The Siuslaw Resource Area, Eugene District BLM Office is bringing one Environmental Assessment (EA) forward for 30 day public review. Steam Donkey Echo EA project encompasses approximately 1,300 acres and is located within late successional reserve, general forest management area (GFMA) and riparian reserve land use allocations. Project actions may include timber harvest, snag and coarse wood creation, road construction, renovation, improvement, and decommissioning.

This EA is available for public review during business hours (8:00 a.m. to 4:30 p.m.) at the BLM office, 3106 Pierce Parkway, Springfield, Oregon. Public notice of this proposed action has been published in the Eugene Register Guard on September 23, 2015. The 30 day review period for the EA ends on October 23, 2015.

Steam Donkey Echo comments may be submitted by email to BLM_OR_EU_Mail@blm.gov.
Comments submitted in hard copy should be submitted to:
Eugene District Office
Sharmila Premdas
3106 Pierce Parkway Suite E.
Springfield, OR, 97477

As you are aware, annual finding for the Government expires on September 30th, 2015. The Administration strongly believes that a lapse in funding should not occur and that there is enough time for Congress to prevent a lapse in appropriations. However in the event that such a funding lapse were to occur and the Government were to shut down, we request that you download the documents available for 30 day public review for your convenience, prior to September 30th, 2015.

Comments, including names and street addresses of respondents will be available for public review at the district office, 3106 Pierce Parkway, Springfield, Oregon, during regular business hours (8:00 a.m. to 4:30 p.m.) Monday through Friday, except holidays and may be published as part of the EA or other related comments. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses and from individuals identifying themselves as representatives or officials of organizations or businesses will be made available for public inspection in their entirety.

Thank you for your interest in your public lands. If you have questions regarding the project please contact Sharmila Premdas at (541) 683-6794.

Sincerely,

Michael J. Korn
Field Manger
Siuslaw Field Office

STEAM DONKEY ECHO ENVIRONMENTAL ASSESSMENT DOI-BLM-OR-E050-2013-0006-EA

Contents

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
EUGENE DISTRICT OFFICE

Steam Donkey Echo
ENVIRONMENTAL ASSESSMENT
DOI-BLM-OR-E050-2013-0006-EA

1.0 Introduction

1.1 General Information

The Steam Donkey Echo project is located in the Oregon Coast Range in T18S R7W sections 9 (unit 1) and 23 (unit 2), Willamette Meridian. The area being considered for thinning and regeneration harvest consists of Douglas-fir stands with small components of western hemlock, western red cedar and hardwoods that naturally regenerated after regeneration harvest in the 1930's. The project area encompasses approximately 1,333 acres and consists of hilly terrain with elevations from about 550 feet to 1,500 feet. Highway 126 is located about 0.5 miles to the north; the town of Walton is located to the northwest of the project area. The project area does not have legal public access because it is surrounded on all sides by private or state lands and roads accessing the project area are subject to agreements under rights of ways. The land use allocations (LUAs) are matrix-general forest management area (GFMA), late-successional reserve (LSR) and riparian reserve (RR). The project is located within northern spotted owl designated critical habitat. Major portions of section 9 have been re-designated as an un-mapped late successional reserve because the area has an identified marbled murrelet site and marbled murrelet habitat. Refer to the glossary for an explanation of technical terms and for final project acres refer to the table attached at the end of the document.

1.2 Purpose and Need

Matrix lands

Matrix regeneration harvest:

The 1995 Eugene District Resource Management Plan (RMP) provides management direction for GFMA LUAs which includes the following objectives: provide a sustainable supply of timber and other forest products, schedule regeneration harvest to assure that, over time, harvest will occur in stands at or above the age of volume growth culmination (Culmination of Mean Annual Increment), and maintain a complex early seral plant community/association across the matrix (USDI-BLM 1995, p. 85). Early seral plant communities occur between disturbance and crown closure, when grass, herbs or brush are plentiful (USDI-BLM 1995, p. 129). The matrix stands being considered for regeneration are fairly homogenous and have reached culmination of mean annual increment (CMAI), meaning that the trees in these stands have reached a stage in their growth cycle at which the rate of annual volume increase is at a maximum or now declining. As these trees age, growth stagnates because of higher stocking levels, leaving the trees less commercially valuable. Consequently, foregoing harvest of these stands is a lost opportunity to utilize these timber resources at the best possible time in their growth cycle as directed by the 1995 Eugene District RMP and ensure that these lands are managed in accordance with the principles of sustained yield forestry through cyclical harvest and reforestation.

