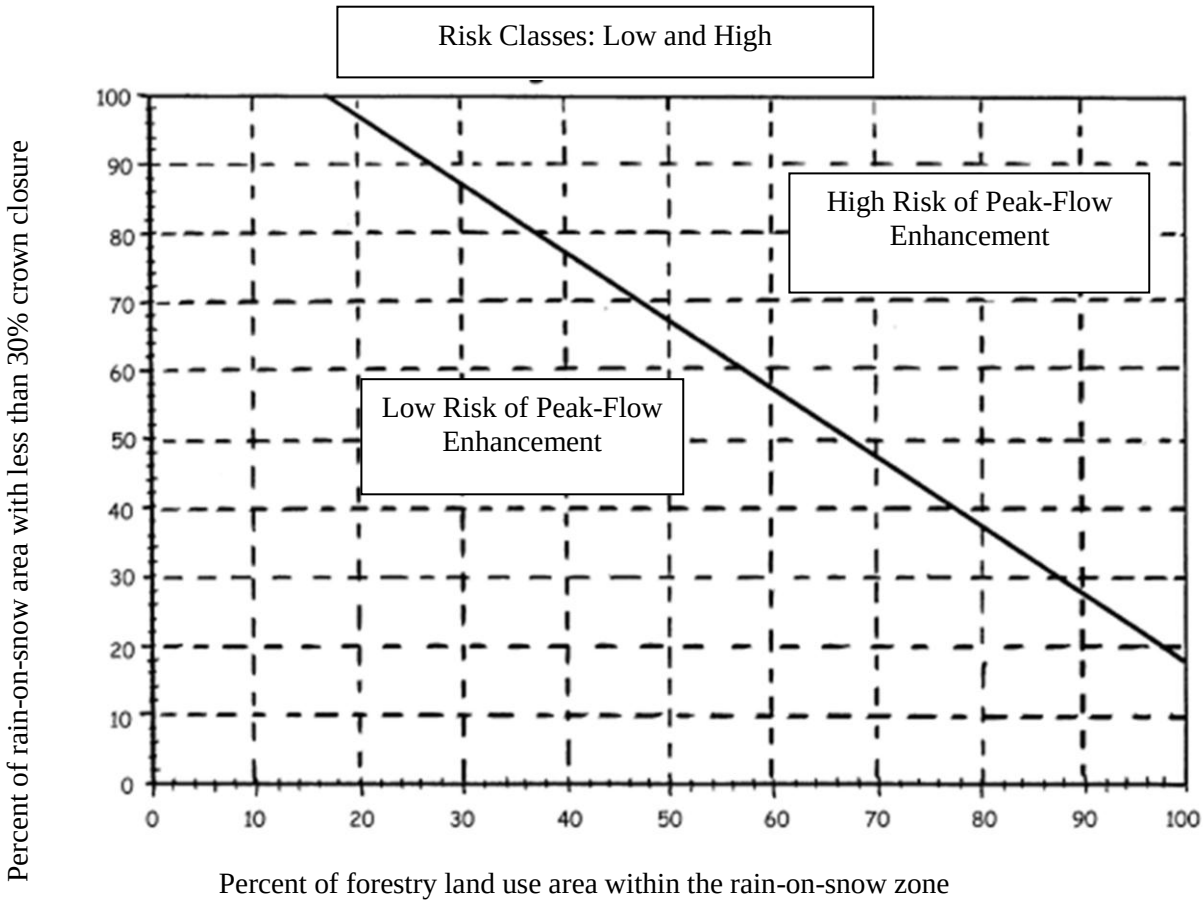
water that would have been dispersed on the forest floor or have remained sub-surface, were it not for the presence of the road. Increases in peak discharge can accelerate stream bank erosion, scour streambeds and increase sediment transport. In the Headwaters Nestucca subwatershed rain-on-snow events most frequently produce peak discharge events.

To assess the current condition of the affected subwatershed, an analysis of the risk of increased peak flows was conducted using the Oregon Watershed Assessment Manual watershed analysis method (Watershed Professionals Network 1999; the "OWEB method") evaluating road area and forest openings. For roaded area, the OWEB method uses a "threshold of concern" based upon the percent of roaded area within a subwatershed. The threshold levels for roaded areas are less than 4% low risk, 4-8% moderate risk, and more than 8% high risk. Roads occupy about 2.9% of the area of the affected subwatershed which indicates that the subwatershed is at low risk for increases in peak discharge as a result of its road area. The assessment was based on GIS data and assumed an average road width of 25 ft.

To estimate the impacts of forest openings, the OWEB method considers the percent of the analysis area in the rain-on-snow (ROS) area and the percent of the ROS area with crown closure of less than 30% (Watershed Professionals Network 1999; analysis based on a review of 1993 and 2009 aerial photos at the 6th field subwatershed scale).

Approximately 74% of the 6th field subwatershed is under forestry land use and within the transient snow zone susceptible to rain-on-snow events (>1200 ft. in elevation with no dominant snow zone or snowpack) where rain-on-snow events produce the highest peak discharges. Approximately 9% of the 6th field has less than 30% crown closure. The OWEB analysis indicated that under current conditions there is a low risk of forest openings contributing to increases in peak stream discharge in the affected subwatershed (74% of the analysis area is within the rain-on-snow zone x 9% of the analysis area has crown closures less than 30% = low risk for peak flow enhancement; Figure 9, adapted from Watersheds Professionals Network 1999, Component IV, Hydrology and Water Use).

Figure 9 - OWEB's Risk of Peak Flow Enhancement from Forestry Openings



Private lands adjacent to the project area (38% of the Headwaters Nestucca subwatershed) are commercial timber lands that are harvested under Oregon Forest Practices Act rules on a rotating basis. Clearcuts, particularly adjacent to stream channels, can elevate stream discharge relative to pre-harvest conditions. Elevated discharges can increase the likelihood and severity of channel downcutting (in-channel erosion), particularly in combination with a lack of large wood, which can homogenize reach scale channel morphology, can travel down the stream network, and contribute to downstream sedimentation.

3.2.2 Environmental Effects Alternative 1: No Action

Instream Large Wood (ACS Objective 1, 3, 5)

Under the No Action alternative, the structurally homogeneous stands in the analysis area would continue to experience low rates of intermediate disturbance, mortality, and subsequent recruitment to streams. On the basis of the BLM Silviculturist's judgment, project area trees would maintain their current (low) growth rates. The current infrequency of shade tolerant tree species would continue to limit the recruitment of those species and thus those species would remain rare and unable to contribute wood to streams.

The BLM would not fell 30 trees into project area tributaries and those streams would continue to have low numbers of large wood pieces. Site visits suggest that instream habitat complexity, particularly in Bald Mountain Fork, could become more simplified as current key pieces of large wood fail. The possible result is that if gravel accumulations were to be flushed out of Bald Mountain Fork because old log jams failed, there is little gravel stored upstream to replace it. Affects to the hydrology would include reduced hyporheic flow which would have biological consequences (which will be discussed in the Fisheries section) as well as morphological ones including reduced pool frequency and depth, and a subwatershed scale affect where Bald Mountain Fork no longer contributed wood and gravel to the Nestucca River, for example.

We assume that riparian stands on private lands near the project area would continue to be dominated by relatively small, young trees and periodically clear cut. Stream channels in those reaches would continue to contain low levels of large wood and stream channels would remain simplified.

Stream Temperature (ACS Objective 4)

Because the No Action would not directly alter vegetation in either shade zone and there is evidence that suggests that stream temperatures in the analysis area do not exceed TMDL thresholds the No Action alternative would probably maintain that temperature trend. In those stream reaches bordered by younger stands, the extent of stream shade will increase as stands continue to grow taller, providing more shade and thus thermal protection.

Riparian stands taken over by shrubs in the absence of streamside trees, such as those on private lands would probably continue to be shrub dominated because of a lack of seed sources for shade tolerant conifers and because dense shrubs preclude shade intolerant tree species' recruitment (Hobbs et al. 2002). Shrubs, being so much shorter than trees, generally provide less shade to streams, particularly in the primary shade zone, therefore riparian areas filled (only) with shrubs have a greater risk of elevated stream temperatures.

Because many of the gravel bars created by large wood in project area streams are beginning to fail due to age, and because the rate of wood recruitment has been so low in recent decades, there may be some potential that streams could become more vulnerable to temperature changes as gravel accumulations are mobilized. The No Action alternative would have no impact on the progression of these processes.

Stream Sedimentation (ACS Objectives 3, 4, 5)

The No Action alternative would not involve any culvert replacements or road maintenance that would convey small volumes of sediment to area streams. However, roads in the analysis area identified as having poor surface conditions or undersized or failing culverts would not be renovated thus any sedimentation currently occurring 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.

Because no project specific haul would occur adjacent to Walker Creek, the creek would probably maintain its current level of fine sediment which would in turn maintain the currently met targets for fine sediments in the upper Nestucca River.

Stream Discharge and Peak Discharge (ACS Objective 6)

Absent the proposed logging and road work, there would be a continued low risk for damaging increases in peak flows as described in the affected environment.

3.2.3 Environmental Effects Alternative 2: The Proposed Action

Instream Large Wood (ACS Objectives 1, 3, 5)

Timber harvest is the aspect of the proposed action that has the most potential to influence future instream large wood recruitment in the analysis area. Research has demonstrated that most key-piece sized pieces of wood (in excess of 24 in. in diameter; big enough to serve as "key" structural features that influence the stream channel around them; Rosenfeld and Huato 2003) in streams tend to originate from areas closest to streams (May and Gresswell 2003). Perhaps most pertinent to the proposed project, McDade et al. (1990) found that over 90% of all wood pieces (key pieces and smaller) in streams in mature conifer stands originated from within 100 ft. of the stream. McDade et al. surveyed mature conifer stands with an average height of 48 m (157 ft.); very similar to the tallest stands the proposed action would thin. In old growth stands in the southern Oregon Coast Range, upwards of 90% of the pieces and about 90% of wood volume in 2nd and 3rd order streams originated within about 200 ft. of the stream, including from landslides (May and Gresswell 2003). Approximately 65% of wood pieces and 50% of wood volume originated from within 100 ft. (May and Gresswell 2003). Welty et al. 2002 modeled 140 year old stands and found that 97% of wood was recruited within 131 ft.; 92% within 100 ft., nearly identical to McDade et al.

None of these studies explicitly related wood recruitment distances to the height of trees in the adjacent stands though clearly the height of trees is a factor related to recruitment distance. To draw an inference from McDade et al.'s (1990) findings, most (slightly >90%) wood originated from within about 64% of the average mature stand height (=100 ft./157 ft.). Applying the same inferred association between current tree height and recruitment distance to an old growth stand (May and Gresswell 2003), most wood originated from within 200 ft. of the stream, a distance equal to the 200 ft. average tree height in that stand; about ½ within 100 ft., or ½ the average tree height. In the stands that the proposed action would thin, the proposed minimum 100 ft. buffer on perennial streams (and there are very few intermittent streams with 60 ft. buffers), would be no less than 62% of the current average stand height (in 160 ft. stands; up to 94% in 106 ft. stands). It is reasonable to infer that since the proposed buffer width and average stand height ratios are similar to those described by McDade et al (1990) and May and Gresswell (2003), that the proposed buffers would capture a similar percentage (~90%) of the potential wood recruitment. Secondly, any loss of wood recruitment potential would occur beyond at least 100 ft. (or 60 ft. in those few locations) where logically any given tree's chance of recruitment to a stream is less assured, considering that fall direction would need to be directly toward the stream and that there would be a considerable amount of timber that the tree would need to fall through in order to reach the stream. This fact is borne out by the recruitment curves from the studies which are not linear. These curves flatten out considerably after 90% recruitment level and indicate that considerably more distance from the stream (30 – 50 feet depending on study) are needed to reach the next 4 – 5% of recruitment.

Because no harvest buffers would be wide enough to maintain most (slightly > 90%) of the potential wood recruitment near streams that would be available under the No Action alternative and that steeper ground more prone to landslide have been excluded from the units, nearly all actual wood recruitment potential would be maintained, and thus the morphological features related to instream large wood, scour and deposition, substrates, pool frequency and depth, and the availability of side channels, would not be measurably affected. Because stream morphology in low order reaches would not be affected, their role in maintaining subwatershed scale hydrologic processes lower in the stream network would be maintained.

Analyses were conducted in an effort to quantify the effect of the proposed action on the number of large trees near streams as a proxy for evaluating effects to the potential for large wood recruitment to streams. Analyses used stand exam data and assumed that trees of each size class were evenly distributed throughout the unit and that the current average tree height was the maximum distance from the stream that a tree could contribute wood to the stream. The top 25 – 30% of the largest trees potentially able to contribute wood to streams from outside the no-harvest buffer (the area where McDade found that 5-8% of instream wood comes from) would be retained per the Diameter Cut Limit (DCL) and that while some relatively large trees smaller than the DCL may be removed, only a few would be before the target basal area was attained. Units 15-14 and 15-23 include stands with relatively large diameter trees and would be adjacent to Walker Creek. In unit 15-14, an estimated 5 trees > 24 in.dbh but less than the DCL could potentially be harvested from within a distance equal to the current average stand height of 140 ft. from the stream. We estimate that Unit 15-23 with 1500 ft. adjacent to Walker Creek, could have an estimated 8-10 trees > 24 in.dbh but less than the DCL harvested from within a distance equal to the current average stand height of 160 ft. from the stream. These reported numbers are gross estimates and are

more likely to be overstated than understated. The reason for this belief is because trees larger than the diameter cut limit are more likely to be nearer the stream and thus reserved, and the average heights used in the analysis included all of the trees including these largest reserved trees, which would overstate the potential recruitment distance (smaller trees are generally shorter and would need to be nearer to the creek to contribute).

It is important to clarify that the studies found smaller amounts of instream wood came from forest areas farther from the stream, but they did not (could not) provide any data on the *likelihood* or *time frame* for when any given tree would contribute wood to the stream. It should be intuitive that not only would trees further from the stream contribute less wood, the *probability* that they contribute any wood at all is also less. It is also important to note that the studies and models cited above did not distinguish between "key piece" size wood and other wood, but rather reported total wood regardless of size. It should also be intuitively obvious that the loss of potential for wood recruitment from the outer edge of the recruitment zone would be from the smaller size classes (tops of trees and branches).

If 5 trees > 24 in.dbh were harvested from 15-14, approximately 30 would remain in the stand and available for potential recruitment (about 86% of the pre-harvest total; 30 trees, > 24 in.dbh, within 140 ft. from the stream). If 10 trees > 24 in.dbh were harvested from 15-23, approximately 51 would remain in the stand and available for potential recruitment (about 82% of the pre-harvest total; within 160 ft. from the stream). It is also important to remember that the remaining 82- 86% of key piece sized trees outside of the no-harvest buffers would occur in the area of the stands where 5-8% of large wood recruitment would occur. Together, these units are adjacent to 2500 ft. of streams in a subwatershed with approximately 30 miles of 3rd order and larger streams (based on GIS analysis) which equates to ~1.5% of the stream length in the subwatershed. As a result, while the proposed action would slightly decrease *potential* wood recruitment relative to the No Action alternative, there is little likelihood it would decrease actual wood recruitment and thus would not affect the hydrologic processes dependent on instream large wood.

Lastly, the proposed action would fell about 30 trees directly into several reaches of project area tributaries to increase instream wood levels. The addition of 30 trees to tributaries will support reach scale (hundreds of feet) and subwatershed scale hydrologic processes by increasing instream wood levels relative to the No Action alternative and thereby encouraging natural channel forming and morphological characteristics including scour and deposition, substrates, pool frequency and depth, and the availability of side channels. An unrelated project (see scoping section) added or will add in 2014, 40 trees into 2 reaches of Walker Creek (including the 1500 foot reach adjacent to unit 15-23) which will help meet the current need of instream wood in that stream.

A possible indirect effect of the proposed action on instream large wood could be the reestablishment of shade tolerant tree species (hemlock specifically) in riparian areas. A lack of seed sources is a contributing factor in the rarity of hemlock in project area riparian areas. Given seed sources by the proposed action, hemlock could repopulate project area streambanks and eventually increase the rate of instream wood recruitment compared to the rate under the No Action alternative simply by being present and therefore available for recruitment to streams. Increased levels of instream wood would support the natural hydrologic processes in the analysis area.

Another potential indirect affect is that thinning may accelerate the frequency of intermediate disturbance relative to conditions under the No Action alternative, like windthrow, by creating more structurally diverse upland stands. Windthrow in upland stands could indirectly affect instream wood by knocking trees over in the riparian stand, potentially recruiting wood to streams. Increased levels of instream wood would support the natural hydrologic processes in the analysis area.

In summary, the direct reduction of instream wood recruitment potential due to thinning would not measurably affect actual instream wood levels now or in the future. Stream hydrology at the subwatershed scale, which is indirectly dependent on instream wood, would also not be affected. Directly increasing instream wood levels by adding 30 trees to streams would have a small magnitude, positive affect to the hydrologic function of the subwatershed. The proposed action would thus be in compliance with the TMDL for habitat modification within the 6th field subwatershed.

Stream Temperature (ACS Objective 4)

The majority of proposed harvest units near streams would be on northern slopes and therefore do not make substantial contributions to secondary shading in the project area (USDA Forest Service and USDI Bureau of Land Management 2010).

The proposed action would thin outside of primary shade zones on all perennial streams (in stands that average between 100 and 140 ft. tall as in much of the analysis area, 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). No harvest buffers of at least 100 ft. on perennial streams would include primary shade zones in their entirety and thus maintain the same levels of primary zone shade as would be available under the No Action alternative.

Intermittent streams would have no harvest buffers of at least 60 ft. which is less than estimated primary shade zone widths of 70-85 ft., thereby allowing thinning in the outer 10-15 ft. of primary shade zones of intermittent streams. However, because unit boundaries (buffer widths, in effect) were designed based on site visits and LiDAR analyses of hill slope and visual evidence of slope (in)stability, many intermittent stream buffers will be in excess of 60 ft. (60 ft. is a minimum). Thinning unit boundaries around intermittent streams in unit 18-3 for example, range from about 80 ft. to just over 200 ft. from the streams (with most boundaries about 100 ft.). Consequently, no harvest buffer widths around most intermittent streams would be wide enough to contain primary shade zones in their entirety and thus maintain the same levels of primary zone shade as would be available under the No Action alternative.

Secondary shade zones are estimated to be from the outside of primary zones (70-85 ft., depending on tree height and hillslope), out to 1 SPTH, 220 ft. in the analysis area (USDA Forest Service and USDI Bureau of Land Management 2010) and would be thinned under the thinning prescription for each unit. With underplanting and the rapid vegetative growth rates in the project area, any loss in effective shade would recover within an estimated 3 years following project completion. Among the goals of the proposed action is reestablishing an understory which would increase secondary shade to streams and indirectly protect against temperature increases or even lower stream temperatures compared to current temperatures or those under the No Action alternative.

Recent research (Groom *et al.* 2011a and Groom *et al.* 2011b) found timber harvest outside of no harvest buffers with average mean widths of 170 ft. (variable from 82 to 200 ft.) did not produce statistically significant stream temperature changes from background conditions, though 2 (of 33) study sites experienced temperature increases in excess of 2 C post-treatment (Groom *et al.* 2011b). In the 33 harvest units studied (on both state and private lands), 26 units were clear cut and 7 were thinned. Sixteen units were thinned on both sides of individual streams. While *average* no harvest buffer widths were reported, no harvest buffers *varied in width* down to 32 ft. (J. Groom, personal communication). The measured no harvest buffers on Oregon Department of Forestry (ODF) lands had an average median width of 139 ft. (with medians from 60 to 197 ft.; J. Groom, personal communication[7]). On 15 harvest units on ODF land including 18 no harvest buffers adjacent to stream reaches, 13 of the 18 no harvest buffers had average minimum widths less than 150 ft. (with an average minimum of 90 ft.; 6 of 18 sites had minimum widths < 100, with an average minimum of 53 ft.; 4 sites ≤ 50 ft. with an average minimum of 42 ft.; J. Groom, personal communication).

Stream shade is positively related to basal area (Groom *et al.* 2011b; Allen and Dent 2001) and % shade is the most important influence on stream temperatures (Allen and Dent 2001). The proposed thinning prescription aims to thin to an average basal area of 236 ft^2 (158 to 296; see Table 4 Harvest Unit Summary) over the entire project area. A modeled relationship (Groom *et al.* 2011b) suggested that for a 500 m long stream reach with adjacent thinning, that a post-treatment basal area around 100 ft^2 per acre was associated with higher shade values and by inference, be unlikely to provoke a temperature change or at least minimize the magnitude of any change.

[7] Median analyses excluded 200 ft. measurements that skewed data distributions to the right, based on the suggestion of J. Groom, personal communication.

Basal areas up to around 200 ft^2 for 500 m long treatment reaches illustrated some of the highest post-treatment basal areas noted in the study (and were therefore associated with the lowest reductions in stream shade; Groom *et al.* 2011b).

The temperature responses documented in Groom et al. (2011b) suggest that the proposed action would be unlikely to provoke a temperature response that was measurably different from background variation under the No Action alternative for the following reasons. Groom et al. (2011b) found that stream temperatures did not change outside of background conditions following treatment (on state lands, which this analysis compared to). In comparison to the proposed action, Groom et al. (2011b) measured stream temperature effects of harvest in stands of shorter trees and shorter stands generally provide less shade than taller trees. They observed more intensive treatments than those proposed here including clear cuts or thinning to relatively low BAs, sometimes on both sides of a given stream. The proposed action would retain higher BAs that would thus provide more shade and prevent temperature increases. They documented the widths of no harvest buffers used and those widths varied, at times considerably narrower than the 100 ft. minimum proposed here. The proposed buffers would be wider and thus have a higher likelihood of maintaining temperatures indistinguishable from those under the No Action alternative.

About one-half of the 26 intermittent streams near harvest units originate near the edges of unit boundaries and flow away from units, as opposed to through or alongside them, which shortens the length of stream segments' "exposure" to primary or secondary shade zone thinning in the harvest unit. Intermittent streams, by definition, lack surface flow during the period of year (the summer) when sunlight has the greatest potential to warm surface water and when water temperatures are at their highest and thus further temperature increases could exceed a threshold. With no surface flow, intermittent streams would thus be invulnerable to warming beyond what they would under the No Action alternative.

Road construction would occur as close at 280 ft. from, and 60 vertical feet above Walker Creek. That area is outside of the secondary shade zone around Walker and thus does not contribute to stream shade or temperature maintenance. As a result, removing trees from the new road corridor will not affect shade or temperatures in Walker Creek. Road renovation would not alter stream shade and thus would not affect stream temperatures. The temporary stream crossing in unit 15-14 would not affect stream temperatures because surface water would not be present during the time work would be conducted. With no surface water present during the dry season, intermittent streams would be invulnerable to warming at road crossings.

Under the proposed action, project area streams would be not be expected to increase water temperatures within any of the project area streams and thus not contribute to temperature increases in lower reaches of the Nestucca River as outlined in the TMDL.

Stream Sedimentation (ACS Objectives 3, 4, 5)

Aspects of the proposed action with the most potential to contribute to stream sedimentation are road construction and renovation, timber haul, and timber harvest to a lesser extent.

Roadwork would occur on gentle to moderately sloping, stable ridgetops and benches more than 100 ft. from streams. The proposed action includes installing 11 new cross drains and replacing 9 existing culverts and cross drains. Eighteen of the 20 culverts would drain ditch lines during wet weather and not be connected to the stream network. One culvert would be replaced in the upper reaches of an intermittent stream and one culvert would be replaced on a small headwater stream. The volume of sediment generated by the culvert replacement that could be delivered to streams would be small, probably less than 0.25 yd^3 for each of the two stream culverts replaced. With very low (or no) summer flow at the time of the culvert replacement, no erosion would occur until the first fall storm events. During the initial rain events of the season, streamflows and background turbidity and sediment transport levels are high and sediment from channel adjustments at the replaced culvert (estimated to be about 0.25 yd^3) would move through the stream system. During this time, there may be a slight, visible, increase in turbidity for a short distance downstream of the replaced culvert (less than 100 feet). Because background turbidities are high during this seasonal time period, project specific turbidity would probably be indistinguishable

from turbidity under the No Action alternative.

As part of road renovation, ditches will be cleaned to insure they effectively drain the road prism. Small volumes (0.25-0.5 yrd^3 per ditch) of sediment will be produced and routed into streams by cleaned ditches. Ditches should stabilize and stop producing sediment within 1 rainy season after being cleaned. Roads proposed to be renovated cross streams approximately 18 times. If it's assumed that there are 2 ditches draining into each crossing (a worst-case scenario), and that 0.25-0.5 yd^3 of sediment will be produced from each ditch during their first post-renovation winter, total sedimentation from the proposed road work at road crossings would be on the order of 9-18 yd^3 of sediment, distributed over 18 streams and roughly 2,300 acres of the 12,587 acre subwatershed. Road/stream crossings are very high up in the watershed and sediment will be flushed to depositional areas during periods of high background turbidity. Cleaned ditches will produce immeasurable increases in turbidity and subsequent sedimentation, relative to the No Action alternative.

Shortening existing ditches with cross drains will reduce the volume, flow lengths, and thus erosive power of runoff in ditches. Because the road prism includes areas of disturbed or potentially erosive ground and because saturated road beds can produce more mobile sediment (and road surface damage), isolating surface water by shunting it out cross drains will help maintain the integrity of the road and minimize sediment mobilization from the road prism. Cross drains are not connected to streams and drain out onto the forest floor. By draining the road prism, cross drains help maintain the structural integrity of roads thereby reducing the likelihood of road segments' collapsing or eroding into streams. Cross drains improve the hydrologic performance of roads relative to those same road segments under the No Action alternative. The affect to streams is that the potential for stream sedimentation from roads will be reduced compared to that under the No Action alternative.

This analysis assumed that haul on paved roads would not present project-specific effects to streams. Haul from 19 of 22 proposed thinning units will only occur during dry season conditions (generally June through the 1st half of October; see Table 7 of seasonal restrictions). In units 18-2, 18-3, and cable yarding portion of 17-1, yarding and hauling will be allowed year round on the Grassy Flats (3-6-17.1) and South Slope Roads (3-6-20.2) at the discretion of the BLM providing that no detrimental environmental effects or infrastructure damage is occurring. These units are a short distance along rocked roads, high on the slope, with few stream crossings (small, 1st order headwaters) and could get to pavement on Bald Mountain Road (4-7-27) quickly. The haul route out of 17-1 (3-6-17.2) has no hydrologic connection and therefore cannot route sediment. The haul routes out of 18-2 and 18-3 have only 1 perennial and 2 intermittent stream crossings. The proposed action will replace or install 13 cross drains along the length of the Grassy Flats (3-6-17.1) and South Slope Roads (3-6-20.2; the roads proposed for year 'round haul) to coarse water out of the road prism and to shorten the lengths of existing ditches.