There is a need for more complex early seral habitat within spotted owl critical habitat. In the 2011 northern spotted owl recovery plan (USDI-FWS 2011, p. A11) studies by Olson *et. al.,* (2004) indicate that while mid-seral and late-seral forests are important to spotted owls, a mixture of these forest types with younger forest and non-forest may be best for spotted owl survival and reproduction. Complex high quality early seral habitats are well below their historic abundance in the Oregon Coast Range (Swanson *et al.,* 2014).

Maintaining complex early seral habitat in northern spotted owl critical habitat is important for improving forage and habitat for small mammal populations, which may improve foraging opportunities for spotted owls. Within the three 6th field hydrologic unit code (HUC) watersheds where the project acres are located, complex early seral habitat with a highly diverse vegetative component is lacking. Instead there are many acres of very young

plantations (approximately 36% of the watershed younger than 30 years of age that is in private ownership) that lack the highly diverse vegetative component because of intensive vegetation control practices.

Matrix thinning:

An additional purpose of the project is to put some stands on a trajectory toward mid to late-seral stage. These are stands that have not reached volume growth culmination (Culmination of Mean Annual Increment) and therefore cannot be considered for regeneration harvest. Currently the stands consist of closely spaced trees with small crown ratios, and not enough light is entering these forest stands (canopy cover greater than 65%) with the result that tree growth and understory shrub productivity has slowed. Commercially thinning stands approximately 30 to 80 years of age improves tree growth, understory tree development and shrub productivity by increasing the amount of sunlight entering the stand. There is a need to thin these stands because the trees would lose value and the land would not be managed on a sustained yield basis in accordance with management direction for matrix lands in the 1995 Eugene District RMP (p. 85). Commercial thinning of stands approximately 30 to 80 years of age to improve tree growth and promote understory development on matrix LUAs is recommended in the 1995 Eugene District RMP (p. 200).

Late Successional Reserve lands

The purpose of thinning in LSR lands is to achieve the conditions that are desirable for species such as northern spotted owls and marbled murrelets. LSRs are also the conservation backbone for all other late-successional and old-growth associated species, such as the approximately 300 Survey and Manage species. Marbled murrelet occupied habitat and recruitment habitat is present within the project area and has been designated as an unmapped Late Successional Reserve. The marbled murrelet occupied habitat area will not be treated under this EA. Forest stands surrounding the occupied habitat known as recruitment habitat may be managed as LSRs (USDI-BLM 1995, p. 62). The 1995 Eugene District RMP recommends density management in LSR to create and maintain late successional forest conditions in forest stands up to 80 years of age (USDI-BLM 1995, p. 28-30).

The LSR stands being proposed for treatment consist of young stands which need thinning to improve vegetative species diversity and canopy heterogeneity which contributes to the formation of late successional habitat. The 2012 final northern spotted owl critical habitat rule (USDI-FWS 2012, p. 71882) encourages active management in younger forest stands and in lower quality owl habitat, or where ecological conditions are most departed from the natural or desired range of variability. The LSR stands currently consist of trees growing too close together, preventing sunlight from entering the stand thus reducing plant growth. Relative density is commonly used to determine the need for thinning within a stand, and is a means of describing the relative degree of inter-tree competition in stands of differing average tree size and stand density of conifers over 8 inches diameter at breast height (DHB), or 4.5 feet above the ground (Curtis 1982). Canopy cover, which is a measure of the cover created by the overstory tree canopies, and is expressed in percentage form and, is closely tied to relative density. When relative density is above approximately 35 and canopy cover is above approximately 60%, active reduction in ground-level forbs and shrub diversity is initiated. All stands considered for thinning within the LSR for Steam Donkey Echo project are at relative densities of 45 or above, confirming that the stands are currently experiencing a closing canopy cover with diminishing vegetative species diversity. Density management would also improve conditions for potential murrelet nesting structure. Currently, canopy cover in the stands being considered for thinning prevents development of large limbs on trees which may develop structure for marbled murrelet nesting. The 1997 marbled murrelet recovery plan provides guidance about the use of silvicultural techniques to encourage the development of new habitat. Since marbled murrelets require large trees with specific structural characteristics in order to successfully nest, silvicultural techniques such as thinning are suitable to facilitate the development of these structures in stands of younger forest (USDI-FWS 1997).

Riparian Reserve lands

Based on direction from the 1995 RMP, all fish bearing streams receive a riparian reserve allocation of two site potential tree heights from the stream, and non-fish bearing streams receive a one site potential tree height riparian reserve allocation. There is no regeneration harvest within riparian reserves.

The purpose of thinning in riparian reserves would be to achieve the desired vegetative characteristics that meet ACS objectives. Riparian reserves would be managed to enhance and/or maintain late successional forest conditions (RMP page 18). The 1995 RMP (page 24) recommends silvicultural treatments to control stocking, re-establish and manage stands, and acquire desired vegetation characteristics needed to attain ACS objectives. In this project area, most riparian reserves areas are meeting ACS objectives, but small portions of the outer riparian reserves in the project area consist of stands that are highly homogenous and have a high conifer density.

Thinning these areas would encourage heterogeneity and improve vegetative species diversity. In the absence of thinning, stands would remain homogenous with high tree density for many decades. These stands would not provide the late successional forest conditions that are important to riparian species.

Decision factors considered in alternative development and selection include:

- Compliance with the 1995 ROD/RMP management direction.
- The nature and intensity of environmental impacts from the proposed action on designated critical habitat for species listed under the Endangered Species Act and compliance with other laws such as the Clean Water Act and the O&C Act.
- The incorporation of recovery actions from the northern spotted owl and the marbled murrelet recovery plans into project design.

1.3 Scoping and Public Involvement

The BLM held a public meeting on September 24, 2013, at the Bureau of Land Management, Eugene District Office located in Springfield, OR. A letter inviting members of the public to a meeting and inviting written comments was mailed out on September 9, 2014. Recipients included local, state and federal entities, private citizens, environmental groups, tribal organizations and watershed councils. Four interested groups and four individuals attended the meeting. The BLM requested that comments be turned in by October 11, 2013, but due to the 16 day government shutdown during that period, scoping comments were accepted until November 14, 2013, at the request of a member of the public.

A public meeting was also held at the Siuslaw Watershed Council office in Mapleton, Oregon on November 7, 2013. There were 14 individuals who attended the meeting, representing adjacent landowners, environmental and stewardship groups.

U.S. Fish & Wildlife Service (USFWS) personnel were present during early interdisciplinary team (IDT) deliberations and gave feedback towards the development of the purpose and need for the project. USFWS and National Marine Fisheries Service personnel attended field trips to the project area where discussions included possible prescriptions, potential impacts, project design features and mitigation measures. Both agencies received copies of interdisciplinary team (IDT) meeting notes.

Scoping comments made by the public included the following: Comments have been incorporated into issue development, developing a range of alternatives, alternative design, and project design features. The effects analysis and the preliminary Finding of No Significant Impact (FONSI) underscore the outcome of the action alternatives.