Approximately 0.5 mile of the AB Road (3-6-15.3) is parallel and adjacent to Walker Creek (from about 5 ft. to 160 ft.; 80 ft. on average based on 45 GIS "near" measurements). The potential for sediment delivery from the AB Road is low because the area is nearly flat (<2% slope), has vegetated ditches, and streams in the area are either intermittent or have very little or no flow in the dry season and thus no or low capacity to transport sediment. Haul on the AB Road will be restricted to dry season conditions.

Fine sediment inevitably created by haul will likely be washed from the road surface and nearby vegetation in the first few precipitation events of the fall when background levels of turbidity are naturally elevated. Regular road inspections during periods of wet season haul will allow close monitoring of haul-related runoff as well as the ability to quickly implement management decisions (like ceasing haul on a given road). Research has demonstrated that relatively short segments of small ephemeral and intermittent streams (300 to 400 feet), like those near haul routes in the analysis area, can store coarse sediment washed from roads which prevents that material from traveling down the stream network (Duncan et al. 1987).

Sediment composition data suggest that project area stream segments near roads accumulate some sediment each dry season, to the levels reported in the Affected Environment section, which is probably mobilized yearly at the onset of the rainy season. If sediment were not being mobilized yearly (or so), substrate composition data would be expected to reveal a steadily increasing level of sediment; an increase not observed.

An increase in stream sedimentation from timber haul is thus expected to be incurred, but immeasurable and of inconsequential magnitude.

The boundaries of the proposed timber sale units have been drawn using site-specific information in the interest of protecting streams and subwatershed scale hydrologic processes. 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.

No harvest buffers would protect streams from sedimentation from harvest units by keeping harvest activities away from streams (by at least 60 or 100 ft.) and providing a buffer strip of intact forest floor and vegetation to slow, disseminate, and filter surface runoff. A survey in the Washington Cascades of 193 discrete erosion features caused by logging that were further than 33 ft. from streams found that 95% of those features did not deliver sediment to streams (Rashin et al. 2006). The proposed buffers are almost two to three times that studied by Rashin which is intended to keep the frequency of erosive features delivering sediment to streams from harvest units comparable to that under the No Action alternative.

Project design features (PDFs) incorporated into the proposed action would eliminate or minimize erosion and sediment delivery to streams (see section 2.2.3.3). Essentially all of the project's ground- and vegetation-disturbing activities would be restricted to the dry season when there is very little precipitation and thus low potential for erosion or sediment delivery to streams because there is no surface water available to erode or transport sediment.

The proposed timber harvest would not be expected to measurably alter project area stream sedimentation from the conditions under the No Action alternative and thus would comply with the TMDL for sediment.

Stream Discharge and Peak Discharge (ACS Objective 6)

Removing trees from the forest during timber harvest and lengthening stream networks by building new roads are the only components of the proposed action that have any potential to affect stream discharges in the analysis area.

Evapotranspiration by plants removes water from the landscape including streams by evaporating it into the atmosphere. The volume of water lost to evapotranspiration is partly related to the basal area (BA) of trees in a given forest stand. Theoretically, and provided water is not a limiting factor (which it certainly is not in the analysis area), decreases in tree BA in a stand will provoke a commensurate decrease in the volume of water consumed by evapotranspiration (Winkler et al. 2010) until the remaining and new vegetation grows faster or spreads or repopulates the stand to exploit the surplus water. If about 20% of the volume of precipitation in the analysis area is consumed by evapotranspiration, and the proposed thinning reduced stands' BAs by an average of 30%, it is not implausible that the volume of water consumed by evapotranspiration in those stands would also decrease about 30% until new growth consumed that water surplus. Under that scenario, the project area after the proposed thinning would have about 6% more water on the landscape than was available in the pre-treatment stand (total annual precipitation = 120 in., 120*0.2 = 24 inches consumed yr; a 30% reduction in BA would reduce the volume of water lost per year to evapotranspiration 17 in., for a difference of 7 in.; 7/120 = 0.06). The project area occupies roughly about 575 acres of the 12,587 acre subwatershed (about 4.5% of the subwatershed; estimated using ArcMAP). A 6% increase in the volume of water on the landscape with only a portion of that making it into streams, over 4.5% of the subwatershed, is a magnitude of increase that's unlikely to measurably affect stream discharges. Any difference in stream discharge between that under the No Action alternative and post-harvest conditions under the proposed action would be immeasurable at the subwatershed scale.

The Alsea Paired Watershed Study determined that more than 20% of a watershed needed to be harvested before post-treatment differences in stream discharge were measureable (Stednick 2007). The proposed harvest would occur on 4.5% of the subwatershed and would therefore be unlikely to affect stream discharge. Proposed thinning would retain canopy closure greater than 60% and OWEB's (Watershed Professionals Network 1999) risk analysis for timber harvest and peak flows doesn't even consider acres with canopy closure greater than 30%;

implying that areas with canopy closure exceeding 30% do not pose enough risk to be factored into a peak flow analysis.

New proposed roads will not permanently increase the area of compacted soil in the analysis area because they'll be decommissioned after the project. Secondly, during the time that they will exist (about 3 years at most for any given road segment), the 2.5 miles of new road would represent about 0.06% of the area of the subwatershed, that when added to the existing proportion of road area in the subwatershed of 2.9%, would still keep the subwatershed in the "low risk" category for peak flow enhancement relative to road density (< 4% road area; Watershed Professionals Network 1999).

3.2.4 Cumulative Effects

Instream Large Wood (ACS Objectives 1, 3, 5)

The proposed action could reduce key piece sized instream wood recruitment potential relative to the No Action alternative by an immeasurably small magnitude because some trees ≥24" could be harvested from the outer edge of where 5-8% of instream wood recruitment occurs.

Another BLM timber sale that was analyzed in the Cedar Creek Projects EA (USDI-BLM 2010) is currently underway (as of 2013) and is also within the same 6th field subwatershed as the Walker Creek Project. Approximately 221 acres of Riparian Reserves will be thinned in the Cedar Creek Project. Only trees less than 24' DBH will be removed and the average height of the trees in the treatment stands is between 89 and 117 feet tall. No-harvest riparian buffers are 100 feet or greater on all perennial streams within one mile of coho salmon habitat or critical habitat and 100 feet or greater on all fish bearing streams beyond one mile from coho habitat, and 60 feet on non-fishbearing streams (approximately 90 acres of the 540 acres analyzed). The analysis in the Cedar Creek project found that only trees in units with 60 foot no-harvest buffers (on the non-fishbearing streams over a mile from coho habitat, had any potential to reach the stream channel, and those that could, would be contributing only wood in the 6" size range. The very small loss of potential for wood recruitment is not expected to have any hydrologic effects to the subwatershed (from the *Threatened or Endangered Fish Species or Habitat* section; USDI-BLM 2010).

The Cedar Creek, Walker Creek and Bald Mountain Fork drainages don't influence one another, but they're major tributaries to the mainstem Nestucca River (5th field watershed), and together, they provide a substantial proportion of the total tributary habitat in the 6th field. The small magnitude of reduced potential from the proposed action and the small magnitude of reduced potential from the Cedar Creek Project, in combination, would still additively only result in a small loss in wood recruitment potential in the 6th filed subwatershed, and only from the smaller size classes. Because of the small magnitude of reduced potential recruitment from small wood sizes, reach scale hydrologic characteristics related to large wood including scour and deposition, substrates, pool frequency and depth, and the availability of side channels, would not be measurably affected, particularly since there is no way of knowing if any of the small lost potential could ever be realized. Because instream large wood recruitment at the reach scale would be maintained, the subwatershed scale functions of those reaches would be the same under the proposed action as under the No Action alternative. By extension, there would also be no affect out to the 5th field watershed scale because 6th field processes would be maintained.

The loss of large wood recruitment potential from private timber lands in the 6th field has mostly already occurred and is independent of any BLM action. The BLM lands within the analysis area would continue to provide high potential for instream wood recruitment whereas much of the private lands will continue to provide low potential for recruitment. Considering that the BLM manages 58% of the analysis area and that the slight reduction in wood recruitment potential would come from approximately 1.5% of the land base in the subwatershed the cumulative effect on wood recruitment would be immeasurably small and in turn have an even smaller effect on the watershed processes driven by instream wood.

The proposed action would directly increase instream large wood by felling 30 trees into headwater stream channels. Another unrelated BLM project will fell/place 40 large trees directly into Walker Creek in the project

area (started in 2013, to be finished in 2014). The Cedar Creek Projects also adding 120 trees worth of logs to a mainstem Nestucca reach in the 6th field in 2012. This cumulative increase in large instream wood will improve hydrologic function in the subwatershed towards more historically desireable conditions.

While a small magnitude of loss of wood recruitment potential is acknowledged, an immeasurably small magnitude of loss of actual wood recruitment is expected, and instream wood levels will be directly increased by the proposed action in combination with other federal actions. While it is not clear if any net cumulative loss of wood would occur, it is clear that any net loss would be substantially diminished as a result of federal actions that directly add instream wood to the 6th field.

Stream Temperature (ACS Objective 4)

Among the goals of the proposed action is reestablishing an understory which would increase secondary shade to streams and thereby maintain water temperatures that do not contribute to elevated temperatures downstream. Reestablishing a multilayered canopy and shade tolerant tree species would improve the potential of riparian areas to achieve "system potential vegetation" as directed under the Nestucca TMDL.

Because reach scale temperatures would not measurably change, project area streams would not directly or indirectly elevate water temperatures in lower reaches of the Nestucca River. Therefore, no cumulative effects to stream temperatures would be expected under the proposed action.

Stream Sedimentation (ACS Objectives 3, 4, 5)

Current timber harvest on private lands in the subwatershed probably contributes sediment to streams because headwaters run directly through clear cuts without stream buffers and because logging slash in headwater streams traps sediment; sediment that is then available to flush down the stream network in the future. Existing gravel roads in the analysis area also contribute sediment to streams by conveying sediment eroded from the road prism into ditches that flow into streams. Timber haul unrelated to the proposed project contributes to stream sedimentation. Stream sedimentation from the analysis area will thus occur under the No Action alternative.

Cleaning ditches will increase short term sedimentation relative to the No Action alternative (for 1 year following ditch work).

Fine sediment inevitably created by haul will likely be washed from the road surface and nearby vegetation in the first few precipitation events of the fall when background levels of turbidity are naturally elevated.

The proposed action would thus be expected to contribute a minor amount of sedimentation in the subwatershed when considered together with the Cedar Creek Project and any actions that may occur on private lands but would still be immeasurably small and short-lived (flush during each winter after harvest season). Because the BLM projects would use Best Management Practices to minimize potential sediment inputs and analysis and experience indicate that any increase in sedimentation would be immeasurably small we don't expect any cumulative effects to rise to a level that would approach the thresholds of the TMDL.

Stream Discharge and Peak Discharge (ACS Objective 6)

The risk of increased peak flows as a function of forest canopy closure and road area would not be different under the proposed action or the No Action alternative. Therefore there would not be any cumulative effects associated with the proposed action.

3.3 Threatened or Endangered Fish Species or Habitat, Magnuson Stevens Act Essential Fish Habitat and Species with Bureau Status.

The proposed action would occur within the range of the Oregon Coast Evolutionarily Significant Unit (ESU) of Oregon Coast Coho salmon (*Oncorhynchus kisutch*; Coho or OC Coho). Oregon Coast Coho salmon and Oregon Coast Chinook salmon (*O. tshawytscha*; Chinook) are also covered by the Magnuson-Stevens Act. Oregon Coast steelhead (*O. mykiss irideus;* steelhead) is a BLM Oregon Sensitive Species. Oregon Coast Coho salmon are listed as Threatened under the Endangered Species Act (1973; ESA). The listing also designated Critical Habitat for the Oregon Coast Coho evolutionary significant unit (ESU), effective May 12, 2008. Oregon Coast Coho, designated Critical Habitat (ESA), and Essential Fish Habitat (Magnuson Stevens Act, 1996; MSA) for Coho, are present in the Headwaters Nestucca River (Nestucca headwaters) including Walker Creek and Bald Mountain Fork, the major streams in the analysis area.

Oregon Coast Coho use a variety of habitats throughout watersheds throughout their life stages. Past land management activities that reduced upland wood supplies have had a considerable negative impact on the distribution and quality of in-stream physical habitat for Coho. The lack of instream wood and complex pools along with the separation of stream channels from floodplains are specific habitat quality and quantity deficiencies noted at the ESU scale. These declines in habitat quality are related to extensive timber harvest, road construction, and channel manipulation (including "stream cleaning"). In 1997, the National Marine Fisheries Service and the State of Oregon identified simplified channel morphology, lack of in-stream roughness, and substrate changes as "factors for decline" related to in-stream physical habitat conditions that potentially reduce or limit Coho populations in the ESU (OCSRI 1997).

Coho prefer to spawn in moderate gradients from one to five percent in small to medium size streams with gravel substrate from 1.3 to 10.2 cm in diameter and cold, oxygenated water. After emergence in the spring, Coho fry typically remain in streams for a full year. During their year in freshwater, young coho prefer complex pool, edge cover and backwater habitats over faster water habitats. These habitat types are particularly important to the survival of fry during heavy winter and spring flows to provide low velocity refugia. These complex habitat types are also used by adults for cover and resting while returning to spawn.

Oregon Coast steelhead are present in the Nestucca River and the Nestucca headwaters with essentially the same spatial distribution as Coho. Oregon Coast steelhead is a Species of Concern of NOAA Fisheries, and is a Sensitive Species in Oregon under BLM's Special Status Species policy.

Oregon Coast Chinook salmon is also covered by the Magnuson Stevens Fisheries Conservation and Management Act (MSA), with its provisions for Essential Fish Habitat. Chinook distribution in the Nestucca headwaters is believed to be limited to the mainstem Nestucca below the confluence of Cedar Creek (approximately 2 river miles downstream from the confluence of Walker Creek and the Nestucca mainstem), limited by a high velocity chute and a higher gradient (~8%) reach upstream of that point. The major streams in the analysis area include designated Essential Fish Habitat (EFH) for Chinook.

The analysis below finds the potential for minor impacts to Coho habitat, specifically regarding sedimentation associated with timber haul and the very small reduction in the potential for large wood recruitment to some streams. According to the implementing regulations governing the Endangered Species Act, the possibility of these minor negative effects occurring would require informal consultation with the National Marine Fisheries Service. See Consultation section below (Section 5).

Analysis also concluded that there would be No Adverse Effects to Essential Fish Habitat (EFH) for Oregon Coast Coho salmon or for Oregon Coast Chinook salmon or their habitat and therefore no EFH consultation would be required.

Other fish species in the project area include Coastal Cutthroat trout (*O. clarkii clarkii*; Cutthroat), several species of sculpin (*Cottus* spp.), and Pacific lamprey (*Lampetra tridentata*). Cutthroat with stream resident life histories have the widest distribution, occupying streams with slopes up to 15% and reaches above barriers to anadromous fish i.e. waterfalls and dams.

3.3.1 Affected Environment

Please refer to the Landscape Setting, the Description of Project Area Aquatic Resources and the Relevant Hydrologic Issues portions of the Hydrology section of this EA for a more thorough physical description of streams and stream processes in the analysis area.

Existing Stream Habitat Conditions and Relevant Fish Habitat Issues

Relatively recent federal land management practices have positively contributed to the extent of productive fish habitat throughout the subwatershed. Large wood volume in the Nestucca watershed is substantially lower than under historical conditions, however compared to current large wood volumes in other Coast Range watersheds, the Nestucca has moderate to high volumes of large wood (ODFW AQI 2006). Fish habitat restoration projects in the Nestucca River including the addition of large wood have been implemented over the past 20 years. A project adding 120 logs to the upper Nestucca River was begun in 2011 and completed in the summer of 2012.

The BLM has recently implemented a separate project to improve fish passage in Walker Creek, replacing 2 culverts. Both of these culverts are located in Coho Critical Habitat in sections 15 and 22. Another project added 20 trees to Walker Creek in 2013 and another 20 will be added in 2014 to a reach adjacent to thinning unit 15-23 to enhance fish habitat.

Not coincidentally, the most relevant hydrologic issues in the analysis area are the most relevant fish habitat issues: instream large wood, water temperature, sediment, and stream discharge. Because these issues were discussed at length in the Hydrology section of this EA, they are only discussed here as they relate specifically to Coho and Coho habitat. Possible effects to the forage available to MSA fish species and fish passage were also considered but determined to not be affected by the proposed action and thus are not discussed further.

Instream Large Wood (Aquatic Conservation Strategy (ACS) Objectives 1, 3, 5)

Instream large wood influences channel morphology at the reach scale (hundreds of feet), by affecting: scour and deposition of stream bed material (including gravel), which in turn affects substrate distributions and pool frequency and depth, the presence and accessibility of side channels and off-channel habitats, and cover. At the subwatershed scale, higher order streams recruit large wood and stream bed material from lower order streams which in turn affects channel morphology on down the stream network.

Channel scour produces and maintains deep pools that Coho require for cover. Deep pools help large Coho swim up small streams to spawn, provide slow areas to rest and deep areas where Coho can generate maximum swimming force with their tail fin completely submerged. Clean gravel deposits (not filled with silt) are used for spawning, egg incubation, and shelter alevins (newly hatched young salmon). Scour and accumulation of streambed material create off channel habitats or raise the streambed elevation so that water can flow over floodplains and backwaters; nutrient rich, low velocity nursery areas for juvenile fish. Backwater habitats and floodplains provide slow water resting areas during winter high flows and storm events. Logs and accumulations of small wood pieces help create structurally complex and macroinvertebrate (i.e. food) rich microhabitats where juvenile Coho rear.

Stream Temperature (ACS Objective 4)

Coho require cool (10-15 C; 50-59 F), well oxygenated water (Laufle et al. 1986). The temperature TMDL for the Nestucca watershed is aimed at keeping water temperatures in the Nestucca River below 64 F (or below 55 F during spawning seasons - November to January).

Stream Sedimentation (ACS Objectives 3, 4, 5)

Sediment can fill pools thus reducing their value to Coho as cover as well as making stream water easier to warm by increasing the surface area to depth ratio of a given pool. Sedimentation also smothers gravel beds by filling in

the small spaces between each piece of gravel, reducing the ability of water to flow through those pores. Sedimentation can cover gravel beds and make them inaccessible to spawning Coho. Sedimentation can smother incubating eggs in gravel. Reducing hyporheic flow (water flow through the streambed) can reduce macroinvertebrate productivity, which is the principle food source of juvenile Coho, and contribute to increases in stream temperature because stream water can be cooled or stay cool while flowing through substrate, not exposed to the sun or warm air (Janisch et al. 2012).

Stream Discharge and Peak Discharge (ACS Objective 6)

Increases in stream discharge can indirectly influence Coho by altering stream habitat. Particularly in the absence of instream large wood that can use increased discharge, so to speak, to create complex channels, higher post-treatment discharge tends to accelerate stream bank erosion, scour streambeds and increase sediment transport. The result can be structurally simple habitat with low Coho productivity.

Fish Habitat Use and Proximity to Proposed Actions

Coho are the primary focus of analysis due to their status as a Threatened species under the ESA, their inclusion under the provisions of the Magnuson Stevens Act, and because in this context, Coho habitat can serve as an umbrella that encompasses most of the habitats used by the other members of the anadromous fish community. When "Coho habitat" is referred to, it is implied to include Coho Critical Habitat, Essential Fish Habitat for Coho, and habitat used by steelhead.

Bald Mountain Fork and Walker Creek contain Coho habitat and are used by steelhead. Table 12 contains a summary of distances of density management units less than 1000 ft. from Coho habitat.

Rapid Bio-Assessment surveys (RBA) between 2002 and 2004 identified Bald Mountain Fork as one the highest Coho producers of the mainstem Nestucca tributaries (Bio-Surveys, LLC 2004). Coho distribution and Critical Habitat in Bald Mountain Fork extends from the confluence with the Nestucca River upstream approximately 1.5 miles to a barrier falls, logjam, and geomorphic change in valley type. Above this point the channel becomes much steeper and the fish community is limited to Cutthroat and several species of sculpin. Proposed thinning uphill from Bald Mountain Fork (units 18-3 & 18-4) would occur at least 300 ft. from the stream. Units 18- 3 and 18- 4 are uphill of reaches of Bald Mountain Fork that are used by Coho and steelhead. The proposed sale boundaries of 18-3 and 18-4 were deliberately set back from Bald Mountain Fork and from its tributaries because of steep and potentially unstable slopes. The western edges of units 20-4 and 20-5 would be ~350' from a reach of Bald Mountain Fork likely used by steelhead.

Two proposed timber sale units would border Walker Creek in section 15; units 15-14 and 15-23. Unit 15-14 would be adjacent to an unnamed 3rd order tributary to Walker Creek for about 1000 ft. That tributary contains habitat that could support Coho though there is no documentation of Coho use of that stream nor is it included in the CH designation. The existing AB road is between this unit and Walker Creek. The eastern edge of the unit would be approximately 150 ft. from Walker Creek, with the AB road in between.

The no-harvest buffer associated with unit 15-23 would be adjacent to approximately 1500 ft. of Walker Creek that is used by Coho and steelhead. There are no tributaries to Walker Creek from this harvest unit. Several unnamed tributaries with resident fish in the headwaters of Walker Creek would have thinning adjacent to them, outside of no-harvest buffers. Unit 21-24 would be adjacent to approximately 1300 ft. of an unnamed, 2nd order, perennial tributary to Walker Creek. Unit 21-23 would be approximately 190 ft. from another unnamed, 2nd order, perennial tributary to Walker Creek at the uppermost extent of fish distribution.

The dam on the Nestucca River that impounds McGuire Reservoir, upstream of the confluence of Walker Creek, is a barrier to anadromous fish. Three of the planned thinning units (23-1, 25-1 and 26-12) are located upstream of the reservoir. An isolated population of Cutthroat is widely distributed above the reservoir. The area above McGuire Reservoir is considered EFH for Coho despite the presence of the (total barrier) dam and reservoir.

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Table 12: Distances of density management units < 1000 ft. from listed fish habitat, from the closest estimated downstream distance through stream channels to listed fish habitat/CH

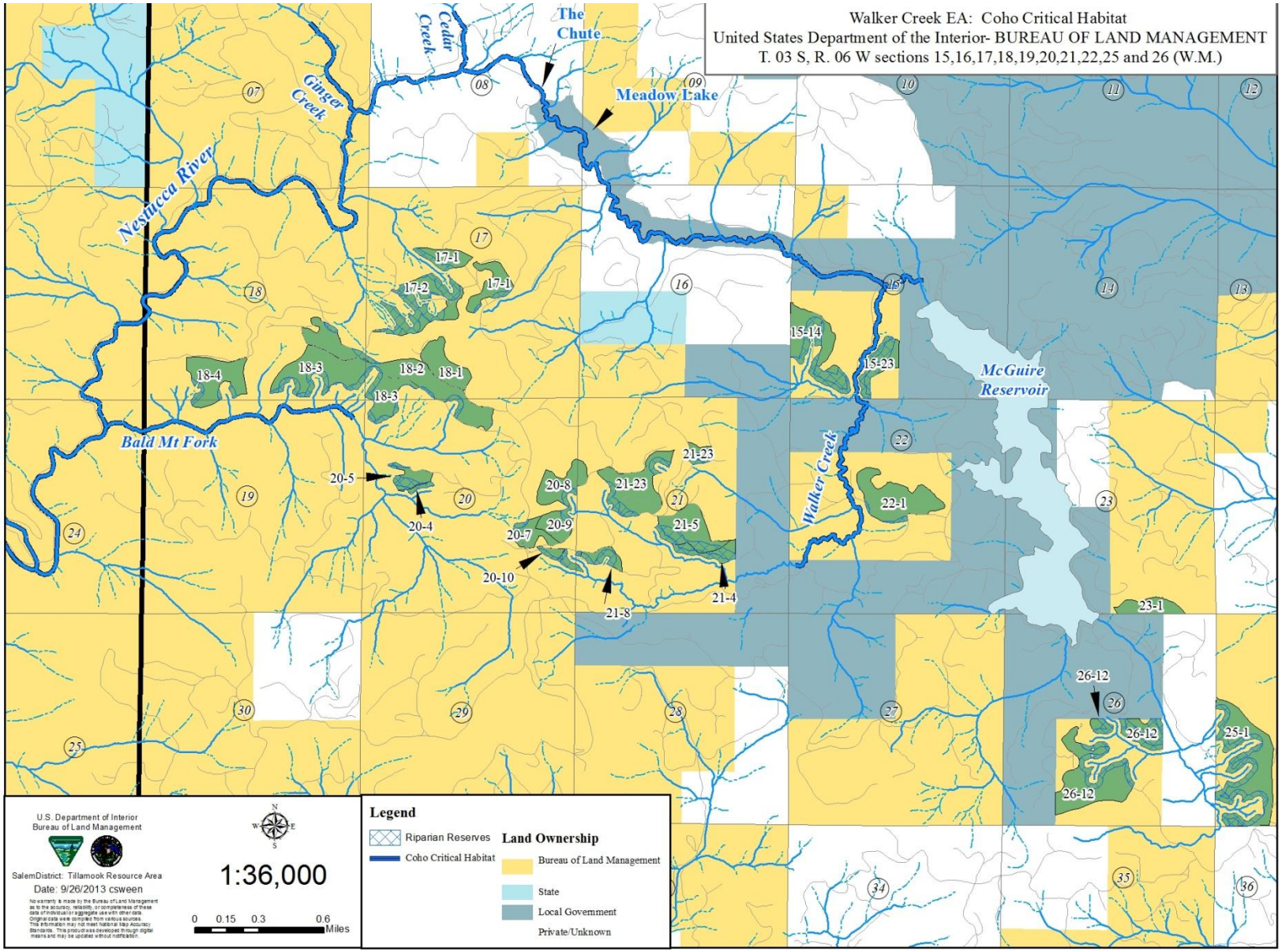
Unit	Stream	Proximity to Listed Fish Habitat (feet)
15-14	Walker Creek	470
15-23	Walker Creek	100
18-3	Bald Mountain Fork	300
18-4	Bald Mountain Fork	450
20-5	Bald Mountain Fork	350
22-1	Walker Creek	200*

*Overland distance; no stream channels originate in this unit.