- Support regeneration harvest, meeting RMP standards;
- Support low logging costs with high economic return;
- Encourage LSR treatments; balance the critical habitat needs of spotted owls with objectives of the O&C lands;
- Encourage thinning in riparian reserves;
- Provide opportunities for winter operations;
- Develop an alternative to include no reforestation in regeneration areas;
- Concerns about thinning within marbled murrelet recruitment habitat and meeting the Eugene District RMP standards;
- Analyze the effects of treatments within spotted owl critical habitat and conduct appropriate surveys for owls;
- Use of appropriate measurement tools to age the stand;
- Discourage new road construction;
- Decommission roads within or roads that access marbled murrelet occupied habitat;
- Prepare an EIS in consideration of the controversy associated with the project;
- Buffer red tree vole nest sites found by citizen or contractor surveys;
- Analyze the economic impacts of the project;
- Conserve hardwoods;
- Careful consideration when thinning in late successional reserves;
- Late successional habitat should be developed in northern spotted owl (NSO) critical habitat, there is abundant early seral habitat on private lands, and there should be an assessment of existing complex

early seral habitat in the Oregon Coast Range; NSO critical habitat should not be considered for developing early seral habitat, there is not enough science to support the action and therefore an EIS is needed;
- Protect large old growth Douglas-fir trees;
- Describe the no action alternative well;
- BLM should consider a full range of alternatives including a thinning alternative with gaps;
- Consider effects on flying squirrels from thinning and protect northern spotted owl habitat;
- Riparian reserve thinning treatments that maintain and not retard Aquatic Conservation Strategy (ACS) objectives should be considered;
- Consider the effects of the treatments on CWD and snags; and
- Carbon sequestration analysis should include the no action alternative

1.4 Conformance

This EA is in conformance with the Eugene District Record of Decision (ROD) and Resource Management Plan (1995) as amended.

1.5 Survey and Manage

The Steam Donkey Echo project is consistent with court orders relating to the Survey and Manage mitigation measure of the Northwest Forest Plan, as incorporated into the 1995 RMP. This project implements (is tiered to) the Final Environmental Impact Statement (FEIS) for the 1995 Eugene District Resource Management Plan, as amended.

For areas where regeneration harvest is being considered

The regeneration portion of this project uses the species list and categories from the 2001 Record of Decision (ROD). At the time this project was initiated, the Bureau of Land Management (BLM) was involved in legal proceedings on the ROD to remove the Survey and Manage mitigation measure Standards and Guidelines from BLM RMPs within the range of the northern spotted owl. Due to uncertainties surrounding these proceedings, this project used the last valid ROD, specifically the 2001 ROD and Standards and Guidelines for Amendments to the Survey and Manage, protection buffers, and other Standards and Guidelines mitigation measures (not including subsequent Annual Species Reviews) (USDA-USDI 2001).

Botanical Species

Botanical surveys were conducted in the project area for the Survey and Manage category A or C vascular plants, lichens and bryophytes documented or suspected on the Eugene District BLM lands. These surveys followed the relevant survey protocol, using established survey methods for rare plants (USDA-USDI 2002). Surveys for Survey and Manage botanical species were concurrent with surveys for special status species. Tree climbing is not required for canopy lichens as litterfall surveys are effective though not entirely complete (USDA-USDI 2002, Rosso *et al.,* 2000).

Sixteen *Ramalina thrausta* lichen sites were located in the action area. *Ramalina thrausta* was generally found in litterfall, but also lower on Douglas-fir trees and on deciduous shrubs, especially oceanspray and vine maple. Litterfall individuals evidently originated from the lower, dead branches of Douglas-fir canopy, and are not expected to live long on the ground. Hence, the locations where *Ramalina thrausta* was found were considered only indicative of larger sites in the canopy. An area within 150 feet of the location found was considered the occupied site, based on expected litterfall patterns. Litterfall originates from somewhere within the larger occupied site, i.e., the trees above and near where the litterfall was found. Isolated sites consisting of a single observation would be protected with all operations deferred within the site (the area within 150 feet of the individual observation). Sites consisting of a larger area delineated by multiple individual observations (i.e., multiple individuals found within 300 feet of each other over a larger area) would be managed to provide for continued site persistence. At these locations, some individuals are expected to be lost due to direct disturbance, but some individuals would be retained to allow site persistence. Site persistence does not require us to protect and manage every individual observation within the site. Even though some observations are located in the harvest units, individuals may still persist post-harvest. Approximately 50% of the observations in thinning units are expected to persist, based on observations found in stands thinned previously 23 years ago. In regeneration harvest units, observations will likely not persist throughout the unit, unless some individuals survive on retention trees.