None of the proposed thinning units would be within approximately 2 river miles of habitat used by Chinook.

A portion of the proposed timber haul would occur in the North Yamhill River (5th field) watershed that provides habitat to ESA-Threatened Upper Willamette River (UW) steelhead. The upper extent of UW steelhead is approximately 4 miles downstream and below a fish barrier dam that impounds Carlton Reservoir. Project related haul would have only 1 stream crossing and because UW steelhead are isolated below Carlton Reservoir 4 miles downstream, no effects to UW steelhead or their habitat are anticipated.

Figure 10 – Map showing Coho Critical Habitat within the Analysis Area



3.3.2 Environmental Effects – Alternative 1: No Action

Instream Large Wood (ACS Objective 1, 3, 5)

Under the No Action alternative, the structurally homogeneous stands in the analysis area would continue to experience low rates of recruitment to streams. On the basis of the BLM Silviculturist's judgment, project area trees would maintain their current (low) growth rates. The current infrequency of shade tolerant tree species would continue to limit the availability of seed for recruitment of those species and thus those species would remain rare.

The BLM would not fell 30 trees into project area tributaries and those streams would continue to have low numbers of large wood pieces. Site visits suggest that instream habitat complexity, particularly in Bald Mountain Fork, could become more simplified as current key pieces of large wood fail. The possible result is that if gravel accumulations were flushed out of Bald Mountain Fork because old log jams failed, there is little gravel stored upstream to replace it. Affects to Coho could include lower spawning success because fewer deep pools could restrict the ability of adult Coho to migrate upstream and reduce the area of rearing habitat for juveniles. Spawning gravel could be scoured and lost downstream which could also reduce macroinvertebrate production as a result of reduced hyporheic flow. Channels downcut in response to removing logs and jams and could cut off off-channel habitats by lowering the streambed elevation which would reduce the area of rearing and refugia habitat for juvenile Coho. Big logs entrain small logs, thus complex microhabitats could become less frequent, lowering juvenile Coho survival. At the subwatershed scale, until Bald Mountain Fork eventually re-accumulated gravel beds, it could cease to be a source of periodic pulses of gravel to the Nestucca River, for example.

The No Action alternative could thus indirectly affect Coho habitat in a productive tributary in the subwatershed by not taking management action where management action is arguably required.

Stream Temperature (ACS Objective 4)

Because the No Action would not directly alter vegetation in the shade zone and there is evidence that suggests that stream temperatures in the analysis area do not exceed TMDL thresholds the No Action alternative would probably maintain that temperature trend and thus maintain Coho production.

Riparian stands taken over by shrubs in the absence of streamside trees would probably continue to be shrub dominated because of a lack of seed sources for shade tolerant conifers and because dense shrubs preclude shade intolerant tree species' recruitment (Hobbs et al. 2002). Shrubs, being so much shorter than hemlock trees, generally provide less shade to streams, particularly in the primary shade zone, therefore riparian areas filled (only) with shrubs have a greater risk of elevated stream temperatures which can stress Coho and contribute to higher mortality.

Because many of the gravel bars created by large wood in project area streams are beginning to fail due to age, and because the rate of wood recruitment has been so low in recent decades, there may be some potential that streams could become more vulnerable to temperature changes as gravel accumulations are mobilized. The No Action alternative would have no impact on the progression of these processes.

Stream Sedimentation (ACS Objectives 3, 4, 5)

The No Action alternative would not involve any culvert replacements or road maintenance that would produce and convey small volumes of sediment to area streams for a period of 1 or 2 years after work was completed. However, roads in the analysis area identified as having poor surface conditions or undersized or failing culverts would not be renovated thus any sedimentation currently occurring would not be corrected. Because no project specific haul would occur adjacent to Walker Creek, the creek would probably maintain its current level of fine sediment. Sediment conditions in project area streams are currently adequate to produce Coho and they would continue to produce Coho under the No Action.

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. Large and persistent sources of sedimentation can reduce Coho productivity by filling in pools, thus reducing their value to Coho as cover as well as making stream water easier to warm by increasing the surface area to depth ratio of a given pool. Sedimentation also smothers or embeds gravel beds by filling in the interstitial spaces between each piece of gravel, reducing the ability of water to flow through those pores. Sedimentation can cover gravel beds and make them inaccessible to spawning Coho. Sedimentation can smother incubating eggs in gravel. Reducing hyporheic flow (water flow through the streambed) can reduce macroinvertebrate productivity, which is the principle food source of juvenile Coho, and contribute to increases in stream temperature because stream water can be cooled or stay cool while flowing through substrate, not exposed to the sun or warm air (Janisch et al. 2012). The indirect affect to Coho of the No Action alternative would thus be an increase, probably a small increase, in the likelihood that project area road segments could fail and contribute sediment to streams.

Stream Discharge and Peak Discharge (ACS Objective 6)

Absent the proposed logging and road work, the volume and timing of stream flows including peak flows, would remain the same as described in the affected environment, and thus not affect Coho or CH.

3.3.3 Environmental Effects – Alternative 2: Proposed Action

The discussion below is intended to disclose any environmental impacts, both positive and negative, to Coho habitat directly, indirectly or cumulatively, that could result from the proposed Walker Creek Project. Please refer to the Environmental Effects Alternative 2, The Proposed Action portion of the Hydrology section of this EA for a more thorough analysis of the effects of the proposed action on streams and stream processes in the analysis area. Because effects to streams were discussed at length in the Hydrology section of this EA, only conclusions of that analysis are included and discussed here as they relate specifically to effects to Coho and Coho habitat.

Instream Large Wood (ACS Objectives 1, 3, 5)

The proposed action could reduce instream wood recruitment potential relative to the No Action alternative by an immeasurably small magnitude because some trees would be harvested from stands that are tall enough that if they fell through no-harvest buffers toward the stream they could possibly hit the stream and contribute instream wood. There is no way of predicting if any of these trees proposed for harvest would actually be recruited to the stream if left unharvested, but they occur in an area outside of the no-harvest buffers where 5-8% of instream wood has been found to come from according to McDade et al. (1990). This small reduction in recruitment potential would not affect reach scale hydrologic characteristics related to large wood such as scour and deposition, substrate composition, pool frequency and depth, and the availability of side channels. Because instream large wood recruitment at the reach scale would be maintained, the subwatershed scale functions of those reaches would be the same under the proposed action as under the No Action alternative.

Because any reduction in large wood recruitment would be immeasurably small, reach and subwatershed scale Coho habitat is not expected to be adversely affected by the proposed action and its effect on large wood recruitment potential. No effects to individual Coho are expected. The proposed action would not contribute to a need to list steelhead under the ESA or MSA.

The proposed action would also fall 30 trees into several reaches of project area tributaries to increase instream wood levels relative to those under the No Action alternative. The intent is to indirectly improve Coho habitat in Bald Mountain Fork by supporting reach scale (hundreds of feet) and subwatershed scale natural channel forming processes including scour and deposition, substrate composition, pool frequency and depth, and the availability of side channels. The assumption is that the Coho producing capacity of Bald Mountain Fork would be at least maintained or improved relative to the No Action alternative if its habitat continued to include those elements required by Coho. Adding wood to tributaries will increase the probability that Coho habitat is maintained in Bald Mountain Fork. The intended affects are to maintain or increase pool depths that provide rearing habitat to Coho, to increase the area of gravel accumulations which Coho use to spawn, and indirectly increase the

resistance of Bald Mountain Fork to temperature increases and maintain complex channels. The desired result is to maintain or improve juvenile Coho survival and thus contribute to the population's and ESU's ability to survive indefinitely.

Indirect effects of the proposed action on instream large wood include the reestablishment of shade tolerant tree species (hemlock specifically) in harvest units. After hemlock becomes established in the understory it could contribute to instream wood as trees fall, debris flows occur and larger overstory trees fall on them. Another potential indirect affect is that thinning may accelerate the frequency of small scale disturbance relative to conditions under the No Action alternative, like windthrow, by creating more structurally diverse upland stands. If these indirect effects on Coho habitat materialized, Coho production in the analysis area could be maintained or increased as a result of the increases in instream large wood and the subsequent cascade of fish habitat effects already described.

Stream Temperature (ACS Objective 4)

The proposed action would be unlikely to provoke a stream temperature response that was measurably different from background variation under the No Action alternative. As a result, no affects to Coho or Coho habitat are anticipated. The proposed action would not contribute to a need to list steelhead under the ESA or MSA.

Stream Sedimentation (ACS Objectives 3, 4, 5)

Project specific turbidity would probably be indistinguishable from turbidity under the No Action alternative and have no effect to Coho. An increase in stream sedimentation in Coho habitat in Walker Creek from project related timber haul on the AB Road is expected to be incurred, but immeasurable and of inconsequential magnitude. No adverse effects to Coho or Coho habitat are expected. The proposed action would not contribute to a need to list steelhead under the ESA or MSA.

Stream Discharge and Peak Discharge (ACS Objective 6)

Any difference in stream discharge between that under the No Action alternative and post-harvest conditions under the proposed action would be immeasurable at the subwatershed scale. As a result, no affects to Coho or Coho habitat are expected. The proposed action would not contribute to a need to list steelhead under the ESA or MSA.

3.3.4 Cumulative Effects

Because important Coho habitat components including instream large wood, stream temperatures, stream sediments, and discharge would not be measurably affected by the proposed action, there would be no negative cumulative affects to Coho or Coho habitat. The proposed action would however directly increase instream large wood by felling 30 trees into headwater stream channels. An unrelated BLM project will fell/place 40 trees into Walker Creek in the project area (started in 2013, to be finished in 2014). The Cedar Creek Projects also included adding 120 trees worth of logs to a mainstem Nestucca reach in the 6th field. The cumulative increase in instream wood resulting from each of these actions will nudge Coho habitat in the 6th field towards more historically desirable conditions and subsequently allow for improved Coho production.

3.4 Soils

The primary concerns for this project and the focus of this analysis is how the proposed project would affect long-term soil productivity and mass movement through soil disturbance and vegetative removal. The primary soil objective in accordance with the 1994 Northwest Forest Plan is to "Protect long-term soil productivity by minimizing erosion, including landslides, and maintaining beneficial physical and chemical properties".

The soil analysis area for direct effects encompasses all of the proposed activity areas where ground disturbance is expected to occur (i.e., timber harvest units, roads and trails, and fuel treatments) within the project area. This area is chosen because changes in soil productivity being analyzed do not have measurable off-site impacts. Off-site soil effects from soil erosion and mass movement to water runoff and water quality are analyzed in the preceding Hydrology section. The soil analysis area for cumulative effects will be the Headwaters Nestucca River 6th field watershed as described in section 1.4.1 of this Environmental Assessment.

Road building, homesteading, timber harvest, reservoir construction and wildland fire are examples of historical human past actions and natural events that have impacted soils within the analysis areas over time, and which have caused various levels of soil disturbance, causing long term soil productivity issues where disturbance was detrimental.

The area soil scientist completed a field and office review of the analysis area. Soil types, disturbance areas, and fragile sites were identified and measures were developed to minimize potential harmful effects. During planning, all fragile nonsuitable woodland sites including approximately 37 acres showing potential indications of slope instability and approximately 2 ½ acres of poorly drained soils were removed from the proposed density management thinning project. Information utilized in the analysis includes the Tillamook County Soil Survey and BLM GIS data.

3.4.1 Affected Environment

Physical Setting

The terrain in the project area and the surrounding area is rugged and mountainous, covered by dense forest vegetation, and is subject to abundant rainfall and some snow mainly in late fall and early winter. Elevations within the proposed harvest area range from 1,820 to 2,760 feet. Approximately 85% of the proposed harvest area is on gentle to moderately steep (4 to 40 percent) slopes, mostly on rounded mountain ridges, hill slopes and benches. The remaining 15% of the proposed harvest area is on steep to very steep slopes (40 to 75 percent). With high infiltration rates and dense vegetative cover, surface runoff is relatively rare and natural hill slope erosion rates are low. The dominant erosion processes within this area are shallow, rapid-moving landslides.

Project Soils

All of the soils are classified as Andisols (Alic Hapludands). They formed from volcanic ash that has been extensively mixed with material derived from local rock. Most are underlain by intrusive rock (dacite or basalt/breccia). The dominant soils include the Murtip, Caterl, and Laderly soil series. There are also scattered bands of soils underlain by sedimentary rock (sandstone/siltstone). Soils series include the Ginsberg soils. Project soils are typically well-drained and over 40 inches thick over bedrock. (Some small areas of soils are wet for long periods. They occur mainly along streams and near seeps and small springs.) Surface rock contents vary in abundance. Surface layers are typically dark brown loams and subsoils are mainly loam or clay loam. The soils have low bulk densities and typically contain high levels of nitrogen and high organic matter.

Soil Productivity

Soils within the project area have a favorable climate, good physical properties and high nutrient levels, creating an excellent environment for growing forest vegetation while making them resilient and at lower risk for detrimental effects from forest management practices. The site index (the most common measure for potential forest productivity = height growth in 50 years) of the area for undisturbed soils is high. Measured on Douglas-fir 50-year basis, the site index is approximately 127 for undisturbed soils under 2,000 feet elevation (approximately 1/4 of the harvest area) and approximately 117 for soils above 2,000 feet (about 3/4 of the harvest area). Site indexes for Douglas-fir in the Coast Range of Oregon can range from 50 in low quality growing sites to 160 in sites with optimal growing conditions.

Existing Soil Disturbance

The proposed harvest units have not been entered in order to conduct forest management activities for many decades. Their forest-floors are generally intact and display little or no outward indications of past equipment use. Most of the highly disturbed soils within the proposed harvest units are present in existing roads, OHV trails, old tractor roads, and skid trails and landings from previous forest management activities. Based upon a review of aerial photographs, LIDAR coverage and field work, disturbed soils from past forest management practices, existing roads and OHV trails encompass approximately 3% to 4% of the proposed harvest area. (In this analysis, highly disturbed soils are approximate to the soil disturbance class 3 and class 4 described in the 2009 USDA Forest Service, Forest Soil Disturbance Monitoring Protocol.) The highest levels of past soil disturbance are located in unit 17 and unit 25, where approximately 4% to 7% of the ground has disturbed soil surfaces.

Also present within the proposed harvest units are approximately 3½ miles of off highway vehicles (OHVs) trails. Many of the trails are rutted, especially those with grades over 20%.

Fragile Sites

There are approximately 15 acres of fragile but suitable for forest management land within the proposed harvest area, located primarily in units 18-2 and 18-3, about 300 to 1,300 feet upslope of the Bald Mountain Fork. These lands are classified as "FGR1" under BLM's Timber Production Capability Classification (TPCC). These lands are classified as FGR1 because they have steep (slopes 60 to 75%) and in some places show signs of mild surface movement, but no signs of recent or old landsliding. They are deemed suitable for timber production with appropriate mitigation. (1995 Salem District ROD/RMP: Appendix C Sec I A-2) Approximately 57 acres of very steep (>80%) slopes adjacent to Bald Mountain Fork were removed from the proposed project due to concerns for logging activity triggering slides in the stream.

Roads proposed for new construction and renovation are located mainly on gentle to moderate sloping mountain ridges and benches and show little sign of instability.

3.4.2 Environmental Effects Alternative 1: No Action

The effects of the no action alternative would be a continuation of current soil processes and conditions as described in the Affected Environment section.

Disturbance and Long-term Soil Productivity

Disturbed soils would continue to recover. Absent of fire, organic matter and the duff layer would continue to slowly increase from the accumulation of needles, twigs, small branches and decomposing larger woody material. Recovery from deep compaction and soil displacement would be very slow (many decades).

Mass Movement

Assuming the project area remains free of any large fires, the probability of mass movement occurring within the analysis area would continue to be very low. Mass movement would continue to occur on an infrequent basis and on a small percentage of the analysis area. In the no action alternative, mass movement would most likely occur in landslide prone landform areas, young forest stands, on steep slopes (>70%), during large storms when soils are saturated, or on older roads in poor locations with inadequate design and maintenance. Most mass movement would most likely occur as small (<1/4 acre) slumps.

3.4.3 Environmental Effects Alternative 2: The Proposed Action

Soil Disturbance and Long-term Soil Productivity

Forest management and road management activities do result in some degree of soil disturbance. Soil disturbance does not necessarily result in loss of soil productivity. Project Design Features and Best Management Practices would be implemented to limit soil disturbance and potential losses to soil productivity (see EA section 2.2.3.3). All fragile sites too sensitive to tolerate any forest management activities (Non-suitable Woodland under TPCC) were removed from the proposed action.

Fuel Treatments

The proposed fuels treatments associated with prescribed burning would result in small (<0.25 acre), scattered, localized areas of highly disturbed soils totaling very small (<0.25 acre), scattered, localized areas of highly disturbed soils totaling less than 2 acres. Prescribed burnings would occur during the high moisture fall/winter burning periods when soil are moist and are less vulnerable to adverse effects. A majority of the burning would occur on existing, highly disturbed surfaces including roads and landings. Burnings would not occur within Riparian Reserves

Depending upon the severity, burning would alter nutrient availability, soil infiltration, and soil structure. Vegetation in the burned areas would re-establish entirely within one to two growing seasons resulting in no detectable loss in long-term soil productivity.

Timber Harvest/Yarding Methods/Winter Harvest

Under the proposed action, ground-based systems would yard approximately 375 acres, or about 65% of the total harvest units, and skyline-yarding systems would yard approximately 200 acres, or about 35% of the total harvest units. Ground-based yarding would occur on slopes less than 35% and most of the skyline yarding would occur on slopes greater than 35%. Skyline yarding will occur on slopes of less than 35% in areas where cable logging is feasible and not cost prohibitive in order to minimize soil impact from ground harvest methods (primarily in unit 20-9 and unit 15-14).

In ground-based yarding units, if a tractor/skidder tree length harvesting method were used, trees would most likely be felled, delimbed and topped within the unit, then skidded to a landing where they would get processed for haul. Ground disturbances would be concentrated in skid trails and landings, where it would be expected to result in a moderate amount of topsoil displacement and moderate to heavy soil compaction (over a 20% increase in bulk density), covering about 6 to 8% of each harvest unit (approximately 13.2 acres in total.) If mechanized harvest or cut-to-length systems were used, trees would be felled, delimbed and processed to length within the unit and forwarded/skidded roadside for haul. The placement of slash and large wood in front of the machine would result in less displacement, less heavy compaction, and more dispersed light compaction within the harvest units, and there would be less need for larger landings to facilitate processing logs. Adhering to a properly designed logging plan which utilizes the aforementioned BMP's and project design features will ensure that either ground harvest method will meet the Salem District RMP's best management practices which states that skid roads and landings within units will be designed to impact less than 10% of the unit (1995 Salem ROD/RMP Appendix C Sec B3) Ground-based logging methods will be determined by the type of equipment that the logging company will be using.

Skyline yarding would result in some discontinuous strips of compaction and displacement in the skyline corridors. Roughly one half of the landings in the proposed project area would be located on existing roadbeds. The estimated amount of highly disturbed soils resulting from this project would average about 2% through each harvest unit, totaling approximately 4 acres. Characteristics of highly disturbed soils are wheel tracks or depressions that are evident and deep, missing forest floor layers, displaced surface soil layer, and persistent and deep soil compaction (greater than 12 inches).

All season skyline timber harvest and haul that are proposed for units 18-2, 18-3 and the cable yarding portion of unit 17-1 would most likely increase the level of soil compaction of impacted areas due to operating in wetter soil conditions, as well as increase the probability of soil displacement from rainfall, however; the area of impacted surfaces would remain approximately the same as to what would occur when conducting dry season only timber

harvests on these units, and project design features of minimum stream buffer distances 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.

Although this project would result in some soils being highly disturbed, the overall soil productivity within the analysis area would be maintained for the following reasons:

1) The proposed treatment is a thinning and would leave most of the vegetation, root systems and litter in place. Vegetation helps stabilize steep forested slopes chiefly by reinforcing the soil through tree roots and by changing the soil water regime (Ziemer, 1981). Leftover logging slash and coarse wood would increase soil moisture available throughout the growing season as well as reduce erosion, and add organic matter and nutrients to the soil profile. Soil moisture and nutrient availability are key environmental factors that affect plant growth.

2) Long-term effects of these disturbances on productivity depend largely upon soil resiliency and recovery processes. Timber production losses from logging mostly occur where soils are shallow (less than 10 inches deep) and infertile, under stressful climatic conditions, and with low productive vegetation. Soils within the project area are deep (greater than 40 inches) and productive and grow under a favorable mild and humid climate.

3) Results of long-term soil productivity studies in coastal Washington and the Oregon Coast Range with similar climate and soils found that soils altered from timber harvest have had little or no impact on early growth of Douglas-fir seedlings and Douglas-fir stands (Miller et al, 1996, Ares et al, 2005)

Road Construction, Renovation, and Decommissioning

The proposed action would result in approximately 19 miles of road renovation and 2.5 miles of new road construction. The new construction would result in approximately 3 ½ acres of highly disturbed soils. Road construction results in the removal and displacement of topsoils, the compaction of subsoils, and the alteration of soil properties (e.g., bulk density, infiltration capacity, water holding capacity, aeration, and nutrients) and could potentially increase soil erosion. Decompacting the natural surface roads upon completion of use would put the road surfaces in a more erosion-resistant condition as well as help to restore some of their hydrologic functions and physical properties of soils; however, the soil function and soil productivity on these surfaces would be impaired for at least 50 years. Potential soil loss in long-term soil productivity from road building at the project scale would be minimal, approximately 0.6% of the surface area of the proposed action, and approximately 0.03% of the surface area of the Headwaters Nestucca River 6th field watershed.

Soil disturbance from road renovation would be minor since nearly all of the proposed road renovation would occur on existing and developed roads where soils are already highly disturbed and not contributing to forest productivity.

Mass Movement

Slope is one key controlling factor in determining the stability of a forested slope and in influencing the occurrence of landslides. In western Oregon, the highest risk of landslides are on steep slopes greater than 70 to 80% provided high water contents or other high-risk features are not present (Robison, 1999). Using LiDAR data, it is estimated that approximately 22 acres within the proposed action area have slopes greater than 65%.

We estimated that the proposed thinning would disturb approximately 0.5 discontinuous acres of ground in areas with slopes greater than 65% and remove approximately 40% of the standing trees, slightly increasing the risk of mass movement on steeper portions of the project.

Overall, there would be little effect on slope stability and soil movement for the following reasons:

- Fragile areas having very steep slopes (>80%), located on landslide prone landforms, or exhibiting signs of previous shallow slope failures are excluded from the project area.

- Disturbance on steep sites would be small in size. The area would be cable yarded in the dry season using at least one-end suspension in areas with continuous slope gradients of 70% or greater.
- The thinning would maintain an understory and leave residual trees to intercept rainfall and transpire water, helping reduce the degree and duration of soil saturation and retain a variable root network thereby retaining soil strength (Sidle, 1992 and Robison et al, 1999).

Whole Tree Yarding

There would be very minimal, if any overall soil long-term productivity impacts in units where whole-tree yarding would occur. The project soils are highly resilient and contain a high nutrient capital. The proposed vegetative treatments would leave approximately 60% of the standing trees in place and much of the needles, twigs and small branches of harvested trees would break off and remain in the unit in transfer to the landing. 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 2013).

3.4.4 Cumulative Effects

Soil Disturbance and Long-term Soil Productivity

It is expected that industrial style timber harvests would continue as scheduled on all non-federal forest lands within the Headwaters Nestucca 6th field subwatershed (42% of the analysis area) in the foreseeable future. The road system to access and transport these future timber management activities are already in place and large scale future road construction within the analysis area is not predicted to occur. The Cedar Creek Project, a BLM project which includes the Super Snap timber sale is on-going and includes 140 acres of ground-based yarding which was analyzed in the Cedar Creek Project EA. The analysis for that project predicted that moderate to heavy soil compaction would occur on less than 10% (14 acres) of the ground –based harvest area. If we assume that private landowners harvest timber with ground-based systems over similar areas as would the BLM then about 1600 acres of the analysis area would have been (or will be) harvested with ground-based systems. And if we assume that private lands would incur twice as much soil damage while ground - based harvesting (20% - probably overestimated) then about 325 acres of the analysis area could have impaired soil productivity on private lands. Adding the estimated impacts of the Walker Creek Project (13.2 acres from ground-based harvest and 3.5 acres from new temporary road construction) to those assumed on private lands and those from the Cedar Creek Project (14 acres of soil disturbance) would result in about 2.8% of the subwatershed with impaired soil productivity which could last over the next 3 – 5 decades. Considering the low level of soil impairment the Walker Creek Project would not result in consequential cumulative effects.

Mass Movement

There would be no cumulative effects associated with mass movement, as the effects from the project action would be local and of short duration (less than 10 years), and there would be no other uses affecting mass movement within the proposed activity areas.

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

The Walker Creek Terrestrial Restoration project would occur within the range of two terrestrial wildlife species listed as threatened under the Endangered Species Act; the northern spotted owl and the marbled murrelet.

The following definitions are those used by the BLM and the USFWS during the ESA consultation process and are used here to guide the analysis for these listed species.

Marbled Murrelet Suitable Habitat: "Conifer-dominated stands that generally are 80-years-old or older, and/or have trees greater than or equal to 18 inches mean dbh. Murrelet suitable habitat must include trees with potential nesting structure(s) as described in the March 26, 2004 policy by the Level 2 Team for the North Coast Planning Province. Suitable habitat generally contains six or more trees with potential nesting structure(s) within a 5-acre area." *Note: Habitat with fewer than six trees with potential nesting structure(s) within a 5-acre area, and located further than twenty miles from the ocean as described in the March 26, 2004 policy is referred to as "Potential Habitat."*

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 closure 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" (USDI - USFWS 2012).

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" (USDI - USFWS 2012). Within the Walker Creek Terrestrial Restoration Project area this generally equates to stands greater than approximately 35-years-old.

3.5.1 Affected Environment

The area used for analysis of potential impacts to spotted owls and marbled murrelets encompasses 7,379 acres which includes those lands south of the Nestucca River within the Headwaters Nestucca subwatershed and is synonymous with the area analyzed in the Walker Creek Activity Plan of 2006. 3,417 acres of the of the BLM land in the analysis area are in the LSR land use allocation and 1,207 acres are in the AMA land use allocation. All of the LSR acres are also designated critical habitat for the spotted owl. Those acres within the LSR that are currently suitable habitat for the marbled murrelet are designated critical habitat for that species. The following tables show the relative acreages by ownership, forest stand age groups, and the proposed acres of thinning by age group that the Walker Creek project would accomplish.

Table 13: Ownership within the south portion of the Nestucca Headwaters subwatershed

BLM	4624	63%
McMinn. W&L	1764	24%
Private	913	12%
State	78	1%
Total	*7379*	*100%*

Table 14: Acres by Age Groups

Owner	*Non-Forest*	*Ac.<40yrs*	*Ac. 40-79yrs.*	*Ac. 80-109yrs.*	*Ac. 110+ yrs.*
BLM	60	1844	692	863	1164
Non-BLM	250	1958	495	55	0
Totals	310 (4%)	3802 (52%)	1187 (16%)	918 (12%)	1164 (16%)

Table 15: Acres Planned for Density Management by Age Class

Age Class	*<40yrs*	*40-79yrs*	*80-109yrs*	*110+*
BLM acres thinned	33	133	410	0
% of age class thinned	2%	19%	47%	0%
% total BLM acres thinned	<0.1%	3%	9%	0%

Northern Spotted Owl

Historical Perspective:

The Walker Creek project area along with all of the upper Nestucca drainage and other lands impacted by the Nestucca fires of the mid to late 1800's have not been good spotted owl habitat for a very long time. At the time of the first Tillamook Burn in 1933 most of the Nestucca watershed was forested with stands that were about 40-50 years old at the oldest with many stands, particularly in the upper reaches of the watershed, only 10 – 20 years old. There were a few patches of old-growth forest that escaped the Nestucca fires only to be harvested by the 1960's. The areas impacted by the Tillamook Burns were excellent spotted owl habitat whereas the habitat in the Nestucca drainage to the south could only be considered sink habitat based on the universal lack of older forest. Due to several fire disturbances within a relatively short period of time legacy structures were destroyed sooner than would have been expected with just one stand replacing event. Also, thin barked species like western hemlock and western redcedar were much more susceptible to mortality from fire than old Douglas-fir trees and consequently may have been relatively rare after multiple fires. By the 1960's an intensive thinning and old-growth patch salvaging program began in the Nestucca drainage. The few owl sites that were known in the 1970's and very early 1980's, had all become unoccupied by the mid-1980's. Extremely few (less than one per acre) large high quality snags remain and the thinning practices of the 1960's and 70's removed any trees with noteworthy structural defects that would otherwise be desirable to wildlife. Douglas-fir was the favored species; shade tolerant species such as western hemlock and western redcedar were removed to reduce site competition.

The entire Walker Creek Project area was surveyed to protocol in 2007-08 with no spotted owl detections. In 2005 during one survey visit for a different project, a single spotted owl was heard approximately ½ mile SW of unit 18-4. Follow-up surveys did not relocate the owl. The nearest known spotted owl site (unoccupied) is the Haskins Creek owl site in Section 13, T3S, R8W, WM. approximately 2.5 miles NE of unit 22-1,which is the closest unit.

Suitable Habitat:

It is important to note the difference in definition at the stand scale vs. the "province" scale when evaluating the potential impacts of the proposed project. It is not possible to determine definitively what forest stands are suitable habitat for spotted owls using the BLM's Forest Operations Inventory data. Age, species composition, and number of canopy layers are useful in helping evaluate stand structural conditions but such important features as snag and coarse wood presence and relative structural defect of trees are not indicated by the data. Likewise, the presence of a developing understory is not indicated by the data unless it has been recently surveyed and is of an age and density that it is becoming a relevant component of the stand. Therefore using parameters such as age and average stand diameter as a surrogate for owl habitat suitability does not work well in these northern Coast Range lands with high human disturbance histories. What we do know is, based on on-the-ground observation, none of the proposed treatment stands contain the structural elements that are found in spotted owl suitable habitat despite the fact that some of the stands are between 80 and 100 years old.
Although none of the units proposed for treatment contain spotted owl suitable habitat, there is spotted owl habitat within the analysis area. Based on stand histories and field observations, the analysis area contains an estimated 1,230 acres of suitable spotted owl habitat, all of it on BLM lands mostly occurring on the lower slopes of the larger drainages where fires were not as intense or occurred as often. Considering the aforementioned difficulty with using forest stand data exclusively in determining the amount of suitable habitat in the analysis area an estimate can only be given with limited accuracy. For purposes of this analysis only, the IDT chose to consider

those stands with a birthdate of 1900 or older to be suitable habitat. While the 1900 birthdate cutoff may be somewhat arbitrary and most assuredly overstates the actual acreages of suitable habitat, stand histories coupled with field experience indicate that essentially all of the truly suitable habitat would be included in stands from 1900 and older.

Several authors have found that spotted owls select forested habitat in riparian areas disproportionately to the abundance of those forest types (Wiens 2012, Hamer et al. 2007) especially in older forests with a hardwood component along low order streams. Several hypotheses have been proposed for the disproportionate use of riparian areas; (1) riparian areas provide more favorable thermoregulatory conditions (Barrows 1981); (2) prey species are more abundant in riparian areas (Carey et al. 1992, 1999); and (3) fire severity has been lower in riparian areas resulting in the retention of structural complexity (Reeves et al. 2006). The last hypothesis seems particularly relevant in the Nestucca drainage with its history of multiple fires in a short period of time.

Dispersal Habitat:

Within the analysis area there are approximately 3515 acres of forest that meet the definition of dispersal habitat described in section 2.5 above, which is about 48% of the area. On BLM lands only, there are 2965 acres of dispersal habitat, which equates to 64% of the BLM lands being in dispersal habitat condition.

Spotted Owl Prey:

In the northern Oregon Coast Range, 95% of spotted owl diets consist of mammals of which the northern flying squirrel comprises 53%. Wood rats make up about 12%, deer mice 10%, rabbits 8% and red tree voles about 2% (Forsman 2012, Ecology of Spotted Owl Prey Workshop, Eugene, OR.). Based on these findings, consideration of flying squirrel habitat is critical for management of spotted owls.

Designated Critical Habitat:

Approximately 2/3rds of the Walker Creek project acres (the LSR portion of the project in sections 16, 17, 18, 19, 20 and 21) are at the eastern end of the 74,000 acre upper Nestucca River portion of the Northern Coast Ranges Critical Habitat Unit (NCO-5) with the remaining 1/3 (the AMA portion of the project) outside of the Critical Habitat Unit.

The Primary constituent elements (PCEs) of critical habitat are described as the specific elements that comprise the Physical or Biological Features (PBFs) needed for the conservation of the spotted owl. The PBFs are the forested areas that are used or likely to be used by the spotted owl for nesting, roosting, foraging or dispersing (USFWS 2012). The PCEs are the specific characteristics that make habitat areas suitable for nesting, roosting, foraging and dispersal (USFWS 2012). The PCEs include: 1) Forest types in early-, mid-, or late-seral stages that support 2) nesting and roosting, 3) foraging, and/or 4) transience and colonization phases of dispersal.

Kutch-Panther Reserve Pair Area:

Reserve Pair Areas are spotted owl management areas developed through a process mandated in the NWFP and Salem District ROD to protect spotted owl sites within the Northern Coast Range AMA. No harvest activities are allowed within mapped suitable owl habitat in an RPA and harvest activities are permissible in “next best” habitat only after surveys have been completed and owl status and use has been determined. Density management thinnings are allowed and encouraged within dispersal and non-habitat in order to promote structural diversity and accelerate stand development toward suitable owl habitat.

Despite its name the Kutch-Panther RPA includes the Kutch Creek and Haskins Creek owl sites. The Haskins Creek owl site is the nearest known owl site to any of the proposed Walker Creek units. Historically the Haskins Creek owl site was in the Panther Creek drainage on BLM land (and was named as such) but after a change in pairing, the activity center was relocated in the Haskins Creek drainage on McMinnville Water and Light land, consequently there is no longer a Panther Creek owl site. The owl site name has changed but the RPA name was not changed since it exists in many planning documents as the Kutch-Panther RPA.

The proposed harvest units in sections 23 and 25 are within the Kutch-Panther RPA (approximately 65 acres) and are categorized as spotted owl dispersal habitat where active management is encouraged to promote structural diversity.

The last known owl activity at the Haskins Creek site was in 2006 with visual and auditory detection of a single female but no nesting was verified. Surveys in 2007 through 2012 did not detect any spotted owls. Surveys of this site have been conducted by contractors for McMinnville Water and Light and Weyerhaeuser Corp. since 2000.

Barred Owls:

Barred owls have become common within the analysis area especially over the last 15 years and were detected during surveys in 2007-08. Barred owls are highly successful habitat generalists that compete with spotted owls for territory space. Barred owl home ranges are considerably smaller than those of the spotted owl and broadly overlap, however with little overlap of core areas. One study in the central Oregon Coast Range found that both barred owls and spotted owls prefer riparian forests older than 120 years but that spotted owls are more likely to be found on steeper slopes than the barred owl. Barred owls have been found to feed on mammals about 66% of the time (compared to the spotted owls 95%) with twice as many prey items being terrestrial (moles, rabbits, mice) vs. arboreal (flying squirrels, red tree voles). Flying squirrels make up over 50% of the spotted owl diet vs. about 25% for the barred owl. However, prey competition between the two owls is the most intense for flying squirrels, especially during the non-breeding season. This is most likely because many of the terrestrial prey items that barred owls will feed on that spotted owls won't, such as amphibians, reptiles, crayfish, terrestrial mollusks, and insects are not available during winter months.

Marbled Murrelet

Marbled murrelets are seabirds that nest on-shore in large trees with adequate platform structures. Located in a band of land that ranges from approximately 24 to 29 miles from the ocean, the Walker Creek project area are located near the outer portion of marbled murrelet Zone 1. In Oregon, Zone 1 is located in a band of land extending up to 35 miles inland and Zone 2 is located 35 to 50 miles from the sea (NWFP C-10); Zone 1 holds a higher likelihood for murrelet occupancy than Zone 2.

Designated Critical Habitat:

Critical Habitat is a term defined in the ESA identifying specific geographic areas containing features essential to the conservation of a threatened or endangered species. It is designated by USFWS to provide for the conservation and eventual recovery of listed species and may require special management considerations or protection. Within the Walker Creek project areas, designated marbled murrelet Critical Habitat coincides with that of the LSR Land Use Allocation. Those portions of the proposed action area contained within Township 3 South, Range 6 West, sections 16, 17, 18, 19, 20 and 21 are located within the boundary of a marbled murrelet Critical Habitat unit (Critical Habitat Unit #OR-02-e) (USDI-USFWS 1996). This includes 355 acres of the density management treatment units and 160 acres identified for wildlife habitat structure creation and areas for Riparian felling (outside of density management units).

The primary constituent elements of murrelet Critical Habitat are (1) individual trees with potential nesting platforms and (2) forested areas within 0.5 mile of individual trees with potential nesting platforms with a canopy height of at least one-half the site-potential tree height (USDI 1996). There are very few individual trees with potential nesting platforms (primary constituent element #1) within 0.5 miles of the proposed treatment units. Trees with potential murrelet nesting platforms near the project areas are discussed below under *Murrelet Habitat within the Wildlife Analysis Area and within or Near Proposed Treatment Units*. With the exception of the 27 acres of the proposed treatment areas contained within unit 17- 2 all of the density management treatment units in the critical habitat unit (totaling 328 acres) and the 160 acres identified for wildlife habitat structure creation and

areas for riparian felling (outside of density management units) are at least one-half the site-potential tree height (primary constituent element of murrelet critical habitat #2).

Proximity to Known Murrelet Sites:

With the nearest known marbled murrelet sites being located approximately 4.5 miles west of the nearest treatment unit, there are no known marbled murrelet sites within the vicinity of any of the proposed treatment units or haul routes. Given the lack of suitable or potential habitat within the general project area and the fact that the project area is located 24 to 29 miles from the ocean, it is highly unlikely there are any murrelets currently inhabiting areas within or near the project nor would any be expected to occupy the area in the foreseeable future.

Murrelet Habitat within the Wildlife Analysis Area and within or Near Proposed Treatment Units:

The area used for analysis of potential impacts to marbled murrelets encompasses 7,379 acres which includes those lands south of the Nestucca River within the Headwaters Nestucca subwatershed. According to BLM's FOI database, approximately 16% of this "Wildlife Analysis Area" is forested with stands greater than 110-years-old (see table 14); none of these acres are proposed for density management although 160 acres are identified for coarse wood and habitat structure creation. As a result of past management practices and fire history there are very few stands within the area containing scattered individual or small clumps of residual old-growth trees and/or trees with potential nesting structure(s) referred to as "Potential Habitat." Despite 16% of the Wildlife Analysis Area being forested with stands greater than 110-years-old, these stands do not contain trees with potential nesting structures; according to BLM's FOI database, there are a total of 24 acres distributed in three stands within the Analysis Area which contain an old-growth remnant tree component and likely potential murrelet nesting structure(s). The closest of these stands is located along the Nestucca River corridor approximately 0.28 miles from the nearest Walker Creek density management treatment unit. There are no identified stands of murrelet Potential or Suitable Habitat on non-Federal land within the Wildlife Analysis Area.

There currently is only one individual large tree (post 1890 fire – not old-growth) with potentially suitable murrelet nesting platforms (Potential Habitat) identified within or adjacent to one of the proposed density management treatment units (T3S, R6W section 17). This tree is located adjacent to one of the roads proposed to be used as a haul route and has not been surveyed for murrelets. This tree would be protected and managed in accordance with Option 3 as described by the Level 2 Team for the North Coast Planning Province (USDA and USDI - USFWS et al. 2004) and as such, no surveys are scheduled to be conducted within this area. There currently is no additional identified suitable or potential murrelet habitat within ¼ mile (the USFWS disturbance distance) of any of the proposed project areas.

Other T & E species

The project areas do not contain suitable habitat and are out of the expected range of the Columbia white tailed deer, Oregon Silverspot Butterfly and Fender's Blue Butterfly. These ESA listed species will receive no further discussion or analysis as they would not be impacted by the proposed project.

3.5.2 Environmental Effects Alternative 1: No Action

Northern Spotted Owl

Under the No Action Alternative no management activities would occur at this time or within the foreseeable future. There would be no density management thinning, underplanting, or snag/down wood/habitat structure creation. The effects of the No Action alternative would be somewhat different for the approximately 135 acres in units 23-1, 25-1 and 26-12 than they would be for the remainder of the project due to the younger stand ages, lack of previous thinning in 25-1 and 26-12 and presence of western hemlock in the understory.

Habitat Conditions - Stands less than 80 years old (Sections 17, 23, 25, and 26):

The stands in these units are 60 – 65 years old and are densely stocked. Individual tree growth has drastically slowed and true suppression mortality is underway in parts of these stands with small 4-10 inch Douglas-fir trees dying from intense competition. There are relatively high levels of down woody material compared to most of the forests in the nearby landscape most of which is in the later decay stages. Nevertheless more woody material on the forest floor improves habitat for small mammals by providing cover during foraging and dispersing activities and substrate for fungi production which in turn provides a food source for multiple species. Forest of this type is probably reasonably good northern flying squirrel habitat based on the high mid-story occlusion provided by both high stem density, the presence of western hemlock in the understory (Wilson 2010), and the above average levels of down wood, but there are few structural features in the stands that could reasonably provide potential nesting habitat for spotted owls. The size of the snags being produced are not going to benefit spotted owls in any meaningful way in that they will not last long, won't provide denning habitat for flying squirrels and with rapid degeneration of the top and limbs won't provide any roosting habitat (Mellen et al. 2009) . Also, density dependent mortality of this type tends to homogenize stands, produce less within-stand diversity, keep relative densities high thus keeping tree growth suppressed and slowly become less suitable for flying squirrels as stem densities decrease (Wilson 2010). Height growth of the stand will slow considerably in the next few decades and the opportunity for trees to overtop their neighbors will be greatly reduced, thus effectively ending the suppression mortality process. Eventually a few trees will break out of the mix and begin to dominate the site. Also, with time small scale disturbances will begin to influence stand structure. For the foreseeable future these stands will remain dispersal habitat with a potential for a good food source and high cover but will not progress into suitable habitat. With the ecological processes currently at work the development of high quality spotted owl habitat which includes foraging, roosting and nesting habitat, is likely to take quite a long time; at least many decades, perhaps a century or more (USDA - USDI 1994a; appendix B2, p. B-45)..

Habitat Conditions - Stands 80 years old and older (Sections 15, 17, 18, 20, 21, and 22):

There are about 410 acres of stands proposed for treatment that are approximately 80 to 100 years old, quite dense and for the most part have been previously thinned. These stands exhibit slowed growth, low levels of down woody material and snags and have essentially stagnated in their structural development. Due to the past histories of multiple fires, grazing, and thinning these stands exhibit little structural diversity and are poor spotted owl habitat, functioning as no more than dispersal habitat. Due to the simple structure there is little evidence that there is an adequate prey base to support owls. Red tree vole surveys were conducted within all of the units with stand ages 80 years old or older with only a few nest structures of any kind found. Only five active vole nests were found of which only two occurred within the boundaries of any of the proposed units (now in RTV management areas excluded from the proposed harvest units). More importantly from the spotted owl's perspective, so few arboreal mammal structures indicates that northern flying squirrels, which make up over 50% of the spotted owls diet and bushy-tailed wood rats, which account for another 25% of the diet are not nearly sufficiently present in the stands to support owls (Forsman et al. 2004). In fact not a single structure examined by the surveyors was positively identified as either a flying squirrel nest or a bushy-tailed wood rat nest, which are considerably rarer in the northern Coast Range than the flying squirrel (most nest structures were identified as Douglas squirrel nests – a diurnal species rarely taken by spotted owls).

Unfortunately, without some kind of within-stand disturbance, local evidence indicates that it will be a very long time before appreciable structural attributes develop that will improve conditions for flying squirrels and thus spotted owls as evidenced by examination of nearby 120 year old stands. These older stands exhibit the same characteristics as the proposed action stands – high single canopy layer with a brush layer on the forest floor with little structure, other than tree boles between, conditions decidedly hostile to flying squirrels (Wilson 2010). Carey (1997) has found that flying squirrel nests are found in live trees about 2/3 of the time and in snags about 1/3. Carey (1995, 1997) also found that flying squirrels favored old-growth stands over younger stands perhaps due to the higher incidence of high quality snags and overall higher mid-story cover provided by multiple canopy layers. The Proposed Action stands don't have high quality snags or trees with cavity structures or high mid-story cover, two conditions that would improve the chances of sustaining flying squirrels.

Stand modeling systems such as ORGANON were developed to model stand growth and yield of mid-seral stands and tend to model tree mortality at a higher rate than actually occurs in the 80-100 year old stands as evidenced by

how few snags actually exist within the proposed units. Density dependent mortality is no longer a relevant contributor of snags and those that are created are small, short lived and of little ecological value to spotted owls, not to say that they do not provide other ecological functions. Snags that develop from density independent sources such as root disease may be considerably larger but tend to decay from the outside in (sap rot decay agents) rather from the inside out (heart rot decay agents) and thus do not contribute much to cavity development, especially if pileated woodpeckers are not present. In moist forest regimes the development of hollow trees is dependent on heart rot or top rot fungi that invade living trees and thus develop hollows while still growing. These conditions occur naturally over time as trees become damaged from abiotic factors and have fungi infections at wound sites which may or may not eventually result in mortality. This process is very slow which is why appreciable levels of cavities suitable for larger wildlife use are much more abundant in old-growth forests than in 80 -130 year old forests. Under current conditions, the snag development that is occurring naturally now is contributing little to the development of high quality spotted owl habitat. Considering that nearby stands 30-40 years older than the analyzed stands currently also lack desirable structural characteristics and in fact are missing important components such as a second canopy layer composed of shade tolerant species and large snags with structural defects, it is not unreasonable to conclude that the analyzed stands may take a century or more to develop complex structural characteristics without some sort of disturbance intervention.

Affects to Critical Habitat:

Under the No Action alternative stand development there would be no direct impacts to owls or owl habitat. No owls are known to use the project area and, no disturbance activities would take place that could affect owls. Indirectly the No Action alternative would result in a stand development trajectory towards complex forest structure associated with owl occupancy that would be relatively slower than under the action alternative.

There would be no affects to spotted owl designated critical habitat as no management action would take place.

Marbled Murrelet

The selection of the No Action alternative would allow these 38- to 99 year old stands to continue on the developmental trajectory they are currently on. The development of potential or suitable murrelet habitat would be retarded in the long-term by the slowed growth rate, decreased crown ratios and the expected decreased stability of some of the forested stands. The development of large platform structures suitable for murrelet nesting would be expected to continue; however given the tight growing conditions present within most of the stands analyzed, large branches suitable for murrelet nesting would develop at a very slow rate. Given the fact that the project area is located in a band of land that ranges from approximately 24 to 29 miles from the ocean (the outer portion of marbled murrelet Zone 1) in an area with less potential for use by murrelets the adverse impacts resulting from the No Action Alternative upon the development of murrelet habitat and murrelet recovery would be minor.

3.5.3 Environmental Effects Alternative 2: The Proposed Action

Northern Spotted Owl

Under the Proposed Action density management thinning, snag/wildlife structure/down woody material development, and underplanting of shade tolerant trees would occur on approximately 575 acres of forest stands in the southern portion of the Headwaters Nestucca subwatershed. The intent of the proposed action is to alter stand development trajectories resulting in more rapid attainment of structural conditions associated with use by spotted owls. This approach complies with the guidance in the Revised Northern Spotted Owl Recovery Plan (USFWS 2012). The silvicultural techniques used will have short-term impacts on existing habitat conditions; however, the long-term changes are expected to be beneficial to owls as discussed below.

As was done for the No Action alternative above, the impacts of the proposed action will be discussed separately for the stands younger than 80 years old and those 80 or older.

Habitat Conditions - Stands less than 80 years old (Sections 23, 25, and 26)

These units are considered to only provide dispersal habitat and possibly foraging habitat, but not nesting habitat due to the lack of structures suitable for owl nesting. Dispersal is a landscape process and it's generally considered that as long as 50% of the landscape retains 40% canopy cover with trees >11" dbh dispersal is accommodated. Since the thinning prescriptions would result in stands that still maintain at least 40% canopy closure (71 – 79%) the stands would still function as dispersal habitat after treatment and would not reduce the acreage of dispersal habitat within the analysis area. With thinning, and snag/wildlife structure/down wood development occurring, the affected stands would move in a different development direction than would occur under the No Action Alternative (underplanting would not occur due to the presence of western hemlock in the current stand). In the short term (approximately the first 15 years after thinning) these stands would decline in suitability for flying squirrels and tree volesdue to the reduced mid-story cover provided by stem density of the pre-thinning stand as well as by some of the larger understory hemlock that may become damaged from logging operations. This potential reduction in prey would negatively affect the post-harvest stands suitability as spotted owl foraging habitat. Beyond 15 years we expect that these stands would begin to rapidly improve in overall habitat suitability as released understory hemlock begin to move into the mid-story and epicormic branching and limb extension begin to fill gaps which would greatly enhance cover for arboreal rodents (Wilson 2010). We also expect that trees treated by topping or girdling within the live crown would have responded and formed stable structural features that could be used by flying squirrels, tree voles and other wildlife, including the spotted owl (USFWS 2011). At 25 to 30 years after thinning we expect that the stand would once again be quite dense and tree growth would be slowing. While density dependent mortality would effectively cease within the thinning area (but would continue within the approximately 65 acres of those stands excluded from the thinning in riparian no-harvest buffers), density independent mortality would continue to occur throughout the time period, especially in section 25 where laminated root rot is prevalent. The loss of suppression mortality snag production resulting from thinning would not impact spotted owls in any meaningful way since snags produced during mid-seral stage development are not large enough to provide meaningful habitat for owl prey species (Manning et al. 2012), or to provide nesting or roosting habitat for owls themselves In summary, the proposed action would have a negative effect on spotted owl habitat, but not on actual owls since none occur here, for approximately 15-20 years by potentially reducing the population of arboreal rodents that are the primary prey items for spotted owls. After 20 years habitat complexity would increase and as mid-story occlusion increases from understory development, habitat for flying squirrels would improve thus increasing foraging opportunities for spotted owls. Also, with increased stand complexity these stands are likely to be functioning as suitable habitat sooner than if no treatments were to occur.

Habitat Conditions - Stands 80 years old and older (Sections 15, 17, 18, 20, 21, and 22)

As noted in the Affected Environment section these stands 80 years and older are very poor spotted owl habitat due to the lack of structural diversity that would otherwise provide primary constituent habitat elements such as nesting structures, cover, and habitat for a prey base. The Proposed action would remove on average about 45% of the trees but only 30% of the basal area and 25% of the canopy cover, indicating that by and large the smaller trees would be removed.

The immediate impacts from the thinning would be less cover for both owls and prey species from having fewer trees and about a 25% decrease in canopy cover which could result in higher predation for both if they were present. Also the brush layer would be altered due to crushing associated with tree felling and yarding and potentially also from site preparation for underplanting. Together these impacts would decrease spotted owl habitat quality from poor to slightly poorer. However, considering that there are no spotted owls currently using the analysis area the immediate effects to spotted owl habitat would not affect the current owl population.

The first 10 to 15 years after treatment the stands would remain poor habitat for owls due to the lack of the aforementioned elements of suitable owl habitat – especially flying squirrels. Considering that there are few if any flying squirrels present now we can expect that until the planted understory begins to reach into the mid story (30 – 50 feet above ground level) that the treated stands would remain poor habitat. After about 30 years we expect that, based on observation and experience in the Nestucca watershed, that some areas of planted understory

would be able to take advantage of better site conditions (more light, less brush competition, more moisture etc.) than others and begin to show a diversified vertical forest structure.

The thinning would also negatively affect snag numbers by the removal of trees that could otherwise become snags if some mortality agent were present. However, stand exam data has shown that these stands, especially the 70% that had been previously thinned, are very resistant to mortality and have stagnated at high relative densities (see table 8). Stand density is no longer an important mortality agent in these stands but density independent factors such as laminated root rot (*Phellinus weirii*), occasional windthrow and bark beetle attacks would still affect mortality after treatment, except that there would be fewer trees available to become snags. The additional coarse wood treatments would provide some immediate habitat and would also provide structural defects that could provide nesting and cover opportunities that are not otherwise available now.

The resulting variable spacing and release of dominant trees would have the favorable effect of allowing trees to develop massive crowns with more opportunity to develop structural features conducive to nesting and protection for both owls and arboreal rodents. Epicormic branching would occur along gaps as would branch elongation. The brush layer would recover and again provide cover for foraging prey species, especially in areas of wider spacing between trees.