The Survey and Manage category B lichen *Cladonia norvegica* was located at one site, consisting of two point locations. This species is found on large down wood and lower tree trunks. In this project, it was found on old growth stumps in the previously thinned unit in section 9. This unit has been dropped from operations due to the large amount of mortality caused by *Phellinus weirii* (also known as laminated root rot), hence *Cladonia norvegica* would not be affected by this project. *Cladonia norvegica* had been a category C species according to the 2011 settlement agreement list, therefore it was included in surveys, but its status reverted to category B, as in the 2001 ROD.

Wildlife species

Red tree voles are the only wildlife Survey and Manage species potentially affected by proposed actions. No other Survey and Manage wildlife are known to occur in these sections (BLM GeoBob wildlife database, 2014).

Red Tree Voles – also see issues considered but not analyzed in detail.

The red tree vole is a Survey and Manage and a Federal Candidate species. Late successional forest is needed for persistence of the red tree vole although the species is also observed occasionally in younger forest habitats (Huff, et al., 2012).

Evidence of red tree voles was observed at four sites in section 09 of the project area. All observations were associated with younger forest habitat (stands less than 80 years of age) with large remnant trees (super dominant trees). One of these observations is in a proposed thinning area, and the other three observations are outside proposed treatment areas. These red tree voles are part of the North Oregon Coast distinct population segment (DPS), which is named the dusky red tree vole, and the USDI Fish and Wildlife Service determined that this DPS warranted listing as threatened but was precluded from listing due to higher priorities for other species. The USDI Fish and Wildlife Service also determined that current USDA Forest Service (FS) and BLM management provide adequate conservation for the red tree vole on FS and BLM lands within the distinct population segment (USDI-FWS, Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List a Distinct Population Segment of the Red Tree Vole as Endangered or Threatened, 2011) (Huff R. , 2015, pp. 2, 63); especially south of Oregon Highway 20. Current management guidance includes the use of a survey protocol (Huff, Van Norman, Hughes, Davis, & Mellen-Mclean, 2012) to determine if habitat important to species persistence could be adversely affected by proposed treatments. "Persistence habitat" includes a stand where most trees are at least 18" dbh (QMD at least 18") and there are at least two super dominant trees per acre. Application of current BLM guidance for the red tree vole determined that there is no red tree vole persistence habitat in the project area because none of the stands proposed for treatments have at least two super dominant trees per acre; Therefore, red tree voles potentially affected by proposed actions do not require Survey and Manage protections (Huff, et. al., 2012) (Pechman, 2006)

For areas where thinning is being considered

Previously, in 2006, the District Court for the Western District of Washington (Judge Pechman) had invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations. Following the District Court's 2006 ruling, parties to the litigation had entered into a stipulation exempting certain categories of activities from the Survey and Manage standard (the "Pechman exemptions").

Judge Pechman's Order from October 11, 2006 directs:

> "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:
>
> A. Thinning projects in stands younger than 80 years old;
>
> B. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
>
> C. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement

work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and

D. The portions of projects 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."

The thinning portion of Steam Donkey Echo project has been reviewed in consideration of Judge Pechman's October 11, 2006, order. Because the thinning portion of the project includes no regeneration harvest and includes thinning only in stands less than 80 years old (stands are 76 to 78 years of age), this project meets Exemption A of the Pechman Exemptions (Pechman, 2006) and, therefore, may still proceed.

1.6 Issues

The following Issues were identified for analysis based on external and internal scoping.

Aquatics

Issue 1: What are the effects of timber harvest and associated activities on the attainment of aquatic conservation strategy (ACS) objectives?

Silviculture, Botany and Wildlife

Issue 2: What is the effect of harvest, prescribed fire and reforestation on the persistence and complexity of early seral habitat?