Ultimately we expect that the Proposed Action coupled with future management of the developing understory and snag/wildlife structure features would result in good quality spotted owl habitat in the treatment units within 30 – 50 years, considerably sooner than the No Action alternative which, based on the local evidence cited in the analysis above, could take a century or more. When considered at the subwatershed scale, the proposed action would be juxtaposed with the approximately 1,200 acres of currently suitable habitat and the 425 acres of 70-100 year old stands that would not be thinned to produce a diversity of stand structure that could provide an area large enough to support breeding spotted owls (about 27% of the analysis area).

The Proposed Action would occur in spotted owl dispersal habitat which would continue to function as dispersal habitat at the completion of the project. The near term negative effects (reduction in tree numbers, which reduces the potential pool for snag recruitment in the future and lowers the current mid-story occlusion slightly by removing tree boles, and the temporary reduction in brush layer density) are relatively inconsequential since the current spotted owl condition is so poor that the analysis area is not used by spotted owls. These near term negative effects should be more than offset by the future beneficial effects as the stands differentiate into more complex habitat and move from dispersal habitat to high quality suitable habitat.

Effects to Critical Habitat:

The Proposed Action alternative would have a near term (0-15 year) negative impact on spotted owl critical habitat unit NCO – 5 primarily through the slight reduction in habitat quality for northern flying squirrels, the main prey item for spotted owls. In the longer term (30-50 years) the critical habitat unit would contain better habitat than would be expected under the no-action alternative because the analysis area would contain more acres of diverse complex forest with habitat features favorable for arboreal rodents and spotted owls.

3.5.4 Cumulative Effects – Northern Spotted Owl

In addition to the Walker Creek project, the BLM is also implementing the Hoag Pass Projects and the Cedar Creek Projects in the same 5th field watershed (Nestucca River) and critical habitat unit (NCO – 5). All three projects are designed to have long term positive effects to spotted owl habitat. All three projects also have similar near term negative effects of slightly reducing habitat quality for owls primary prey species, the northern flying squirrel. Because surveys have shown that these areas are not being used by spotted owls the reduction in flying squirrel habitat for the next 15 or so years would not be expected to have a negative effect to individual owls or the population as a whole. In the longer term, beyond 30 years, we expect that these three projects would synergistically have a positive effect on spotted owls through improved habitat quality over a larger area than just the Walker Creek Project which would support owl breeding and dispersal.

Marbled Murrelet

Impacts to Known Murrelet Sites:

There are no known occupied marbled murrelet sites within the vicinity of any of the proposed treatment units or haul routes for the following reasons. Given the lack of suitable or potential habitat within the general project area and the fact that the project area is located approximately 24 to 29 miles from the ocean, it is highly unlikely that there are any unknown murrelets currently inhabiting the analysis area or would they be expected to occupy the area within the foreseeable future.

Impacts to Murrelet Suitable or Potential Habitat:

There currently is only one identified tree with potentially suitable nesting platforms (Potential Habitat) within or near a proposed treatment unit (T3S, R6W section 17). It is located along one of the roads proposed to be used as a haul route. This tree would be protected and managed in accordance with Option 3 as described by the Level 2 Team for the North Coast Planning Province (USFWS et al. 2004).

Due to the lack of suitable murrelet habitat within or near the project areas and design features incorporated to protect the one tree with potentially suitable murrelet nesting platforms, the Walker Creek project would result in no habitat modification to current marbled murrelet habitat.

In the long-term (greater than 50 years) the 575 acres of thinning treatments areas would be expected to begin to develop into murrelet potential habitat and eventually, suitable habitat sooner than without treatment. Thinning would result in maintaining or increasing stand vigor and growth, thereby promoting crown development and complexity including large limbs (potential nesting structure) and increasing the treated stands horizontal and vertical structural diversity.

Given the fact that the project area is located in a band of land that ranges from approximately 24 to 29 miles from the ocean (the outer portion of marbled murrelet Zone 1) and the length of time necessary for the benefits of the proposed project to marbled murrelets to be realized, the potential benefits of the Walker Creek project and the development of murrelet habitat upon murrelet recovery would be minor.

Designated Critical Habitat:

The proposed density management treatments located within murrelet Critical Habitat comply with the standards contained within the Marbled Murrelet Critical Habitat Biological Opinion (dated May 13, 1997) as outlined in Appendix E of the *Biological Assessment of habitat-modification projects proposed during Fiscal Years 2013 and 2014 in the North Coast Planning Province*, (USDA and USDI 2012), and there are no adverse impacts to Marbled Murrelet Critical Habitat by implementation of the density management project. The only impacts to Marbled Murrelet Designated Critical Habitat that would be expected would be the long-term benefits to the development of suitable habitat that would occur in the future as a result of the proposed action.

Impacts to Marbled Murrelets due to Disturbance:

The potential for disturbance impacts to murrelets exist where activities that generate noise above the ambient forest level occur near breeding murrelets or unsurveyed suitable nesting platforms. Given there is only one identified tree with potentially suitable nesting platforms within or near a proposed treatment unit and the nearest small patches of suitable murrelet habitat are located along the Nestucca River corridor approximately 0.28 miles from the nearest Walker Creek density management treatment unit, the possiblity for disturbing nesting murrelets would be so small as to discountable

3.5.5 Cumulative Effects – Marbled Murrelet

There would be no cumulative effects to marbled murrelets as a result of implementing the Proposed Action. There is no known murrelet habitat on private land in the Analysis Area and there is not expected to be any in the foreseeable future. The proposed action would not affect murrelet habitat, and consequently it would not contribute any cumulative impacts to the current habitat condition.

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

The analysis below includes species that could occur within the Tillamook Resource Area (the lowest area delineation for the lists); and have the potential to be impacted by the Walker Creek Project; and are on the BLM State Director's Special Status Species List (per Instruction Memorandum No. OR-2012-018), Survey and Manage Species (SEIS Special Attention Species within the ROD/RMP) as identified within the 2001 S&M ROD and modified by BLM-Instruction Memorandum No. OR-2011-063 (S&M settlement agreement), the USFWS's 2008 "Birds of Conservation Concern" list for the U.S. portions of the Northern Pacific Forest Bird Conservation Region, or are included in the Salem District's ROD/RMP. Table 21 below contains the complete list of species and a brief impact synopsis which shows which species may be impacted and are thus carried forward to the analysis below.

BLM's Special Status Species policy objectives are to initiate proactive conservation measures that reduce or eliminate threats to Bureau Sensitive (BS) species to minimize the likelihood of and need for listing of these species under the Endangered Species Act. The objectives of the S&M measure is to survey prior to ground disturbing activities and manage known sites for those species shown in the table below. BLM policy regarding Migratory Bird Treaty Act described in Instruction Memorandum No. 2008-050 as clarified in Instruction Memorandum No. OR-2009-018 requires that the BLM assess the effects to populations and habitat for birds of conservation concern when implementing projects; and consider modifications to projects if substantial effects are expected to occur to a "significant" proportion of the species habitat.
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Table 16: Special Status Species (BLM 6840 Policy), Survey and Manage Species (SEIS Special Attention Species in Salem ROD/RMP) and Migratory Bird Treaty Act wildlife species that could occur within the Tillamook Resource Area

Project Name: Walker Creek		
Common Name	**Status***	**Impact Synopsis**
Mammals:		
Fringed Myotis	Salem ROD/RMP	**Affected** – Beneficial impact to low quality habitat. Promote development of roosting habitat.
Long-eared Myotis	Salem ROD/RMP	
Long-legged Myotis	Salem ROD/RMP	
Silver-haired Bat	Salem ROD/RMP	
Townsend's Big-eared Bat	BS, Salem ROD/RMP	**Not Affected** – Cave, Mine, Old Building obligate. None of these are in the project area.
Red Tree Vole (North Oregon Coast DPS)	BS, S&M	**Negligible impact** – Low quality habitat within project areas. Surveys conducted and occupied sites protected. Potential short-term (~15 yrs. +/-) adverse impacts upon the development of suitable habitat.
Birds:		
Bald Eagle	BS	**Affected** – No nest or roost sites near the project area. Promote development or improvement of

Project Name: Walker Creek		
Common Name	**Status***	**Impact Synopsis**
		bald eagle nesting and roosting habitat.
Black Swift	MBTA	Not affected – No habitat within project areas
Harlequin Duck	BS	Not affected – Negligible potential for impact.
Horned Lark	MBTA	Not affected – Project not within suitable habitat
Lewis' Woodpecker	BS	Not affected – No habitat present; not within expected range
Olive-sided Flycatcher	MBTA	**Affected** – Possible improvement of habitat
Oregon Vesper Sparrow	MBTA, BS	Not affected – Project not in suitable habitat
Peregrine Falcon	MBTA, BS	Not affected – No habitat present
Purple Finch	MBTA	**Affected** – Possible improvement of habitat
Purple Martin	BS	Not affected – No habitat present
Rufous Hummingbird	MBTA	**Affected** – Possible improvement of habitat
Willow Flycatcher	MBTA	**Affected** – Possible improvement of habitat
Reptiles and Amphibians:		
Cope's Giant Salamander	BS	Not affected – Not within range
Foothill Yellow-Legged Frog	BS	Not affected – No habitat present; not within expected range
Pacific Pond Turtle	BS	Not affected – No habitat present; not within expected range
Painted Turtle	BS	Not affected – No habitat present; not within expected range
Invertebrates (Mollusks):		
Crowned Tightcoil (snail)	BS	**Affected** – Species not located during surveys. Impacts to potential habitat.
Evening Field slug	BS, S&M	Not affected – Species not located during surveys. Preferred habitat excluded from project by riparian buffers.
Pacific Walker (snail)	BS	Not affected –Not in expected range
Puget Oregonian (snail)	BS S&M	**Affected** – Species not located during surveys. Impacts to potential habitat.
Invertebrates (Arthropods):		
Johnson's Hairstreak (butterfly)	BS	Not affected – Hemlock habitat maintained; unlikely presence within project areas
Siuslaw Sand Tiger Beetle	BS	Not affected – Outside of range
Hoary Elfin	BS	Not affected – No habitat present

BS = Species listed as Sensitive under the BLM's 6840 Special Status Species Policy (species list per BLM IM No. OR-2012-018)
Salem ROD/RMP = Species included in the Salem District ROD/RMP for special consideration
MBTA = Species covered by the Migratory Bird Treaty Act of 1918
S&M = Survey and Manage Species (SEIS Special Attention Species) as identified within the 2001 S&M ROD without Annual Species Review.

3.6.1 Affected Environment

Red Tree Vole (RTV) - Survey and Manage (S&M) and Bureau Sensitive (BS)

USFWS has determined the North Coast Distinct Population Segment (DSP) of red tree voles to be warranted but currently precluded from listing under the Endangered Species Act by higher priority actions (USDI-USFWS 2011). As such the North Oregon Coast DPS of the red tree vole was added to the USFWS list of candidate

species meaning the USFWS may propose to list this population under the Endangered Species Act at a later date. This population segment includes red tree voles located in the vicinity of the Walker Creek Project area. The North Coast population of red tree voles is managed as Bureau Sensitive under the BLM's Manual 6840 Special Status Species Policy as well as Survey and Manage Species (SEIS Special Attention Species) as identified within the 2001 S&M ROD (without Annual Species Review).

The red tree vole is an arboreal rodent that rarely comes to the ground and may live its entire life on a few acres. It is thought to be strongly associated with mature and late-successional Douglas-fir forest with optimal habitat being old-growth forests. Some recent studies and the results of many surveys over the last ten years have shown that red tree voles are also sometimes found in younger forests, especially if they contain a component of older trees or are located near stands of mature forest. At this time it is uncertain what role younger forests play in the general health of the red tree vole populations, especially in the northern mesic zone where the Walker Creek Project area is located.

Red tree voles are uncommon in the Northern Coast Range with few known sites north of the Nestucca River basin. Those sites that are north of the Nestucca river basin are along the western edge of the historic Tillamook Burn areas on State Forestry or State Park lands. In the last ten years of red tree vole surveys covering about 5,500 acres within the Tillamook Resource Area, BLM has located approximately 104 red tree vole nests of which about 40 were active. Nearly all of these sites have been found in stands at least 110-years-old with considerable structural diversity and/ or old-growth remnants.

Red tree vole transect surveys (Survey Protocol for the Red Tree Vole Version 2.1 Revision, October 2002) were conducted on a total of 610 acres in support of the Walker Creek Project. These surveys included all of the 410 acres of the proposed density management treatment units greater than 80-years-old despite the fact that the stands lacked old-growth remnants and habitat quality within the vast majority of the areas is considered to be very marginal in quality. Transect surveys resulted in 91 trees being identified for climbing. Climbing resulted in 14 red tree vole nests (5 active and 9 inactive) being identified. Two of the active nests were within proposed units near the edges of stands that were dropped from the Proposed Action prior to surveys (already exhibiting some features of more complex forest especially epicormic branching and mid-story limbs). The remaining active nests were in areas already dropped from the Proposed Action at the time of surveys. Red tree vole management areas have been established for the five active nest sites (minimum 10 acres) which resulted in a total reduction of approximately 15 acres from four Proposed Action units.

Terrestrial Mollusks - (BS and/or S&M)

The Walker Creek project is within the range and/or contains habitat for three terrestrial mollusk species that are on BLM's Special Status Species list as Bureau Sensitive and/or are Survey and Manage Species (SEIS Special Attention Species) as identified within the 2001 S&M ROD (without Annual Species Review). 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. Additionally, a few species seem to be associated with areas where humidity remains high such as seeps and riparian areas.

After approximately 10,000 acres of survey effort in the Tillamook Resource Area there have only been a few encounters with the three species considered here. There are four known sites of the Puget Oregonian (*Cryptomastix devia*) (S&M and BS) in the Tillamook RA (nearest approximately 1.5 miles miles northeast of the nearest proposed unit) which represents a range extension of what was thought to be a Washington Cascades and Columbia gorge species; these sites are the only records in the Coast Range. The crowned tightcoil (*Pristiloma pilbryi*) (BS) is a very small terrestrial snail that is most abundant under the dense thickets of salal near the coast. Inland forested sites are associated with abundant, persistent moisture. According to the BLM's regional database the only crowned tightcoil known site in the Nestucca drainage is more than 4 miles southwest of the project area; this represents the only site currently within the BLM database in Oregon.

The evening field slug (*Deroceras hesperium*) (S&M and BS) is associated with perennially wet meadows in forested habitats. Due to the limited number of verified sites, little detail is known about exact habitat requirements for the species. However, 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 situations where the soil and vegetation remain constantly saturated. Areas with coastal fog may allow the species to occupy habitats farther from open water. The only verified site for this species in the Tillamook Resource Area is along the Nestucca Access Road approximately 12 air miles to the west. The Walker Creek Project's no-harvest riparian buffers likely exclude any potential habitat for this species which may be located in the vicinity of the project.

Mollusk Surveys

Two rounds of mollusk protocol surveys were completed in the fall of 2011 and the spring of 2012 on a total of approximately 663 acres located within and/or near selected Walker Creek proposed treatment units; 312 of these acres are within proposed treatment units. Additional protocol surveys were conducted on 15 acres of Walker Creek proposed treatment units during the spring of 2013. In addition to these recent mollusk surveys conducted in support of the Walker Creek Project, approximately 63 acres of the proposed Walker Creek treatment units were surveyed between the spring of 1999 and the fall of 2001 in conjunction with the Bald Loop planning effort. Together, these surveyed acres represent some of the best mollusk habitat within or near the proposed project areas including all proposed treatment units over 80 years of age. No Survey and Manage or Bureau Sensitive mollusk species were located during surveys.

Bald Eagle - (BS)

The final rule delisting the bald eagle from the Endangered Species Act was effective August 8, 2007 (USDI 2007). The bald eagle is still classified as Threatened under the Oregon ESA and provided protection under federal law (e.g., Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act). It is currently managed as "Bureau Sensitive" (BS) under the Bureau's Special Status Species Policy.

Bald eagles generally nest and/or roost within one mile of a large major river or lake, or within 0.5 mile of a major tributary. They prefer large, older trees that have an open branching pattern in the top half of the tree. Dispersed eagle usage may occur throughout the general area containing the Walker Creek project wherever suitable eagle habitat is present; eagle usage of the area would most probably occur during the late fall or winter months when steelhead, Chinook salmon, and Oregon Coast coho are spawning. Bald eagles are occasionally seen foraging along stretches of the Nestucca River however eagle sightings are much more common along stretches of the river located further downstream at points west of the Elk Creek/Nestucca River confluence where the river classification changes from a 5th to 6th order stream. This confluence is located approximately 3.5 miles west of the nearest treatment unit.

There are no known bald eagle communal winter roosts within or near the Walker Creek Project Area. The nearest known bald eagle nest is historic in nature and located along Elk Creek about 4.5 miles west of the nearest proposed treatment unit. Because of the high visibility of bald eagles and bald eagle nests, it is unlikely that undiscovered bald eagle nests or roosts are located within or near the project areas.

Harlequin Duck – (BS)

The harlequin duck is a small sea duck that breeds along rocky, swift flowing rivers from the Rocky Mountains to the Coast Range of Oregon. They typically nest on the ground in well-concealed locations along fast-moving rivers and mountain streams. Nests are typically located close to water and may be situated at the base of trees, on piles of woody debris, under fallen logs, or on sheltered stream banks. While in streams, harlequins spend much of their time in riffles and glides except when rearing very young ducklings, when they often spend time in the slower pool water. The female is the only brooding parent as the male leaves for the Pacific coast soon after nest initiation. The female begins moving the young downriver within a few weeks after hatching in late May to mid-June. It is estimated that by late August the female and the brood are in the vicinity of the coastal estuary.

The harlequin duck was not known to breed in the Oregon Coast Range until a female with young was identified in the Nestucca River in July of 1994. Since then, there has been documented breeding behavior (females with young) during several breeding seasons. Observations have occurred within the mainstem of the Nestucca River up to approximately the Fan Creek confluence, a point approximately 1.5 miles downstream from the riparian buffer of the nearest Walker Creek treatment unit. At its nearest point, the mainstem of the Nestucca River is approximately 0.5 miles from the nearest Walker Creek treatment unit (unit 18-4).

Bats - (BS and/or ROD/RMP Species)

Five bat species of bats are either Bureau Sensitive (BS) and/or listed as a species with specific management direction in the ROD/RMP (Salem RMP) may be within or near the project area. Townsend's big-eared bat (BS/Salem RMP), long-eared myotis (Salem RMP), long-legged myotis (Salem RMP), silver-haired bat (Salem RMP), and fringed myotis (BS/Salem RMP), are known to inhabit mature and immature coniferous forest, and they may forage near riparian areas, open areas, and along forest edges and roads. They can utilize large hollow trees for roosting, hibernating, and maternity colonies. Accumulations of large logs, snags or live trees with defect such as loose bark and cavities may function as additional day or night roosts. BLM has installed a number of bat boxes under bridges within the Nestucca watershed.

There are no known bat roosting or hibernaculum sites within the project area nor are there any caves, old buildings or abandoned mines. Some of the more open forested and riparian habitats and roadways within and near the proposed treatment units function as bat foraging habitat. Suitable bat habitat, especially higher quality large snags, is currently lacking within and near most of the areas proposed for treatment; this limits the overall value of bat habitat within the area.

Johnson's Hairstreak - (BS)

Johnson's hairstreak is a small butterfly that is dependent on coniferous forests that contain mistletoes of the genus *Arceuthobium.* It is the only Bureau Sensitive insect that may be affected by the proposed action. The mistletoes occur mainly on western hemlock and occasionally true firs. The eggs of this butterfly are laid in mistletoe masses and the chrysalids overwinter there. The larvae feed on the leaves of the host plant. Historically the Johnson's hairstreak was thought to occur throughout the Pacific Northwest in old-growth forests. Some of the stands in the density management project area contain hemlocks and although not observed, there may be mistletoe within these stands that could support this butterfly.

The current range of Johnson's hairstreak is uncertain however, recent efforts have resulted in an additional five records from Oregon with the nearest sighting being approximately 29 miles to the southwest of the density management project. There are no known records of the species occurring within or near the proposed density management project areas.

Migratory Bird Treaty Act

Executive Order (EO) 13186, issued Jan. 17, 2001 directs federal agencies to enter into a Memorandum of Understanding (MOU) with the U.S. Fish and Wildlife Service to further the goals of the Migratory Bird Treaty Act of 1918 (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 Walker Creek Project follow: "*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 . . . "

In general, thinning of young conifer forests results in greater abundance of birds and, depending on the presence of other habitat features such as snags, hardwoods, etc., can also increase bird species richness. Of the bird species that are included in the USFWS's 2008 "Birds of Conservation Concern" list for the U.S. portions of the Northern Pacific Forest Bird Conservation Region only the olive-sided and willow flycatchers, purple finch and the rufous hummingbird occur within the analysis area and have the potential, either negatively, positively or both, to be impacted by the Walker Creek Project.

Olive-sided Flycatcher

In the Coast Range, the olive-sided flycatcher builds nests in mature conifer stands, preferring western hemlock and Douglas-fir, with openings nearby such as early seral forest stands, marshes, ponds, etc., over which they forage. They are most abundant in landscapes containing late-seral forests highly fragmented by early-seral habitats – a landscape rich in high contrast edges. 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, the Walker Creek project area contains some marginal quality flycatcher habitat. This habitat is located along forest edges containing relatively larger trees particularly along forest gaps such as *Phellinus weirii* areas.

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. Non-federal and industrial timber company land within the area of the proposed project are currently providing a great deal of early-seral habitats, however many recent clearcut units are treated with herbicides and then replanted exclusively with Douglas-fir seedlings. Under this management scenario, brushy thickets are usually rare or short-lived if not totally lacking. These sites generally do not have time to develop complex early-seral conditions before the site is completely occupied by a monoculture of fully-stocked Douglas-fir seedlings.

Habitats 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 clearcut.

Purple Finch

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

Purple finches undoubtedly breed in the vicinity of the Walker Creek 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 the Walker Creek Project Creek 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 some edges of proposed treatment units, road clearings, property lines or near current openings within treatment units where limited suitable habitat exists.

3.6.2 Environmental Effects Alternative 1: No Action

Special Status Species (BLM 6840 Policy)

Under the "No Action" alternative the current habitat condition for any Special Status Species would be unaffected now and into the near future by BLM management actions.

Left unthinned, project areas would be 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 decrease, diameter growth rate would be expected to continue to decline, and competition-related mortality would increase, especially in the younger stands, resulting in coarse wood additions mainly from the smaller-diameter trees that slowly die from suppression. Understory development would also be expected to be limited because of stand densities as well as a general lack of shade tolerant species in the overstory to provide a seed source in most stands. Any conifers which may exist in the understory (i.e. saplings and seedlings) of some stands would be expected to decline in vigor and exhibit a very slow growth rate, with some possibly falling out of the stands because they are no longer able to survive under the increasingly dense overstory shade.

Eventually disturbances such as windthrow, root disease, insect attack, or possibly fire would 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. A naturally functioning forest system in this area would normally include western redcedar and/or western hemlock in the overstory that would provide a source of shade tolerant seed that could take advantage of the additional light provided by canopy openings from disturbances and thus provide conifer regeneration in the understory. However, because there is virtually no seed source for shade tolerant conifers within or near the treatment units because of the lack of hemlock or cedar in the overstory, the development of complex multi-layered stands would take considerably more time than would occur with active establishment of an understory layer as would occur under the Proposed Action. This statement is based on experience with nearby 120 year old stands that were thinned 40 years ago and despite the opening of the canopy, did not develop a second canopy layer due to the lack of hemlock or cedar in the overstory (forestry objectives 40 years ago did not include underplanting thinnings). Even if we assume that a few shade tolerant conifers would become established, which would need to occur near some seed source outside of a given unit, then those trees would need to grow to some level of maturity (and height, in order to effectively cast seed) which may take 50 years in the understory, before they could cast seed in the right location where the seeds can grow and start the process over again and thus slowly advance further into the stand. Considering this dynamic process, it is not unrealistic to expect that it may take a century or more for these stands to begin to develop complex multi-layered characteristics.

Eventually the No Action alternative would result in a complex, multi-layered, old forest system with more, smaller trees, with less crown development but with a higher amount of coarse wood (although of smaller piece size). It is not clear that when the proposed treatment stands eventually do attain old forest characteristics through the No Action alternative whether the overall animal species composition and abundance would be appreciably different than would occur under the Proposed Action but we expect, for reasons stated above, that it would take longer to attain the assemblage of species associated with those types of forest..

Under the "No Action" alternative, there would not be any potential for additional drying of the terrestrial environment that may otherwise result from a reduction in canopy cover that would affect terrestrial mollusk habitat, nor would there be any damage or destruction of existing coarse woody debris. Habitat for red tree voles would remain poor as it is today and based on evidence of nearby single layered, simple structured stands that are 40 -50 years older and exhibit very few potential arboreal rodent nest structures would continue to be poor beyond five decades. Over a longer period as stochastic events (storms, disease, drought etc.) slowly change the structural characteristics of the stands, habitat would improve. The identified beneficial, long-term impacts to bald eagles including the accelerated development or improvement of eagle nesting and roosting habitat through the promotion of trees with larger crowns, snags and snag-topped trees would not occur.

Migratory Bird Treaty Act

Under the "No Action" alternative the current habitat conditions for the MBTA listed Species of Concern would be unaffected now and in the near future by BLM management actions. The stands would continue to grow and mature at a declining rate. Eventually disturbances such as windthrow, root disease, insect attack, or possibly fire would 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.

Due to the limited scale of the project area and the small potential for impacts, the "No Action" alternative would not be expected to affect the population viability or population trends for the purple finch, rufous hummingbird or the olive-sided and willow flycatchers.

Not treating those stands proposed for thinning would maintain less desirable habitat conditions for the rufous hummingbird and the purple finch in the near term (next two or three decades) and possibly beyond into the long term since both of these species favor more open forested conditions. The olive-sided flycatcher may also find the unthinned stands less favorable than thinned stands but that assessment is less clear in that stands that are too open are not favored for nest site selection. However thinned stands that maintain high growth rates and then recover canopy closure with larger, denser crowns that mimic late-seral conditions may be more beneficial to olive-sided flycatchers within a few decades as long as open foraging areas still occur nearby.

Not treating those portions of the stands within many of the designated *Phellinus weirii* pockets would not create additional nesting habitat for the willow flycatcher or rufous hummingbird. It would maintain less desirable habitat conditions for the olive-sided flycatchers, and the purple finch in the near term (next few decades) and possibly longer since these species favor more open forested conditions.