Silviculture

Issue 3: What effect do the actions have on carbon sequestration?

Issue 4: How would reforestation alternatives affect future growth and yield?

Wildlife

Issue 5: How would management actions affect marbled murrelet habitat?

Issue 6: How would management actions affect northern spotted owls and their designated critical habitat?

1.7 Issues considered but not analyzed in detail

Comments received during public scoping and the project IDT brought forward the following additional concerns related to resources that had potential of being affected by the proposed actions. Some of these issues have been raised on previous projects and analysis conducted has resulted in determinations of negligible impacts, which helped inform the IDT on the need for detailed analysis in this document. For other issues, the IDT conducted initial analysis, including inventory and assessment, before concluding that detailed analysis was not needed. For reasons described below, these issues were not carried forward to be analyzed in detail.

<u>Would regeneration harvest occur in habitat within the planning area that may potentially contribute to a reasonable assurance of persistence of red tree voles?</u>

Although there is no persistence habitat at the stand scale because the density of super-dominant trees is too low, if a smaller scale is applied to determine if the area has conditions meeting the definition of persistence habitat, there could be potential red tree vole habitat where thinning and no treatment are proposed. About 5 scattered acres (one 2-3 acre area with 7 large remnant trees and three 1 acre areas with 2-3 large remnant trees in each 1 acre area) could be important to persistence. However, Survey and Manage protections are not required because there is no persistence habitat in regeneration harvest areas, and because thinning of stands less than 80 years of age in these small areas of persistence habitat is not likely to adversely affect species persistence (Huff, et al., 2012, Pechman 2006). Since the action alternatives treat the same thinning and density management areas, there was not a need to develop an issue concerning the dusky red tree vole.

How would riparian reserve thinning affect current and future coho salmon habitat conditions?

This issue was considered but not analyzed in detail because the analysis under the ACS objectives (see section 4.1 of this EA) determined that fish habitat characteristics would remain un-affected under all action alternatives. Habitat indicators such as stream temperature, riparian shading, large wood (LWD), stream flows and sediment and substrates have a great influence of the habitat conditions for coho salmon in stream reaches. Project elements or proposed actions can have effects on habitat indicators and as a result affect fish habitat with the proposed action. All of these conditions and habitat indicators were analyzed under the ACS objectives analysis (section 4.1) and determined to maintain current conditions, or remain un-affected by the action alternatives.

Approximately 384 acres of the project lies within riparian reserves however, very few riparian reserve acres would be thinned. Of the 384 acres of riparian reserves, in alternative 2 about 11 acres (3%), in alternative 3 about 20.5 acres (5%) and about 21 acres (5%) in alternative 4 would be thinned. Thinning would occur in the outer portions for all alternatives. No treatments would occur within 150 feet of streams except for streams 23-17 and 23-15. On these streams, portions of the headwall areas lie in the adjacent catchment area; the no-treatment areas reach out 110 feet from the two streams to the top of the ridge and encompass the entire headwall area. The extremely low number of acres of outer riparian reserves being thinned and ACS analysis in the EA provides adequate evaluation to conclude that coho salmon or their designated critical habitat would not be affected by the action alternatives, this issue was not analyzed in detail.

What effect would the action alternatives have on an existing historic site?

A historic site located within the project boundaries would remain outside the treatment areas and would not be affected by this project. No effects to cultural resources are anticipated with the implementation of the action alternatives, because the BLM has buffered the known historic cultural resource site out of the project area. During July 2013 the BLM conducted a cultural resource inventory targeted at locating and recording the site according to Appendix A of the 1998 *Protocol for Managing Cultural Resources on Land Administered by the Bureau of Land Management in Oregon.* A new State Protocol was signed in January 2015, therefore, under all action alternatives a post-harvest cultural resource inventory would be conducted in accordance with Appendix D of the 2015 *State Protocol Between the Oregon-Washington State Director of the Bureau of Land Management (BLM) and the Oregon State Historic Preservation Officer (SHPO) Regarding the Manner in Which the Bureau of Land Management Will Meet Its' Responsibilities Under the National Historic Preservation Act and the National Programmatic Agreement Among the BLM, The Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers*. The State Protocol requires a post-project survey on all harvest areas where slopes are less than 15% and on 5% of the areas where slopes exceed 20%. Professional judgment would be used to determine if surveys are needed on areas with slopes between 15 – 25%. Therefore, no detailed analysis was completed for this issue.