3.6.3 Environmental Effects Alternative 2: The Proposed Action

Red Tree Vole - Survey and Manage (S&M) and Bureau Sensitive (BS)

The proposed thinning could result in temporarily slowing the development of suitable red tree vole habitat. Swingle and Forsman (2009) suggest that thinning of young conifer forest could have detrimental effects on red tree vole habitat speculating that decreased connectivity between individual tree crowns may be the reason. While the proposed level of thinning would result in an average canopy closure of at least 63%, it would nonetheless result in a variably spaced canopy where some of the crowns remain interconnected and others remain disconnected for several decades. However, as the treated stands continue to develop and the crowns of the retained trees have expanded and become more massive (30-50 years), the quality of the vole habitat would likely be better than had the stand not been thinned. A relatively variable spaced thinning would also encourage heavier branching, and where tree boles become exposed to more solar radiation epicormic branching may occur possibly as soon as 10 years. Epicormic branches are clusters of branches growing directly adjacent to the tree stem which provide very stable platforms for tree vole nests because they are not buffeted by wind. Considering potential for the increase in stable tree structures suitable for red tree vole nests, the project could result in improved tree vole habitat as soon as 10 years and certainly within 30-50 years.

There would be no direct effects to red tree voles since management areas have been established and excluded from the treatment areas for the five active nest sites (minimum 10 acres) which were located by surveys conducted in support of the Walker Creek Project.

We expect that the Proposed Action would not affect the population of red tree voles in the analysis area nor would it affect any known sites for red tree voles. We draw these conclusions because: the stands considered for treatment are currently poor tree vole habitat because they are too young to have developed features desirable for tree vole nesting and protection from predators or, as in the case of the71% which has been surveyed (stands 80 and older), found to be uninhabited by tree voles most likely also due to a lack of habitat structure; the few active tree voles that were found during surveys have been excluded from treatment stands and have been placed within 10 acre management areas; better tree vole habitat within the analysis area is not included in the proposed treatment; and beyond ten years and within 30-50 years after treatment we expect the treated stands to be better tree vole habitat than if not treated.

Terrestrial Mollusks - Survey and Manage (S&M) and/or Bureau Sensitive (BS)

In general, thinning of forested stands like the Proposed Action causes minor changes in the microclimate (warmer and dryer) at the ground level post-harvest whereas *Phellinus weirii* treatments would have greater potential such impacts. During warm and dry periods terrestrial mollusks become inactive and seek refuge below ground or in large semi-decayed wood to prevent drying out and death. Results from studies of microclimate changes between various thinning densities compared to unthinned stands seem to indicate that, although thinned stands are warmer and dryer than unthinned stands, there is considerable overlap in conditions between them suggesting that these stands provide a wide range of microclimates (Chan et. al., 2004). The Walker Creek Project proposes to thin to residual basal area and/or a diameter cut limit and would result in an average crown closure within the thinned stands expected to average between approximately 63% and 79% immediately after thinning (see Table 10).

Considering that even in unthinned stands there are long periods in a given year when the climate is too warm and dry for terrestrial mollusk activity, it stands to reason that there may only be a slight change in the average time when conditions in the thinned stands are unsuitable for mollusk activity compared with the unthinned stand condition, presumably on the cusps of the dry weather in the early summer and later fall, and if there is a change, it may be within the range of natural variability. Also, the additional cover at the ground level provided by slash, created CWD and the increase of the shrub layer due to the thinning would help moderate some of the effects of additional solar radiation and air movement through the stand which contribute to warming and drying.

The treatment prescription to control *Phellinus weirii* (Sections 23, 25, and 26, all stands less than 80 years old), including post-harvest slash treatments, would have an adverse impact upon mollusk habitat. In these areas, ground conditions could be changed (made drier and warmer) to a point where they are unfavorable to terrestrial mollusks for a longer portion of a year, perhaps by as much as 6-8 weeks; design features including green tree retention (including hardwoods), those addressing CWD habitat and the fact that the *Phellinus* treatment areas are generally configured into dispersed, relatively small units (seven acres or less) would help minimize the adverse impacts.

Harvest activities, especially ground-based harvesting and new road construction, can have direct adverse impacts upon mollusks and mollusk habitat by crushing individuals, breaking apart later decay stage coarse wood and/or disrupting the duff layer on the forest floor.

Hardwoods are an important habitat component for some mollusk species. All hardwoods including big-leaf maples and red alder would not be cut unless they are in road rights-of-way, landings or yarding corridors; this would help minimize the potential for adverse impacts of the Walker Creek project upon mollusk habitat.

Surveys of over 71% of the proposed treatment acres did not result in any encounters with the three species analyzed here. Considering that these three species show a predilection for persistent moist conditions such as those found near the edge of live water which would be excluded from harvest activities by no-harvest buffers in

the Proposed Action we would not expect that we would find these species in the 29% of the area not surveyed (stands less than 80 years old). Based on results of surveys coupled with project design features we do not expect that the proposed action would result in any loss of species persistence at undiscovered sites (Survey and Manage species) or result in a need to list any species under the ESA (Bureau Sensitive Species).

Bald Eagle - (BS)

Suitable Bald Eagle Habitat Modification:

This project would promote the continued and accelerated development of bald eagle nesting and roosting habitat. The promotion of large crowns by thinning has the potential for long-term beneficial impacts to the quality of eagle habitat within the area. Design features that create snags and snag-topped trees (e.g. topping within the live crown) within the density management units or in older adjacent stands may provide an increased opportunity for eagle roosting sites and given enough time, potential nest trees.

Impacts to the Bald Eagle as a Result of the Potential for Disturbance:

There are no known eagle nests or communal roost sites within 0.25 miles of the project area. Dispersed eagle usage may occur throughout the general area containing the Walker Creek project wherever suitable eagle habitat is present; this eagle usage of the area would most likely occur during the late fall or winter months. As a result of project implementation, the project may generate noise above the ambient level which could displace roosting bald eagles. It is expected that displaced birds would temporarily relocate to other areas containing suitable habitat and lower levels of disturbance activity. Based on the fact that there are no nests or communal roosts within the area, but rather just dispersed eagle usage, this potential disturbance impact is considered very minor and would not result in adverse effects to any individual eagle or the population as a whole. If a new bald eagle nest or roost is discovered, any project activity within 0.25 mile or 0.5-mile sight distance would immediately be evaluated by the unit wildlife biologist for potential effects on bald eagles, and mitigated to prevent disturbances.

Harlequin Duck - (BS)

Impacts to harlequin duck habitat are expected to be negligible. The action would not be expected to result in any loss of population viability. The nearest treatment unit is approximately 0.5 miles from the mainstem Nestucca River. Although unlikely, it is possible that during the spring, breeding ducks could be along banks of some streams within the riparian reserves of the treatment units while the project is being implemented. Should they be present, breeding harlequin ducks would likely be most vulnerable during the period of nest incubation, since after hatching, the ducks are highly mobile and would be able to avoid disturbance simply by moving away from the site. Depending on time of harvest, the proposed action could cause some short-term disturbance to harlequin ducks including incubating females and/or females with young. Given the relative rarity of sightings of harlequin ducks along the Nestucca River, and with the nearest thinning unit approximately 1.5 miles upstream of the nearest sightings, at the Nestucca's confluence with Fan Creek, chances of harlequin ducks nesting within the project area are very small. The maintenance of no-harvest riparian buffers along all streams within the project would also help to reduce the potential for adverse impacts to harlequin ducks or their habitat.

Bats - (BS and/or Salem ROD/RMP Species)

The density management Project would not be expected to result in the loss of population viability for any of the bat species analyzed or result in the need to elevate their status to any higher level of concern including the need to list under the ESA. There are no known hibernacula or maternity sites within the project area nor are there any caves, old buildings or abandoned mines that some bat species use for roosting. Therefore the proposed treatment areas do not likely provide any breeding habitat but do contain some roosting habitat (larger snags with loose bark or other crevices) and foraging habitat, mostly along edges with younger stands, and riparian areas. Suitable bat habitat, especially higher quality large snags, is currently lacking within and near most of the areas proposed for treatment; this limits the overall value of bat habitat within the area. Design features have been incorporated to protect existing snags, especially larger snags (24"+ DBH and $\geq$ 30 feet in height, specifically reserve trees

around them). Smaller snags that pose a safety risk during harvest operations may be felled (and left on site) so we expect that there will be a small loss of snags from the small diameter classes, however these are generally not the types of snags used by bats for roosting.

The Proposed Action would be expected to immediately improve the quality of bat foraging habitat within some portions of the density management treatment units by opening up the canopy and creating small fragmented gaps in an otherwise very dense, closed canopy which increases insect activity and thus improves foraging opportunities for bats.

The project's design features for CWD creation as well as snag and green tree protection and retention, (including those trees with features desirable to species such as bats), should protect almost all of the desirable bat habitat structure for roosting or resting bats and greatly reduce direct or indirect adverse impacts to bats which may result from the proposed project. Within the units proposed for thinning, including portions of the Riparian Reserves, there is potential for long-term benefits to bats based upon the fact that the treatment would favor the development of some older forest characteristics favored by these species; growth rates of reserve trees would be increased or maintained resulting in larger trees and eventually larger CWD developing sooner than with no treatment (basal area growth 92% greater for thinned stands than unthinned stands after 25 years -see Vegetation Characteristics section above). Ultimately we expect that the project would not negatively affect the forest bat populations analyzed here and may improve habitat conditions for these species.

Johnson's Hairstreak - (BS)

Some of the stands in the density management project area contain hemlocks and although not observed, there may be mistletoe within these stands that could support this butterfly. The mistletoes occur mainly on western hemlock and occasionally true firs. There are no known records of the Johnson's Hairstreak occurring within or near the proposed density management project areas.

There is very little likelihood that Johnson's Hairstreak would be adversely affected by the Proposed Action. Project Design Features would maintain hemlock component within the stands where it is currently present and would avoid selecting any hemlock with suspected mistletoe infection for harvest. All of the stands over 80-years-old would be underplanted with shade tolerant species, including hemlock, to help develop a second canopy layer and introduce tree species diversity in the stands. Migratory Bird Treaty Act

Olive-sided Flycatcher

There is a slight possibility that the proposed project could affect individual flycatcher nests by [removing them] if present in the treatment units, This potential impact is however, considered to be rather remote based on the fact that the majority of the stands within the area of the Walker Creek project are still somewhat younger than those preferred by olive-sided flycatchers; higher quality habitat is found within stands in the area which are not proposed for treatment They are most abundant in landscapes containing late-seral forests highly fragmented by early-seral habitats – a landscape rich in high contrast edges. The Walker Creek project areas currently contain marginal-quality flycatcher nesting habitat.

Olive-sided flycatchers typically forage by catching flying insects from high perches on snags or tall trees adjacent to forest openings. The proposed thinning would provide some benefit to flycatcher habitat by providing more early seral openings (*Phellinus weirii* areas, and small gaps) in the vicinity of the mid-seral or mature stands – both those stands being thinned and stands reserved from treatment. Post-treatment, these larger created gaps in canopy containing numerous scattered and clumped reserve trees would be expected to provide high-quality foraging opportunities for olive-sided flycatchers.

Given that the stands proposed for thinning are somewhat younger than those preferred by olive-sided flycatchers and the fact that stands that are too open are not favored for nest site selection, in the near term it is questionable as to whether or not there would be a benefit to flycatchers through providing additional nesting habitat. In the

long-term (approximately 20+ years), the project would benefit olive-sided flycatchers through the development of mature/late-seral stage habitats.

Willow Flycatcher

In general, habitats within the proposed treatment units currently do not provide habitat for the willow flycatcher with the possible exception of BLM forest openings that may be located directly adjacent to private clearcuts. It is possible that through the harvesting process one or more nests could be destroyed if willow flycatcher were nesting within the proposed units during the harvest operation. In contrast to practices common to many industrial timber companies within the area of the proposed project, the BLM does not prepare planting areas with herbicides. The techniques of manual brushing of competing vegetation utilized by the BLM does not result with the site being so exclusively dominated by planted conifer seedlings. Shrub species preferred by nesting willow flycatchers are usually a major habitat component within BLM regeneration harvest units, heavily thinned areas and gaps created to manage designated *Phellinus weirii* pockets. Post-treatment, localized areas managed to control designated *Phellinus weirii* pockets within harvest units as well as areas treated with a heavier thinning prescription would be expected to provide increased nesting opportunities for the willow flycatcher through the development of a robust shrub layer. This nesting habitat would be expected to be a condition favored by willow flycatchers for up to approximately 15 years after harvest operations.

Purple Finch

It is possible that through the harvesting process one or more nests could be destroyed if purple finches were nesting within the proposed units during the harvest operation.
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.

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 edges of proposed harvest units, property lines or near a current opening within the treatment unit where suitable habitat exists. "Take" under the MBTA is possible if harvest operations were to be active during the breeding season in an area containing nesting hummingbirds. On the other hand, the expected development of the understory brush layer within the treatment units, especially within the gaps created to treat *Phellinus weirii* pockets and areas of heavier thinning within the thinning units, would appreciably improve hummingbird foraging and nesting habitat within the area for the next ten to twenty years.

3.6.1 Cumulative Effects

Generally speaking the Special Status Species, Migratory Bird Treaty Act and Survey and Manage Species analyzed here would not experience any cumulative effects in the next several decades. Beyond the next two to three decades, at the landscape scale, a very small, positive cumulative effect would likely begin to occur for Special Status Species that prefer older forest structure such as the red tree vole or bald eagle. While the thinning of approximately 575 acres of conifer forest may temporarily reduce the quality of mollusk habitat on those acres, the project's cumulative impact would not be expected to result in any loss of population viability for mollusk species of concern or for any of the Special Status Species considered.

3.7 Recreation and Visual Resources

3.7.1 Affected Environment

The analysis area for this EA consists of all lands within the southern portion of the Headwaters Nestucca 6th field subwatershed.

Recreation

Recreational opportunities within the analysis area consist of recreational OHV use, pleasure driving, hunting, dispersed camping, and harvesting of special forest products, such as mushrooms. The project area includes a segment of the Nestucca National Back Country Byway and a portion of the Upper Nestucca Off-Highway Vehicle (OHV) Riding Area (approximately 3.5 miles of trails within proposed harvest units), including an OHV staging area.

Signs of past and current OHV use can be seen throughout the project area; use within the trail riding area is limited to designated roads and trails, outside the boundaries of the designated riding area, the OHV designation is open. Open OHV use is classified as an area where all types of vehicle use are permitted at all times anywhere in the area subject to the operating regulations and vehicle standards set forth in 43 CFR 8341and 43 CFR 8342. The project area is within reasonable travel distance from major metropolitan areas (Portland and Salem) and within close proximity to urban communities (McMinnville, Willamina, Carlton) which enables OHV users to schedule day trips to the area as opposed to multi-day trips required for many public land locations that allow for OHV use.

Visual Resource Management

Visual resources consist of the land, water, vegetation, animals, structures and other features that make up the scenery and physical features visible on a landscape. Administered lands of the Salem District BLM have been classified under a Visual Resource Management (VRM) Inventory Class system that was established by BLM. VRM class criteria include: scenery quality ratings, public sensitivity ratings and area mapping criteria for distance zone-seen. Lands within the analysis area fall under Visual Resource Management (VRM) classifications I, II, III, and IV, with the majority of the proposed project within the VRM class IV.

Table 17: Proposed Harvest Area Acres in Each VRM Class

	VRM Class I	VRM Class II	VRM Class III	VRM Class IV
Acres Total by Class	20	73	50	432

VRM Class I Objective: Preserve the existing character of the landscape. This provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

VRM Class II Objective: Retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

VRM Class III Objective: Partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

VRM Class IV Objective: Provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of the view attention. However, every attempt should be made to minimize the impact of these activities these activities through careful location, minimal disturbance, and repeating the basic elements.

Visual contrast rating system analysis was completed for VRM categories I and II. The landscape features and management actions determining the VRM categories are Walker Flat ACEC for the VRM I lands and the main stem of Walker Creek, a state scenic waterway, for VRM II lands. There are no major travel routes that provide views of these areas. The only unobstructed view of the VRM Class I lands in unit 15-14, is located at the end of spur road 3-6-21.5 approximately ½ mile to the SW and the area is only visible because the road ends in a young plantation that is rapidly obscuring the view through tree growth. There are limited views of trees crowns in VRM Class II units 15-14, 15-23, and 21-4 from various locations along gravel surfaced roads originally built for logging activity.

Other Resources

There are no federally designated Wild and Scenic Rivers within the project area. Walker Creek is considered a State Scenic Waterway by the state of Oregon. Considerations for Walker Creek's Scenic Waterway characteristics were analyzed and considered during the visual contrast rating analysis.

3.7.2 Environmental Effects Alternative 1: No Action

Recreation

OHV use, pleasure driving, hunting, dispersed camping, and harvesting of special forest products are the primary recreational activities found within the project area. Under the no action alternative, these activities would continue to take place within the project area. Any changes in recreational use would be dependent upon factors other than BLM land management activities therefore there would be no effects to the recreational users under this alternative.

Visual Resource Management

With the exception of unexpected changes due to a natural catastrophic event, natural stand progression would continue. Timber management activities would persist on both private and public lands in the analysis area. No BLM modifications to the landscape character within the project area would be expected to occur. Modifications to the neighboring lands are expected to continue as forest management activities occur.

3.7.3 Environmental Effects Alternative 2: The Proposed Action

Recreation

The proposed action is a terrestrial restoration project that includes commercial density management thinning. The worst case scenario is that during harvest activities up to 3.5 miles of OHV trails (or about 13% of the trail system) and one staging area would be closed for portions of one to three years depending on harvest scheduling that is unknown at this time. The most likely scenario would be that about one mile of trail, or about 4% of the system, would be closed at any given time. We do not expect that these closures would result in fewer riders visiting the area. Considering that the vast majority of ridership occurs on weekends and project design features limit harvest activity traffic to weekdays we also expect that recreation traffic conflicts caused by the proposed action would be slight.

We expect that hunting activities in the analysis area would not be affected by the proposed action. Thinning operations would alter the understory shrub layer (reduced for 3-5 years, recovered or denser after 5 years) and reduce overstory canopy which would provide additional light to the understory which could conceivably improve forage conditions for deer and elk. However, forage for deer and elk is not limiting and these animals move considerable distances so whether they are in a given area during hunting season or not would not be affected by the proposed project.

Dispersed camping typically occurs on or along little traveled roads such as logging spurs from previous harvests and is usually done in association with hunting. Some of these spurs or roads may be re-used for harvest operations which may deter some users. These camping places are common and would only be unavailable for a few weeks during harvest (most of which would occur during the summer months before hunting season. We don't expect that the overall amount and quality of camping opportunities would be diminished by the proposed action.

Heavy truck traffic along the Nestucca Back Country Byway associated with the proposed action could potentially cause conflicts with the motoring public, especially along the narrower portions of Bald Mountain Access Road. Most pleasure driving occurs on weekends during good weather. However during the summer months there is more driving activity mid-week than during other times of the year. The level of conflict is expected to be low, generally nothing more than inconvenience associated with delays during some yarding operations or slow driving in the vicinity of log truck traffic. The project design feature that requires the implementation of the Traffic Safety Plan dated June, 2013 which entails the placement of signage beyond those required by OSHA, would help alert the motoring public to the extra traffic and should minimize potential hazards. We expect that with design features in place that the potential for adverse effects to the pleasure driving public from the proposed action would be inconsequential.

Visual Resource Management

The proposed action alternative is to thin stands, reducing canopy closure an average of approximately 25%. Unit 15-14 currently has a canopy closure of 82% containing VRM Class I and VRM Class II management areas. The proposed action would reduce the canopy closure to approximately 67% after timber harvest activities. Visual changes to the project area are expected to be negligible, only apparent from within the stand and not apparent from any distant view, therefore would not attract attention of the casual observer. The only unobstructed viewpoint to this unit is at the end of a logging road (3-6-21.5). This road is in relatively poor condition; vegetation blocks views from all other locations where views may have been attained.

VRM II management areas are located in portions of Units 15-23 and 21-4 and may be observable from roads 3-6-15.3 and 3-6-22. Forest structure prevents views of the remaining units. Views of units 15-23 and 21-4 are limited consisting primarily of treetops. The proposed action would thin these stands, the canopy closure for the various units is currently between 79% to 88%, and would be lowered approximately 20% or less after timber harvest, changes in contrast would be slightand would not attract the attention of the casual observer. There are no unobstructed viewpoints for these units; vegetation blocks views from most locations where views may have been attained.
The remainder of the project area lands are designated VRM III and IV which allow for moderate to significant change to the landscape. The nature of the commercial density management is such that slight change to the landscape would occur that would be little noticed by the casual observer and therefore would not rise to the level of moderate change. Considering the low level of change there would be no effects to VRM III and IV lands resulting from the proposed action..

3.7.4 Cumulative Effects

Recreation

Off-Highway Vehicle use:

The geographical scope for consideration of OHV use for this project consists of the roadways and designated trails within the boundaries of the Upper Nestucca OHV Riding Area. Trails within harvest areas would be limited to use during harvest activities and one fire season following harvest activities.

There are no past actions that affect OHV use within the boundaries of the riding area.

Considered present actions include commercial thinning harvest sales relating to the Hoag Pass Projects. These sales are located just south and west of the project area. Some of the timber sales in the Hoag Pass Projects area would also limit trail use during harvest activities and one fire season following harvest activities. Due to the nature of timber sales, these projects will likely be staggered over a 6 to 7 year timeframe. It is not possible to accurately calculate which trails may be closed at any given time of the time period that the Hoag Pass and Walker Creek Project sales may be operational, however an educated estimate based on experience with timber sale implementation would that between 4% and 15% of the OHV trail system could be closed during some portion of the 6-7 year timeframe.

Reasonably foreseeable actions consist of a current planning effort to upgrade the Nestucca Back Country Byway Improvement Project. This project may include culvert replacement, placement of additional vehicle turn-outs, and improvements to the road surface. This project would not affect trail use but will likely cause travel delays for users traveling to trailhead parking areas. It would be feasible to consider this project beginning between 3 and 5 years following completion and approval of the Environmental Assessment.

Driving for Pleasure/Sightseeing:

The scope considered for pleasure driving and sightseeing includes the Upper Nestucca Back Country Byway, approximately 39 miles of paved roadway except for a 2.6 miles section of gravel surface.

There are no past actions that affect pleasure driving or sightseeing.

Present actions considered include the commercial thinning harvest sales of the Hoag Pass EA. Additional truck traffic will likely cause an inconvenience for recreational pleasure driving when traveling along Bald Mountain Road, a single lane road with turn-outs. A Traffic Safety Plan has been implemented to inform all users of the increased traffic.

Reasonably foreseeable actions consist of a current planning effort to upgrade the Nestucca Back Country Byway Improvement Project. This project may include culvert replacement, placement of additional vehicle turn-outs, and improvements to the road surface and may be implemented 3-5 years from present. This project would likely cause travel delays for users for periods of time that may overlap with proposed harvest operations from the Walker Creek Project. We expect that the impacts would be the road work and not additive with any increased truck traffic.

3.8 Invasive, Non-native Species (Executive Order 13112)

Executive Order 13112 was issued by President Clinton on February 3, 1999, to prevent the introduction of invasive species; provide for their control; and minimize the economic, ecological, and human health impacts that invasive species cause. This order defines invasive species, requires federal agencies to address invasive species concerns and to not authorize or carry out new actions that would cause or promote the introduction of invasive species, and established the Invasive Species Council.

3.8.1 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" and there are over a hundred known species that fit this category.

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.

The Walker Creek Project area is approximately 15 miles west of the town of Carlton, Oregon, in the Upper Nestucca River watershed. Existing vegetation within the walker Creek project area consists of 38-99 year-old conifer overstory, scattered pockets of hardwoods, an under-story of common shrubs and scattered populations of grasses and forbs. A comprehensive plant species list 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 Walker Creek Terrestrial Restoration project that could cause soil disturbance and influence the spread of invasive/non-native plant species are: commercial density management thinning, 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 setting and disturb soils therefore providing opportunities for widespread weed infestations to occur. Many, if not all of the weed species designated as category B (established infestations) on the Oregon Department of Agriculture's (ODA) noxious weed list are present throughout the area. Because they are present in and adjacent to the project area, newly formed seed is readily available and/or an established seed bank is present.

Botanical surveys for invasive, non-native plant species within the Walker Creek project area began in June 2012 and concluded in August 2012. Completed surveys indicate that where mature native plant communities were established, non-native species were not dominant or were non-existent. 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*), Shining geranium (*Geranium lucidum*), buttercup *(Ranunculus repens*), horsetail (*Equisetum telmateia*), spotted napweed (*Centaurea stoebe*), perennial pea (Lathyrus latifolius) and Herb Robert Geranium (*Geranium robertianum*). These species were located along road edges and exposed areas that tended to have soil disturbance (i.e. open meadows, past commercial thinning, riparian areas and OHV trails). These aggressive weed species are prevalent throughout Western Oregon and proliferate easily through vectors such as human traffic, animal movement, wind, and water. Some degree of noxious/exotic weed introduction or spread is probable as management activities occur in the project area.

3.8.2 Environmental Effects Alternative 1: No Action

Surveys completed show that most invasive/non-native species found were located along existing roadways. 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 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 would invade the areas that have soil disturbance and are exposed to higher intensities of light.

3.8.3 Environmental Effects Alternative 2: The Proposed Action

Most non-native weed 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 to fluctuate over time within the analysis area based on these factors as described.

The invasive non-native weed species found during surveys were located along existing roadways. We can expect initial increase in population size and new establishment due to density management thinning activities but they should be confined to disturbance areas as described above in "affected environment" and would be expected to decrease as native species re-vegetate and the recovery of canopy closure occurs. All the Invasive/Non-native plant species identified during surveys do not tolerate overtopping and can be negatively affected by competition for light. There are however invasive non/native plant species that thrive in dense forest settings (e.g. false brome, garlic mustard, etc) that could cause substantial adverse effects to the native forest floor flora composition if they become established. These species are not now present in the project area and design features such as washing equipment prior to entering the project area, and monitoring for three years after project completion would minimize the potential for introducing these species. We expect that if new populations of non-native/invasive species were to be introduced they would be detectable within three years at which time appropriate measures would be taken to eradicate the new population.

3.8.4 Cumulative Effects

The analysis area for cumulative affects to noxious/non-native invasive plant species is Headwaters Nestucca River 6th field watershed which includes Ginger Creek, Cedar Creek, Walker Creek, Bald Mtn. Fork and is 12,587 acres in size. A combination of Federal, State and private timber lands are found within the 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, and motorcycle trails. Activities that do not necessarily create disturbance but influence the spread of weed seeds are recreational camping, 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 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 Walker Creek Project could potentially bring in new invasive non-native species that would be considered high priority to control especially if it 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 Walker Creek Project, implementation of the proposed action would not result in cumulative effects in the analysis area.

3.9 Special Status and SEIS Special Attention Plant Species and Habitat

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

Similarly, it is BLM policy to manage Candidate species and their habitats to ensure that BLM actions do not contribute to the need to list any Candidate species as Threatened or Endangered. The Oregon BLM Director has the authority to designate Sensitive (or Special Status) Species, which are to be managed under the same policy as Candidate species. It is also BLM policy to carry out management for the conservation of state-listed plants. Surveys being conducted for the Walker Creek Project area are compliant with these management policies. (Refer to 1.2.1, pg. 3 of this document for Survey and Manage Compliance).

Survey and Manage (SEIS Special Attention in the Salem District ROD) species have also been considered in the analysis for this environmental assessment.

3.9.1 Affected Environment

A variety of habitats for Survey and Manage (S&M) and SSS species are represented throughout the Walker Creek project area. Factors that affect the suitability of habitats for special status botany species include: substrates, rock features, elevations, slopes, aspects, water, and topography. Surveys for all lichens, bryophytes, and vascular plants identified on the BLM Special Status Species, 2001 Survey and Manage ROD w/o annual species reviews, and Threatened and Endangered Plant species were conducted in all stands proposed for thinning treatments. Surveys began in June of 2012 and were completed in August of 2012. A complete record of the field surveys including a comprehensive plant list is available for review at the Tillamook Resource Area field office. No Threatened or Endangered species were encountered although a threatened vascular plant species, Nelsons checker-mallow (*Sidalcea nelsoniana*) is located less than ¼ mile south of one of the proposed project locations in T3S-R6W- Sec. 15.

Several S&M lichen species were located during surveys and a portion of the sitings have been verified by taxon experts according to BLM protocol. All of the S&M species require management of known sites and therefore would be protected based on management recommendations regarding specific habitat requirements.

Design features such as establishing no-harvest stream buffers, harvest by commercial thinning vs. regeneration harvest, and increasing the amount of down woody debris, all contribute to the essential habitat requirements for sensitive plant species. Sensitive plant species located within or adjacent to the analysis area only have the ability to colonize or populate where required habitat is available.

S&M species

Cheanotheca chrysocephala: (S&M category B). There are approximately 114 sites of this lichen documented throughout all the Westside BLM Districts. Twenty-seven sites of this lichen were located during surveys. *Chaenotheca chrysocephala* is a crustose lichen that is frequently found on bark and wood of old conifers including *Abies* spp., *Picea* spp., *Pseudotsuga menziesii, Thuja plicata* and debarked snags. The species prefers semi-open forests at relatively low elevations (80-1150 m) and is most abundant on conifer trunks in mixed forests and in edge habitats, also in relatively young stands, but more or less absent from conifer trunks in closed, low-elevation rainforests.

Stenocybe Clavata: (S&M category E). Thirty-five sites of this non- lichenized pin fungus were found during surveys. There are a few other sites of this species in the BLM database in the upper Nestucca River watershed. There are also others from the Eugene District, and all from the same source, most likely as a result of strategic surveys carried out over the BLM's continuous vegetation survey plots (CVS). Habitat for *Stenocybe Clavata* has been characterized as bark of old conifers in humid, sheltered forests at low elevations, although it has been found up to 1150 m. Frequently occurs in mature Sitka spruce and western hemlock forests in the Coast Range and often grows on conifer bark that is covered with *Ochrolechia* sp. (Rikkinen 2003)

Chaenothecopsis pusilla (S&M category E). One site of this non-lichenized pin fungus was found during surveys. Similar to *Stenocybe clavata* above there has been little survey effort afforded this species. Known sites in the BLM's GeoBOB database for the Salem district show them to be the same as those for *Stenocybe clavata* found by the same surveyor thus showing evidence that the relative rarity of this species is unknown and could be due to lack of survey effort.

Based on what information is available, habitat for this species includes bark and wood of Pacific silver fir, big leaf maple, red alder, Port Orford cedar, sitka spruce, Douglas-fir, Oregon white oak, western redcedar, western hemlock, mountain hemlock, and on rock (Rikkinnen 2003). It usually occurs in relatively open stands in drier microhabitats where sheltered from precipitation, such as in crevices of bark, the dry side of leaning trunks, or the underside of limbs. Elevations range from sea level to 6000 feet.

Chaenotheca ferruginea: (S&M category B). One site of this crustose lichen was found during surveys. Its habitat is frequently over bark and wood of conifers in semi-open montane forests and foothills, also on conifer

tree boles in rainforests. Although it is found on Douglas-fir throughout its range in the Pacific Northwest, it is also very frequently found on western redcedar in riparian areas. Details for the life history of *Chaenotheca ferruginea* are not well documented. The stalked apothecia may facilitate spore dispersal by wind or contact with passing arthropods and birds. Growth and dispersal rates of *Chaenotheca* are probably very slow. Its range, distribution and abundance in the Pacific Northwest are known from British Columbia, Oregon, Washington and California. It is common at low to mid elevations on the west side of the Cascade Mountains.

Hypogymnia duplicate: (S&M category A). One site of this lichen was found during surveys although several known sites have been identified within approximately one 1 air mile of the project location. *Hypogymnia duplicata* has fairly narrow ecological amplitude. It grows as an epiphyte on mountain hemlock, western hemlock, Pacific silver fir, Douglas-fir and subalpine fir of the western Cascades, Olympics and Coast Range, primarily between 330 and 1660 m (1100-5450 ft.) elevation. Habitat for Oregon populations is noted mostly as moist hemlock stands and true fir forests. Rare habitat types include moss-covered basalt outcrops and snags in a bog.

ESA listed species

Nelsons checker-mallow (*Sidalcea nelsoniana*) is an herbaceous plant that occurs in undisturbed meadows that is listed as threatened under the Endangered Species act and is designated in the Recovery Plan for the *Prairie Species of Western Oregon and Southwestern Washington*. It is currently the only threatened plant species found on the Salem District BLM. The BLM land where this population occurs has been designated as an Area of Critical Environmental Concern (Walker Flat ACEC). It was officially listed as threatened throughout all or a part of its range under the U.S. Endangered Species Act on February 12, 1993. It also became designated as threatened by the State of Oregon (OAR 603-73-070). Various forms of monitoring plans by scientists hired by the City of McMinnville (and BLM Scientists) were implemented at Walker Flat between the years 1984 -1997. The goal of such monitoring was to determine the health of the *Sidalcea* habitat over time. Due to official listing, the U.S. Fish & Wildlife Service became responsible for preparing a recovery plan and guiding actions that would restore *Sidalcea* populations at Walker Flat. The Salem District BLM, through Assistance Agreements with the Berry Botanic Garden, completed monitoring of the site every 3 years to determine population health and develop maintenance/restoration requirements of the *Sidalcea* habitat.

The proximity of this population and meadow habitat to one of the proposed project thinning areas in the proposed action (unit 15-14) creates a concern when considering the potential for introducing new populations of invasive non-native plant species due to ground disturbance and the increase of available light in the proposed thinning area. As discussed in the Invasive non-native section of this EA design features for the proposed action such as cleaning equipment, establishing native vegetation in disturbed areas and monitoring would negate any concerns for this site. Monitoring of this site for invasive non-native plant species and woody stemmed encroachment of the meadow habitat has been ongoing since its designation and any change in habitat that would negatively affect this population of *Sidalcea nelsoniana* would trigger a rapid response.

3.9.2 Environmental Effects Alternative 1: No Action

With the no action alternative no changes to the environment or disturbance to habitat would occur, therefore no effects to Special Status and Special Attention plant species would occur.

3.9.3 Environmental Effects Alternative 2: The Proposed Action

Cheanotheca chrysocephala, *Chaenotheca ferruginea*, *Stenocybe clavata*, *Cheanothecopsis pusilla*

The proposed thinning would not affect these species sites since all of these species prefer relatively open stands of large trees which the proposed thinning is expected to produce. All of the trees that host the known sites would be reserved and protected from damage. Also, considering that at least 60% of the existing canopy cover would be preserved along with all of the largest trees in the stands (diameter cut limits in stands over 80 years old), we expect little micro climate change that would affect these organisms. These measures should be adequate considering that the most important feature that these species use to colonize a tree is the deep bark furrows on

live coniferous trees which offer much of the protection for these tiny species. Opening up the stand some would also allow for the potential for wider dispersal as reproduction is primarily accomplished by wind driven spores, although, this advantage would be reduced over time as other project objectives to encourage multi-layered stands by under planting conifer species that would eventually close in the understory. Understory development (e.g. planting densities) would not imperil or threaten the existence of any known site within the project area.

Hypogymnia duplicata

As mentioned above, the proposed project is a thinning with design features that would retain at least 60% of the existing canopy cover and the substrate or host tree would be reserved. The main threat to *Hypogymnia duplicata* is loss of populations due to activities that affect the habitat or the population, including removal of colonized substrate and alteration of microclimate. Design features have been incorporated into the proposed action to protect all known sites for Special Status species by not removing the colonized substrate and also reserve all of the largest trees (diameter cut limits). *Hypogynmnia duplicata* tends to colonize on the north face of the substrate (tree) therefore changes in microclimate (e.g. increased exposure to light) from the proposed thinning are not likely.

3.9.4 Cumulative Effects

There would be no indirect or direct effects under the proposed action alternative; therefore there would be no cumulative effects.

3.10 Air Quality, Fire Risk and Fuels Management

3.10.1 Affected Environment

Air Quality

The major source of air pollutants within the Walker Creek analysis area would come from potential wildfire starts and from associated resource management activities including prescribed burning (swamper burning, hand, machine, and landing piles), and dust from the use of natural-surfaced roads in association with road work, log hauling, and biomass removal.

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

Fire Risk

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

The two main causes of wildfire starts across the state are lightning and people. Dry lightning (lightning that that has no accompanying moisture) that occurs during the summer months is rare in Northwest Oregon. Within the Oregon Department of Forestry's Forest Grove District over the last ten years, two of the 23 fire starts accounting for 12 of the 38 total acres burned are attributed to lightning (http://oregon.gov/ODF/FIRE/HLCause.pdf). The highest risk ignition source within the analysis area is people. The entire analysis area is accessible to the public

via rocked roads. OHV use on the Upper Nestucca OHV Trail System and on drivable and unimproved roads is prevalent.

Fire Regime and Condition Class (FRCC)

The modeling predictions for fire regime and condition class come from the LANDFIRE Rapid Assessment Vegetation Models located at: (http://www.fs.fed.us/database/feis/fire_regime_table/fire_regime_table.html)

The model identifies the analysis area as falling within the Pacific Northwest Forested landscape. The project area contains two potential natural vegetation groups. These groups are characterized by differing vegetation composition, structure, and dynamics, and fall into different Fire Regimes. The first group, Douglas-fir/Western hemlock dry mesic falls into Fire Regime III and is characterized by a moderate to low fire return interval with a mixed severity. It is associated with dryer south and west facing slopes. The second group, Douglas-fir/Western hemlock wet mesic falls into Fire Regime V and is characterized by a low fire return interval with a high severity and is associated with north facing slopes. The fire regime classifies the role fire would play across the landscape in the absence of modern human intervention. The Condition Class classifies the amount of departure from the natural fire regime. The timber stands in the analysis area generally fall within Condition Class 1 with species composition and structure functioning within their natural (historical) range. Some stands are moving into Condition Class 2 with moderate increases in tree density, recent fire exclusion, and replacement of shrubs with woody fuels and litter.

Timber Stand and Fire History

Although not documented the aboriginal peoples of North America were probably responsible for some major stand replacement fire events in the analysis area. The Nestucca Fire, which is suspected to have occurred in 1857 with boundaries extended in 1868, is one of the least documented of the Great Coast Range fires that have been identified following white settlement in Oregon. It likely spread from east to west and covered approximately 300,000 to 375,000 acres. The fire extended from the Nestucca-Trask basin divide south to Siletz Bay, with a marked difference between the northern (analysis area) and southern portions of the resulting burn. Munger (1944) attributes the differences to the land management history of grazing and land clearing, but the presence of precontact Indian prairies, balds, brakes, and berry patches undoubtedly affected fire extent, afforestation, and reforestation patterns. There has clearly also been another undocumented event that occurred throughout the Nestucca basin around 1890 as there are many stands there that originated very near the year 1890. This is not surprising considering the history of settlement and expansion in the northern Willamette Valley including the areas of Carlton and McMinnville southeast of the project area. In areas of the upper Nestucca with stand ages less than 120 years old (1890 origin) there are small scattered clumps of trees (one or two per five acres) that are larger than the stand averages with open grown characteristics (still have large lower branch stubs and larger and longer crowns) that have been aged to the 1890 fire. This provides strong evidence of prolonged periods of grazing that kept areas un-forested with the exception of the occasional widely scattered patch of young trees which accounts for the discontinuity of stand ages within the project area.

3.10.2 Environmental Effects Alternative 1: No Action

Air Quality

In the short term (0-1 year) there would be no timber harvest, road construction, log hauling, or any need for prescribed burning and no localized effects to air quality. In the long term (1-100 years) as the bottom and middle layers of the timber stands continue to grow, the increase in understory trees and associated ladder fuels would cause the stands to become more susceptible to a stand replacement fire event that would burn an area larger than the proposed project area and subsequently a larger input of smoke would be created than if prescribed burning had been implemented to reduce the hazardous fuels accumulations within the project area.

Fire Risk and Fuels Management

The analysis area would continue on its current trend. The current risk of a fire start would remain low. There would be a slow increase in the coarse woody fuel load (1000 hour fuels) as well as the fine fuel load (1, 10, and 100 hour fuels) in these timber stands as density independent mortality within the stands occurs. Areas infected with the root disease *Phellinus weirii* would see larger increases in fuel loading than non-root disease areas as infected Douglas-fir tree roots are weakened and the trees fall in small 1 to 2 acre pockets. Ladder fuel densities would increase as understory trees grow larger and new understory trees begin to grow. The potential for these stands to eventually succumb to a wildfire would be dependent on anthropological events which are not predictable within a natural fire return interval framework.

3.10.3 Environmental Effects Alternative 2: The Proposed Action

Air Quality

Hauling would occur over BLM and other roads. Dust created from vehicle traffic from proposed project activities on gravel or natural-surface roads would contribute short-term (during harvest and hauling) effects to air quality. None of these management activities would create dust above threshold (the intensity level that is just barely perceptible) levels. These effects would be localized to the immediate vicinity of the operations. The dust will settle on vegetation next to the road and is not expected to travel far enough to reach any populated areas. See the *Hydrology* and *Threatened or Endangered Fish Species or Habitat* sections for a discussion on the effects of roadside dust on aquatic resources.

If the increased fuel load resulting from the proposed activities is determined by the BLM through post-harvest surveys or by the use of the Stereo Photo Series for Quantifying Forest Residues in Coastal Forests (General Technical Report PNW-GTR-231) to be a fire hazard, or to appreciably reduce the ability to reforest, then prescribed burning would be conducted and smoke would be created.

Following harvest, there would be approximately 21,169.2 total tons of slash in the project areas. Prescribed burning treatments would remove approximately 1717.5 tons of this fuel load at landings and in other roadside areas where machine piles are constructed. Hand or machine pile burning, and landing pile burning would occur during the fall/winter time period.

All burning would be coordinated with the local Oregon Department of Forestry office, and would be conducted in accordance with the Oregon State Implementation Plan and Oregon Smoke Management Plan. These plans limit or prohibit burning during periods of stable atmospheric conditions. Burning would be conducted when the prevailing winds are blowing away from SSRAs (Smoke Sensitive Receptor Areas) in order to minimize or eliminate the potential for smoke intrusions to the human environment. The potential for smoke intrusion would be further reduced by burning under atmospheric conditions that favor good vertical mixing so that smoke and other particulate matter is borne aloft and dispersed by upper elevation winds.

Prescribed burning would cause short term impacts to air quality that would consist of smoke and/or haze that would persist for one to three days within one-quarter to one mile of units. None of the harvest units are sufficiently close to any major highways that motorist safety would be affected. The overall effects of smoke on air quality is predicted to be local and of short duration. We do not expect adverse effects to air quality that would affect humans since there are no habitations within the area affected by smoke and people passing through the area during the time that smoke is present can leave the area quickly if experiencing a reaction to the smoke.

Fire Risk

Fire is a natural disturbance processes in the analysis area. The fuel load, risk of a fire start, and resistance to control of a fire, would all increase as a result of the proposed action, and would be greatest during the first season following harvest when needles dry but remain attached to tree limbs. The additional fuel load created by the

harvest of timber, and the addition of coarse woody debris for wildlife habitat within harvest units would add an estimated 24 - 44 tons per acre of dead fuel to the density management thinning harvest units.

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

All harvest units would see a short term (1-5 year) increase in fire ignition potential because of the increase of fine dead fuels.

The first strategy to reduce the risk of a fire is to reduce fuels in accessible areas. Newly constructed roads within the project areas would be removed or blocked following harvest, however all of the project areas would remain relatively accessible to the public following harvest. In addition they would be accessible to the public during hunting season immediately after the close of fire season when fuels are often still highly ignitable.

Proposed harvest activities would remove some ladder fuels and decrease tree crown density (or crown bulk density). A relative density of 35-45 or lower has been identified as the point where crown bulk density is unlikely to sustain a high intensity crown fire (Agee, 1996). The silvicultural prescription for all of the units in the Proposed Action area reduces approximately 40 percent of the acreage to a relative density at or below 45 percent, however the majority of the project areas would still have a relative density in the high 40's or 50's and the potential for sustaining a high intensity crown fire would remain in these stands.

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

For the short term (0-5 years), the fire risk associated with the harvested stands within the analysis area would remain low. Over the long term (5-100 years), the fuel load would slowly increase, primarily as a consequence of increased mortality of diseased (*Phellinus weirii* infected) and other stressed trees in the stands, but also as a result of the wildlife trees left as snags and other trees that are cut and left for CWD. While fuel loads would increase, ignition probability would return to very low background levels since the easily ignitable fine fuels would be gone, natural ignition sources (lightning) during dry periods are extremely rare, the most easily accessible harvest areas would be treated to reduce fuel load, and regulations are in place to control human ignition sources during the driest part of the year (Oregon State Forestry Regulated Use Restrictions and closure of OHV trails).

Fuels Management

Proposed management activities would change the structure of the BLM-managed timber stands in the analysis area. The fuel load would increase as a result of the proposed action. The modeling predictions for fire behavior based on the National Fire Danger Rating System (NFDRS) fuel models would move the density management thinning stands from Fuel Model 8 (Closed timber litter) to Fuel Model 10 (Timber litter and understory), Fuel Model 11 (Light logging slash), or Fuel Model 12 (Medium logging slash). The additional fuel load created by the harvest of timber, and the addition of coarse woody debris for wildlife habitat within harvest units would add an estimated 24 - 44 tons/acre to the density management thinning harvest units. Treatment of selected, high hazard fuel concentrations would occur for hazard reduction and site preparation.

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

The fuel load would increase following harvest. Pile burning, biomass removal or other fuels management treatments would help to mitigate the additional fire risk. We estimate that following harvest and with the addition of CWD there would be an average of approximately 34 tons of additional fuel loading per acre in the density management thinning areas. Whole tree yarding is expected to bring about 17 - 20 of the 34 tons per acre to the landings which would be removed, most likely by burning but could be hauled away by the purchaser if they choose to do so. This would leave an estimated 14 -17 tons per acre of slash in the units following the harvest. The slash will mainly be comprised of limbs. 14 – 17 tons per acre would be equivalent to 0.64 – 0.78 pounds per square foot.

3.10.4 Cumulative Effects

The Headwaters Nestucca 6th filed subwatershed is the areal scope of this cumulative effects analysis. In this subwatershed the BLM has one other ongoing project and one reasonably foreseeable future action. They are the Cedar Creek Project that includes the Super Snap timber sale (which is currently active), in-stream restoration work (which has been completed) and associated road maintenance and improvement; and the Nestucca Backcountry Byway Project which is in the early planning stages and is expected to address road related issues along the Nestucca Access and Bald Mountain Access Roads. There is also non-federal lands in the subwatershed most of which are young plantations that are years from being harvestable. We estimate that there are less than 1000 acres of non-federal lands that may be merchantable in the next decade.

Air quality would be affected by the BLM projects and any potential non-federal projects. However, because the effect to air quality from any one of these projects would be small and short lived, and that these direct and indirect impacts would occur at intervals that would not likely overlap, there would be no cumulative effect to air quality.

Fire risk associated with the Walker Creek Project may be cumulative with increased risk associated with the Cedar Creek Project (Super Snap Timber Sale) in that if a fire were to ignite there would be additional fuels to carry a ground fire. The conditions for this to happen would have to be extreme because the Cedar Creek area is over a mile from the nearest Walker Creek unit and on the other side of the Nestucca River so the fire would need to be at least on the order of thousands of acres for there to be a cumulative interaction. Any potential harvests on private ground will likely reduce fire risk in the area in the short term due to the fact that most harvests on these types of property remove most of the vegetation and then treat most of the fuels leaving large sparsely vegetated openings. While there may be more fuel available within the cumulative effects analysis area, the probability of ignition would not be cumulative, that is for example, implementation of the Walker Creek Project would not increase the probability that a fire could start in the Cedar Creek area or vice versa, therefore any cumulative effects would be inconsequential.

3.11 Carbon Storage, Carbon Emissions, and Climate Change

<u>Resource Specific Methodology</u>

The BLM modeled forest stand growth using data from stand exams and modeled using ORGANON. The BLM compiled models to calculate carbon contained in biomass in: the live tree pool in decadal increments, "other than live tree" biomass, harvested forest products, fuel used to harvest timber and slash burning into a "carbon calculator" tool used to quantify changes in carbon storage and release. The BLM calculated carbon sequestration, storage and emissions at the project scale as a basis for evaluating their significance relative to the following spatial and temporal scales. The quantities and percentages for the Walker Creek project area were generated by this carbon calculator.

Spatial Context: Climate change is inherently a global issue. Carbon cycling is only an issue as it relates to contributing to greenhouse gasses and these gasses potentially contribute to climate change. Carbon cycling at the project level is compared at regional, continental and global scales to provide perspective. The units of measure are *tonnes* (t), also known as a metric ton, which is equal to 2,204.6 pounds, and *Gigatonne* (Gt), which is equal to 1 billion tonnes.
Temporal Context: The BLM selected 0-10 years as the short term analysis time period because all operations and direct carbon emissions would occur within one decade. The BLM selected 11-25 years as the long term analysis period because the models become speculative beyond 25 years.

3.11.1 Affected Environment

Carbon currently contained in biomass in the Walker Creek project units = 138,763 tonnes (0.00013876 gigatonnes (Gt)). Of this, 109,472 tonnes (approx. 79 percent) is in live trees and 29,291 tonnes (approx. 21 percent) is in "other than live trees" biomass. The stands over 80 years of age were analyzed separately from the stands below 80 years of age. The two outputs were combined to produce these figures. This comprises the following portions of forest carbon storage at larger scales:

- 0.00007708-0.0000694 percent of 1.8-2 Gt in the Pacific Northwest, Coast Range (Hudiburg, et al. 2009)
- 0.00000514 percent of 27 Gt in the United States (US EPA, 2009)
- 0.00000105-0.0000003 percent of 132-457 Gt worldwide (Matthews et al, 2000, p. 58)
- Average annual sequestration (accumulation) of carbon in live trees in the Walker Creek project is currently 1,916 tonnes (0.00000192 Gt). This is 0.11 percent of 0.00169 Gt on BLM-managed lands in western Oregon and .00001 percent of 0.191 Gt in the United States (2008 FEIS, p. 4-537).

3.11.2 Environmental Effects Alternative 1: No Action

Under the no action alternative, no changes to carbon emissions (as greenhouse gasses), carbon storage or carbon sequestration would be caused by management actions at this time.
Live tree carbon storage would increase to 157,366 tonnes (0.00015737 Gt), a net increase of 47,894 tonnes (0.00004789 Gt) from present levels. This is 33,588 tonnes (0.00003359 Gt) more total storage of carbon in the project area after 25 years than for the proposed action alternative.

3.11.3 Environmental Effects Alternative 2: The Proposed Action

In the short term (0-10 years) the proposed thinning would reduce carbon storage in the live trees pool by 31,100 tonnes, to 78,372 tonnes in the project area immediately after thinning. Carbon removed would be transferred to the "other than live trees" and "harvested wood products" pools or would be emitted as carbon dioxide (CO_2). Changes to storage in the "other than live trees" pool were not quantified because they are assumed to balance in the long run (25 years) as logging slash and understory growth adds biomass while decay and fuels treatments reduce biomass and emit CO_2.

In the short term average annual emissions of carbon would be 5,328 tonnes (0.00000533 Gt) caused by harvest operations (diesel fuel used), fuels treatments (slash burning), and decay or burning (without energy capture) of forest products. This comprises the following portions of carbon emissions at larger scales:

- 0.00000333 percent of 1.6 Gt in the United States (US EPA, 2009. pp. 2-3)
- 0.00000078 percent of 6.8 Gt Worldwide (Matthews et al, 2000, p. 58)

In the short term (0 to 10 years) the 45-150 trees per acre retained after thinning (*EA section, 2.3.1.3*, Table 10) would continue to store carbon and sequester additional carbon at an average rate of 1,816 tonnes per year. This would increase total carbon storage in the project area to 123,778 tonnes (0.00012378 Gt), a net increase of 14,306 tonnes (0.00001431 Gt) of carbon stored.

In the long term (11-25 years) an additional 1,135 tonnes (0.00000114 Gt) of carbon would be emitted from harvested wood by decay and burning without energy capture. 13,903 tonnes (0.0000139 Gt) of carbon would remain stored in wood products still in use, in landfills, or burned with energy capture.

3.11.4 Cumulative Effects

The scope of the cumulative effects cannot be determined at this level. The smallest scope the models are designed to assess is the national scale that encompasses all of the United States. The relatively tiny contribution of greenhouse gasses estimated for the Walker Creek project when added to the tiny relative contribution of the other projects is still undetectable at the national scale. There would be a theoretical contribution but we cannot say what it means.

3.12 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 Nestucca River 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 Walker Creek Terrestrial Restoration Project is within the Upper Nestucca River Tier 1 Key Watershed (ROD/RMP p. 7). The project would comply with Component 2 by meeting the management directions to conduct watershed analysis prior to timber harvest activities, and reduce or not increase existing road mileage in the Key Watershed.

- **ACS Component 3 - Watershed Analysis:** The project would comply with Component 3 by incorporating the following recommendations from the Nestucca Watershed Analysis:

    - Density management and thinning in Riparian Reserve to develop and maintain late seral stand characteristics. Thinning in this project is designed to develop stand vertical and horizontal complexity sooner, including the development of a conifer understory that would provide more shade while decreasing drying winds at the ground level, and large trees, leading to earlier potential for recruiting high quality CWD, LWD, snag and large tree habitat. The Proposed Action would maintain at least 60% crown closure in Riparian Reserves. Untreated areas would contribute to spatial variability and a more diverse vegetative characteristic and density within the project area.
    - Develop standing dead and down LWD by leaving enough trees for future recruitment. Thinning would leave adequate retention to develop large trees for future recruitment. This goal would be achieved over time.
    - Road densities. Roads to be constructed, improved or renovated for use in this project would be located on ridgetops and stable, gentle slopes to avoid impacts to streams from sedimentation. All new roads would be temporary and would be decommissioned upon completion of harvest activities.
    - Noxious weeds. Equipment washing prior to entry into the project area is a required design feature. Vegetation Management EIS provides further guidance.

- Riparian condition and large wood on Federal Lands. In dense conifer stands, thinning would accelerate tree growth for eventual recruitment into streams. Suitable large trees would be available years to decades sooner than they would be without treatment. In other stands with relatively large trees already, no-harvest buffers would be wide enough to include all of the trees with the highest potential to contribute to large wood in streams.
- Stream flows, water quality, ODEQ 303(d), and stream temperatures. The project would not be expected to contribute to measurable changes in stream flows, water quality or stream temperatures.
- Soils, Slope Stability and Mass Wasting: The project has been designed to minimize soil erosion and mass wasting. There are no landslides or bare slopes identified in the project area. Secondly, no-harvest buffers around streams would maintain the current extent of tree stocking in the zone most likely to slide into streams over time. When slides into streams inevitably occur at the natural, background rate after completion of the proposed action, enough wood is expected to remain on the hill to contribute a substantial wood component to the streams.

- **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 Nestucca watershed generally and the Headwaters Nestucca subwatershed specifically. This thinning would also improve stand structural diversity sooner which would directly benefit riparian associated species such as the spotted owl 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 improvements in 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. Addressed in text (EA sections 2.3.1, 2.3.5, 2.3.6), in summary:

No Action: The No Action alternative would maintain the development of the existing vegetation, associated stand structure, and instream habitat at its present (very 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. Variable density thinning would result in forest stands that exhibit attributes typically associated with stands of a more advanced age and stand structural development (larger trees, a more developed understory, and an increase in the number, size and quality of snags and down logs). This would occur sooner than under the No Action alternative. Thinning treatments in Riparian Reserves would be the same as the adjacent LUAs. It would increase the growth of residual trees and reduce the time for those trees to

become large enough to provide a future source of high quality large woody debris to stream channels. Coarse woody debris treatments would substantially increase the amount of CWD, both snags and down logs, in all LUAs, both inside and in places outside the proposed treatment areas, including directly into stream channels to 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. in summary:

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 60% canopy closure, protecting existing large snags and down wood, and the long term (30-50 years out when forest structure would begin to show most or all of the hallmarks of the desired future condition (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 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. Addressed in text (EA sections 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.3.4). In summary:

No Action: Under the No Action alternative, under-maintained culverts and roads could deteriorate to the extent that stream channels would be negatively affected. There is also evidence to suggest that instream wood levels in many of the project area streams are not meeting hydrologically or ecologically desirable standards. The degree of hydrological and ecological function of current instream wood may decline as old instream wood is not replaced quickly enough by new instream wood. Some of the lack of instream wood is related to the sparse stream-side recruitment of new riparian trees including shade tolerant species which is at least partly related to a lack of seed sources. The No Action alternative would have no effect on the progression of these processes.

Proposed Action: Instream 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 and thus would not affect the hydrologic processes dependent on instream large wood. Felling trees into streams will directly increase instream wood levels. A species-diverse understory as a result of thinning and underplanting could result in more stream-side recruitment of shade tolerant tree species 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 temporary culvert in unit 15-14 will not affect the stream channel morphology. An existing culvert will be replaced with a larger culvert 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 segment will adjust (locally erode and aggrade) to the new culvert during high flow periods during the first 1-2 winters following replacement. The culvert replacement 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.

The Proposed Action would thus be expected to meet the objectives of ACSO 3.

ACSO 4: Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Addressed in text (EA sections 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.3.4). In summary:

No Action: The No Action alternative would be expected to 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 contribute to 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 and seed source for such trees which could hinder the 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, road decommissioning, and timber hauling. 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 3-5 years), current conditions and trends in turbidity and sediment yield would likely be slightly improved under the Proposed Action. The Proposed Action would be unlikely to have any measurable effect on other water quality parameters including bacteria, stream temperatures, pH, or dissolved oxygen. The Proposed Action would thus be expected to meet the objectives of ACSO 4.

ACSO 5: Maintain and restore the sediment regime under which aquatic ecosystems evolved Addressed in Text (EA sections 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.3.4). In summary:

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

Proposed Action: 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, 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. The Proposed Action would thus be expected to 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. Addressed in Text (EA sections 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.3.4). In summary:

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. 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. Deficiencies in the processes noted in ACSO 6 in the project area are not a result of a lack of instream flow thus the No Action alternative should have no bearing on the goals of ACSO 6.

Proposed Action: Proposed thinning could theoretically add to stream discharge by reducing evaporation and transpiration caused by reducing the number of trees in adjacent stands. That effect would however be countered by the accelerated growth of the remaining trees and regrowth of the brush layer and understory. Biologically relevant changes in summer base flows are considered unlikely, and if present and measurable, would be of short duration (1-3 years), and would be equally likely to be small increases as decreases. The inability to maintain minimum flows that sustain ecological processes is not considered to be a risk posed 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. The Proposed Action would thus be expected to 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. Addressed in text, in summary:

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. The Proposed Action would thus be expected to 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. Addressed in text (EA sections 2.1, 2.2, 3.1, 3.2, 3.3). In summary:

No Action: The current structural diversity and species composition of plant communities would continue along the current trajectory; that is, structurally simple and lacking in plant diversity. It is not clear how plant species diversity would change and over what time scale given the effects of the disturbance history in the project area. There is no evidence to suggest that absent the Proposed Action, that plant species diversity would substantially increase in the foreseeable future. Structural diversification would occur over a longer period of time than under the Proposed Action.

Proposed Action: No-harvest buffers would maintain the current extent of thermal cover available to streams. Thinned stands including those in Riparian Reserves would maintain at least 63% canopy cover, sufficient to maintain secondary stream shade. Erosional processes would not be expected to be effected by the implementation of the Proposed Action under its PDFs and BMPs. No-harvest buffers and thinning unit boundaries drawn specifically to exclude instream wood source areas would maintain the current availability of trees most likely to be recruited into streams. The largest trees potentially able to contribute wood to streams from outside the no-harvest buffer would be retained per the diameter cutting limits (DCL) and that while some relatively large trees smaller than the DCL may be removed, very few would be removed before the target basal area was attained.

In stands of smaller trees, the residual trees would be expected to develop faster and thus be able to provide structurally important wood to streams more quickly. In stands comprised of larger trees, thinning and underplanting would be expected to develop a second canopy layer that would increase secondary shading to streams and provide more diverse allochthonous inputs 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 be expected to 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. Addressed in text (EA sections 2.1, 2.2, 3.1, 3.5, 3.6, 3.8, 3.9). In summary:

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 have no adverse effect on riparian dependent species. Although thinning activities may affect some invertebrates within the treatment areas, adjacent non-thinned areas should provide adequate refugia for those species. In the long term, the treatments would restore elements of structural diversity such as large snags and snag-topped trees, and a shade tolerant understory 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.

4. CONTACTS AND CONSULTATION

4.1 Contacts

4.1.1 Tribes, Individuals, Organizations, or Agencies Consulted

For information on internal and external project scoping, see *EA section 1.3*.

A scoping letter was sent to the Confederated Tribes of the Grand Ronde Indians in September of 2011. The Tribe did not respond to our letter.

On March 19, 2013 several staff members of the Tillamook Field Office visited the Walker Creek Project area, along with other areas of the Resource Area, with Andy Giessler of American Forest Resources Council (AFRC). A brief overview of the project was given and Mr. Giessler discussed concerns of his organization in a general nature, that is, nothing particularly specific to the Walker Creek Project. One of the concerns raised that could have bearing on the project is that AFRC is generally interested in knowing why areas are dropped from harvest consideration during the BLM planning and EA process.

On July 31, 2013 staff from the BLM Field Office held a tour of the Walker Creek Project Area for members of the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) Level 1 ESA Consultation teams. The specific intent was to gauge concerns that the regulatory agencies may have with the details of the Proposed Project. The USFWS members expressed specific support for the goals, objectives and design of the project regarding ESA listed terrestrial wildlife (Project Record Document #48). The NMFS responded by generally supporting restoration work that the Tillamook Field Office is doing within the Walker Creek sub-basin but expressed specific concern with the width of the no-harvest buffer adjacent to proposed treatment unit 15-23 (100' no-harvest buffer) and after reviewing the draft biological assessment requested that the no-harvest buffer be 150 feet. On August 8th, 2013 the NMFS Level 1 representatives sent the BLM, in the form of an email, their justification for requesting a150 foot no-harvest buffer adjacent to unit 15-23. The NMFS cited concerns over potential stream temperature increases in Walker Creek as their rationale for asking that the BLM incorporate a 150 buffer along the stream adjacent to unit 15-23 (Project Record Document #45).

The EA and FONSI will be made available for public review from ***March 12, 2014 to April 11, 2014*** 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 *McMinnville News-Register* newspaper of McMinnville,

Oregon and the *Headlight Herald* newspaper of Tillamook, 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.

4.2 Consultation

4.2.1 US Fish and Wildlife Service (USFWS)

The spotted owl would be affected by this project only through the modification of dispersal habitat in the short term and improvement of habitat in the long term. While modification would occur, all acres would continue to function in the same capacity after treatment as before. Due to the minor impact to components of spotted owl habitat, informal consultation with the U.S. Fish and Wildlife Service is warranted.

Consultation would occur programmatically in batched Biological Assessments for the individual timber sales that would be a part of the project analyzed in this EA. An individual timber sale would be included in the consultation batch for the year in which the sale is offered in the "Light to Moderate Thinning" category.

4.2.2 National Marine Fisheries Service (NMFS)

Based on the analysis presented in this Environmental Assessment, the BLM completed a biological assessment and determined that the proposed action is Not Likely to Adversely Affect (NLAA) listed fish and warrants informal consultation with NMFS. The NLAA determination was based on the following reasons: 1) Small potential inputs of sediment to coho habitat streams associated with timber hauling and culvert replacement, and, 2) The small reduction in the potential for recruitment of large wood into streams that contribute to coho habitat suitability (see section 3.3.4).

After reviewing the draft biological assessment for the Walker Creek Terrestrial Restoration Project, the NMFS requested an adjustment to the no-harvest buffer on a single treatment unit (unit 15-23) adjacent to coho designated critical habitat in Walker Creek. This change would extend the no harvest buffer to 150 feet along approximately 1500' of Walker Creek to alleviate their concern over potential effects to water temperature (Project Record document #45). The BLM's analysis of the effects to Oregon Coast coho salmon, including those related to temperature, are presented in section 3.3 of this Environmental Assessment. The Proposed Action analyzed in section 3.3 includes no-harvest riparian buffers on all streams associated with the proposed treatment units. On all perennial streams the no-harvest buffers would be at least 100 feet from the edge of the stream channel, including along Walker Creek adjacent to unit 15-23, where the no-harvest buffer is estimated to average 109 feet due to topographic breaks observed in LiDAR data (see section 3.3.4).

Based on site specific conditions, such as topography, stream orientation and existing vegetation, along with interpretation of the available science, the effects analysis demonstrates that the proposed action's no-harvest buffer width of at least 100 feet adjacent to the proposed thinning is adequate to maintain water temperature in Walker Creek and thus would not contribute to adverse impacts to listed fish.

Therefore, for purposes of expediting consultation in order to achieve both long-term and near-term objectives of the project, the BLM will increase the buffer on unit 15-23 to 150 feet. The BLM did not make changes to the effects analysis for temperature in Walker Creek to reflect this boundary change: since the BLM's analysis already demonstrates that there would be no adverse effects to stream temperature with no-harvest buffers of 100 feet, intuitively there would be no adverse effects by widening the buffer to 150 feet. The boundary change would reduce the harvest treatment area by approximately 2-3 acres.

Section 7 Endangered Species Act Consultation will be completed prior to any Decision authorizing an action.

5. LIST OF PREPARERS

Table 18: List of Preparers

Resource	Name
IDT Leader	Andy Pampush
Botany/ Invasive Species	Kurt Heckeroth
Cultural Resources	Heather Ulrich
Engineering	Vanessa Stone
Fire/Fuels	Clint Gregory
Fisheries	Clay Ramey
Hydrology/ Water Quality	Clay Ramey
Logging Systems	Brian Christensen
Recreation/Visual Resources	Debra Drake
Silviculture	Clint Gregory
Soils	Chris Sween
Wildlife	Steve Bahe - Andy Pampush

6. ADDITIONAL SUPPORTING DATA

6.1 Water Quality Management Plan

Introduction

Water Quality Management on BLM-administered lands that are covered under the Walker Creek 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

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 Walker Creek Terrestrial Restoration Project Environmental Analysis on the Tillamook Resource Area.

Table 19: Best Management Practices

BMP No.	Practice Technique
R 1	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.
R 9	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.
R 14	Where deemed necessary, use temporary sediment containment structures to contain runoff from construction areas (e.g. silt fencing, retention ponds, etc.).
R 16	Complete construction activities prior to fall rains. Prevent erosion in areas with

	direct connectivity to streams by stabilizing exposed soil materials.
R21	Where sediment could be transported to streams, consider windrowing slash at the base of newly constructed fill slopes to catch sediment.
R44	Install all stream crossings during the low flow period, generally from June 15 to September 15.
R47	Construct the stream crossing approach to minimize fill volumes and sediment delivery potential.
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.
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.
R77	Avoid routine machine cleaning of ditches during the wet season, generally October 16 to May 31.
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.
R87	Storm proof open or older roads with continued use, but infrequent maintenance. Storm proof new temporary roads, if over-winter.
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.
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.
TH 2	Design cable yarding corridors so as to limit canopy loss in Riparian Reserves to meet shade targets. Where feasible, require full suspension over flowing perennial and intermittent streams with erodible bed and bank, and jurisdictional wetlands.
TH 4	Limit downhill logging into Riparian Reserves where yarding trails can converge, and potentially intersect the stream network.
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.
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.
TH12	Restrict ground-based harvest and skidding operations to periods of low soil moisture when soils have resistance to compaction and displacement.
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.

7. Public Comments to External Scoping and BLM Responses to Comments

<u>Project Record Document #11</u>
Doug Heiken
Oregon Wild

Summary of Oregon Wild Comments:

- *We urge BLM to focus on the younger stands (<80 years old) that are more plastic and responsive to treatment. The emphasis for the North Coast AMA is restoration of late successional forest habitat. Older stands are unlikely to experience net ecological benefits from thinning, in particular because thinning older stands will remove trees that are needed for long term recruitment of snags, dead wood, and carbon which are essential components of high quality late successional habitat.*

  <u>BLM Response:</u>

  We believe that it is necessary to treat the proposed stands over 80 years old. Using stand age as an arbitrary cut-off for treatment is ineffective in our highly disturbed and managed stands in the northern coast range. The proposed treatment stands are extremely simple structured, single layered Douglas-fir stands with no vertical or horizontal structural diversity. These stands are likely to remain structurally simple for many decades to come as is evident from nearby 120 year old stands that are 30 – 40 years older than the Proposed Action stands and also exhibit an extreme lack of structural diversity. Without intervention these stands would continue to be simple structured and poor habitat for late-successional species for decades to come (see section 3.5). We expect the trees in these stands to respond to treatment in ways that would make an important difference in stand structure such as the development of palmate branch clusters from epicormic branching, crown mass development, limb elongation and general growth in massiveness, but more importantly we believe that the development of a shade tolerant understory is critical to the development of complex forest habitat. We cannot make up for the lost legacy of coarse wood resulting from several fires, grazing and past thinnings. We believe however, that our strategy for managing coarse wood over time (see section 2.2.3.2 *Coarse Woody Debris and Wildlife Habitat Structure Enhancement*) coupled with the considerable amount of forest nearby that would not be thinned would produce a better quality late-successional forest habitat considerably sooner than if left on its own to develop.

- *Thinning in riparian reserves must be carefully evaluated to avoid adverse effects on future recruitment of dead and down wood (important throughout the riparian reserves for both aquatic and terrestrial species). Contrary to common misconception, thinning does not aid recruitment of snags and wood.*

  <u>BLM Response:</u>

  Riparian Reserves comprise a considerable portion of the spotted owls' critical habitat, a species that has a propensity for riparian forests. The proposed action includes design features that would assure that virtually all of the potential wood that could be recruited to streams would remain. It is correct that thinning does not aid in recruitment of snags and down wood. Most literature shows that thinning will reduce the number of snags that develop in young stands through the loss of suppression mortality. It is important to note that the literature also finds that the snags that develop as a result of suppression mortality are very small. These small snags persist for only a short time and are of little value to terrestrial species or to stream dynamics. Mortality that results from other sources than suppression mortality are much more important to the function of late-successional forest and the processes that develop large snags would continue to operate in the thinned stands, although it is true there would be fewer trees available that could become coarse wood.

- *Recognize that unthinned areas provide certain benefits that are not provided in thinned areas, such as: dense forest cover that provide high quality habitat for certain wildlife (e.g. flying squirrels that need visual occlusion for predators), higher levels of snag recruitment, higher carbon storage,etc.*

  BLM Response:

  We recognize that diversity of forest structure is not only important at the stand level but at other scales as well. Just within the Walker Creek subwatershed there are over 1,230 acres of forest stands over 110 years old and over 450 acres of stands 60 – 100 years old that were evaluated and eliminated from thinning consideration. We understand the value of dense forest for high quality habitat and as you have alluded to regarding the flying squirrel, dense forest means more than a closed canopy. The forest proposed for thinning have dense closed canopies but very little vertical occlusion due to the lack of a shade tolerant understory which this project would address.

- *When conducting commercial thinning projects take the opportunity to implement other critical aspects of watershed restoration especially pre-commercial thinning, restoring fish passage, reducing the impacts of the road system, and treating invasive weeds.*

  BLM Response:

  We are addressing a wide array of restoration opportunities within the Nestucca River watershed. Through our Activity Planning process we have evaluated multiple projects that address many disciplines. Pre-commercial thinning is a regular part of our silviculture program, although there are few stands in the Walker Creek project area that are ripe for PCT. We are replacing two large fish passage culverts in Walker Creek in the summer of 2013, we surveyed and treated weeds along roads in the watershed, we placed large wood in two reaches of Walker Creek in the summer of 2013, we placed large wood in the mainstem Nestucca River adjacent to the Walker Creek planning area in the summer of 2012 and we would be upgrading the quality of road surfacing in the Walker Creek Terrestrial Restoration project. See the Internal Scoping section above.

- *Young stands do not exist in isolation, so be sure to consider the effects of thinning on adjacent mature & old-growth habitat which may provide habitat for spotted owls, marbled murrelets, and other species. Spotted owls may use young stands for dispersal, foraging, and security from predators.*

  BLM Response:

  There are fewer than 30 acres of stands that could be considered old-growth in the Walker Creek subwatershed all of which are in a narrow strip along the Nestucca River. Surveys have shown that spotted owls and marbled murrelets do not use the stands considered for thinning despite some of the stands being 80 -100 years old. There is no use of stands 120 years old in the project area either. The reasons for this are clear in that past history and management of these forests have left them in a very poor habitat state with little characteristics of mature forest and so it is not surprising that species preferring late-successional forest are absent (see section 3.5). That said we have considered forest condition in and around the proposed project area and feel that it is important to treat these stands to offer a mosaic of forest conditions not currently represented.

- *Generally retain all the largest trees, and some of the smaller trees in all age-size classes. This can be accomplished in part by retaining untreated "skips" embedded within the stand.*

  BLM Response:

  The prescriptions for the proposed treatment include diameter cut limits in all stands 80 years old or older which would reserve all of the trees in the approximately upper 30% of the diameter classes. The thinning

of trees below the diameter cut limit would be controlled by basal area retention (see 2.2.3. Proposed Treatments) which would provide for some smaller trees to be retained although the thinning would generally be from the smaller diameter classes. Many of the stands proposed for treatment are relatively small (5-10 acres) with the largest unit being less than 60 acres. With no harvest buffers and other interspersed older or younger stands we feel that a diversity of stand conditions would be achieved through the Proposed Action.

- *Retain and protect under-represented conifer and non-conifer trees.*

  BLM Response:

  One of the primary objectives of the Proposed Action is to introduce tree species that are missing from the landscape. In all stands 80 and older only Douglas-fir would be removed. In those younger stands where there is a component of western hemlock, Douglas-fir would again be the target species for removal except if there are portions of the stand where hemlock is the dominant species.

- *Strive for a variable density outcome.*

  BLM Response:

  We hope to achieve a variable density outcome both at the stand scale (through basal area control at the plot level) and the landscape scale. Within the stand we expect variability in spacing, tree diameters, vertical diversity, and ultimately species diversity. At the landscape scale we hope to achieve forest heterogeneity by introducing approximately 575 acres of variable spaced forest interspersed with older (albeit less complex) forest and young plantations.

- *Retain abundant snags and course wood both distributed and in clumps so that thinning mimics natural disturbance. Retention of dead wood should generally be proportional to the intensity of the thinning, e.g., heavy thinning should leave behind more snags not less. Retain wildlife trees such as hollows, forked tops, broken tops, leaning trees, etc.*

  BLM Response:

  There are currently few snags and little coarse wood available to reserve due to the past stand histories. Similarly, there are few quality wildlife trees available to reserve. The Proposed Action would reserve and protect from damage all snags and down wood to the extent that is practicable considering safety. Special attention would be given to snags that are currently valuable to wildlife (24”dbh and 30’ in height) by specifically reserving trees around them to reduce exposure to the safety hazard. The prescription also gives special preference for reservation to trees with features desirable for wildlife.

- *Continuous recruitment of snags is critical to development of old growth forest habitat. Think not only about existing snags but more importantly about the processes that grow and recruit snags, including: a large pool of green trees from which to recruit snags and the existence of competition and other agents of mortality.*

  BLM Response:

  We have developed a strategy for protecting existing snags, creating additional snags and maintaining trees to become snags in the future. Most importantly however we also have a strategy for developing an understory stand that would become important in the more distant future for snag recruitment that otherwise is not expected to develop for a very long time without intervention.

- *If using whole tree yarding or yarding with tops attached to control fuels, the agency should top a portion of the trees and leave the greens in the forest in order to retain structure and nutrients on site.*

  BLM Response:

  Whole tree yarding or yarding with tops and limbs attached would be an option with the Proposed Action. Provisions would be made to retain a portion of tops and limbs in the forest (see Project Design Features below). Also, the purchaser would not be required to specifically remove top and limb material from the site. We expect that with the vast majority of trees being harvested being Douglas-fir that a considerable amount of top and limb material would be left from felling and yarding breakage.

- *Buffer streams from the effects of heavy equipment and loss of bank trees and trees that shade streams. Mitigate for the loss of LWD input by retaining extra snags and wood (and green trees for recruitment) in riparian areas. Recognize that thinning "captures mortality" and results in a long-term reduction in recruitment of functional down wood, and that effect is not mitigated by future growth.*

  BLM Response:

  All perennial streams would have at least a 100 foot no-harvest buffer and the few intermittent streams in the project would have at least a 60 foot no-harvest buffer. Additionally, in the stands 80 years old and older, diameter cut limits would reserve the largest trees in the stands outside of the buffers. To the extent practicable all snags would be reserved. Over 90% of wood recruitment to stream from forest stands similar to the Proposed Action stands comes from the first 100 feet (McDade 1990). The older stands considered in the Proposed Action are beyond the "capture mortality" stage (which does result in a long-term loss of snags less than 10" (mostly 4-6"), which are for the most part not considered "functional" and do not persist). Density independent mortality process would still be at work on the residual stand.

- *Avoid road construction. Where road building is necessary, ensure that the realized restoration benefits far outweigh the adverse impacts of the road.*

  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 trail and OHV trails. All new road construction would be temporary which should limit the long term impacts to mostly soil productivity at the site. Temporary roads are not expected to affect water quality, fish or wildlife resources for the reasons described in EA sections 3.2, 3.3, 3.5 and 3.6.

- *If this project involves biomass utilization, the impacts need to be clearly disclosed.*

  BLM Response:

  This project is not designed to result in appreciable biomass production. The purchaser would have the option to haul off landing slash consisting of material less than 6" in diameter if he or she so chooses but would not be allowed to remove material from inside units other than according to the whole tree yarding criteria (yarding with top attached). Extra landing space would not be allowed solely for purposes of storing landing slash material for biomass production.

- *If the stand is younger than 80 years, the agency may rely on the Pechman exemption and not complete surveys for rare and uncommon species. However, this exemption is intended to apply to even-aged stands, and the agency should apply the survey protocol in any portion of units with two or more predominant trees per acre. See Red Tree Vole Survey Protocol Version 2.1.*

BLM Response:

There are no "pre-dominant" trees within any of the proposed harvest units. Nonetheless all of the stands with stand exam ages of 80 years old or older were surveyed to protocol for red tree voles as well as all other survey and manage species. The remaining 165 acres that are less than 80 years old are considerably less than 80 and clearly meet the Pechman exemptions.

- *The agency must protect mature forests because they are the best candidates to grow and develop into old-growth habitat in the shortest time frame.*

BLM Response:

The stands proposed for treatment have not yet reached the mature forest stage despite some of them being nearly 100 year old. Fire history, previous thinning, little mortality, lack of appreciable gap development and lack of understory tree layer development resulting from lack of seed source have stagnated these stands into dense single layer non-complex forests (see section 3.1.1). Without intervention we expect these stands to persist in this condition for a very long time based on observations of nearby 120 year old stands that are currently in the same non-complex condition. These stands are not on a trajectory to develop old-growth in a short amount of time.

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