How would the action alternatives affect the introduction and distribution of non-native invasive and noxious weeds?

Non-native and invasive weeds in the Steam Donkey Echo project area mainly occur along the roads, since one of the major ways weeds spread is roads. Logging equipment, road graders, bulldozers, car tires, log trucks, OHVs and many other types of machinery that travel along roads pick up seeds and vegetative structures from the forest and roadsides and move them to new areas. Project Design Features such as washing equipment and vehicles prior to entering BLM reduces the introduction of new species and reduces spread from logging operations.

Logging creates disturbance and increased sunlight to the soil surface and existing plant communities. Non-native and invasive weeds are typically generalists and pioneer or early successional species, so they flourish after disturbance and are often more vigorous than native plants. The best control is a dominant cover with a group of species that casts a dense shade. Regardless of the overstory species present, thinning and regeneration harvest would create new opportunities for invasive plants as well as increase the growth of the conifer crops. As shade from canopy cover of recovering or regenerating conifers and other tree species increases, weed occurrences would decline.

How would the action alternatives affect special status species?

Botany: Special Status Plants, Lichens and Fungi. Botanical surveys were conducted in the project area for BLM special status (federally listed threatened or endangered, and BLM sensitive) vascular plants, lichens and bryophytes documented or suspected on the Eugene District BLM. These surveys occurred in the current project area, using established survey methods for rare plants. Surveys for lichens, bryophytes and vascular plants

occurred June through September 2013. No special status species were located and no mitigation measures are necessary.

Special status fungi may occur in the project area and could be impacted by timber sales; however surveys were not conducted for fungi. According to BLM information bulletin OR-2004-145, pre-disturbance surveys in proposed project areas for these fungi are not practical to conduct and are not required. However, according to BLM information bulletin OR-2004-145, protection of known sites along with ongoing large-scale inventory work is adequate to assure that projects will not contribute to the need to list these species under the ESA. This determination stems from the analyses in USDA-USDI 2004. Almost all of the special status fungi suspected on the Eugene District are also survey and manage fungi. Survey and manage fungi are similarly managed as special status fungi (strategic surveys and management of known sites), with the addition of equivalent effort surveys where projects are planned in old growth stands. No currently known sites of special status fungi are found in the project area.

Special Habitats: During botanical surveys, a special habitat area was located. A small area (0.6 acres) of shallow rocky soil, with no tree canopy, supports meadow indicator and other characteristic species, some of which are uncommon in the Siuslaw resource area (*Elymus glaucus, Montia parvifolia, Sidalcea virgata, Pentagramma triangularis, Cirsium remotifolium, Nothochelone nemoralis, Potentilla glandulosa*). This special habitat would be protected in accordance with the Eugene District RMP guidelines for special habitats (page 40). No effects are expected to this habitat as it is located in a riparian reserve area with no planned treatment.

Wildlife: Detailed analysis has been completed for two threatened species in this EA, the northern spotted owl and the marbled murrelet. A table with other special status wildlife species presence in the project area and a brief description of the potential effects are attached in the appendix. The table describes why detailed analysis is not needed to determine if there is the potential for significant effects for species other than the northern spotted owl and marbled murrelet.

Other than for the northern spotted owl and marbled murrelet, this issue was considered but not analyzed in detail.

2.0 Description of the Alternatives

(Final acres for the EA are listed in the appendix – all acres mentioned in the EA otherwise are approximations)

No Action Alternative 1

There would be no treatments considered in this alternative. Treatments such as regeneration harvest and gap creation to enhance high quality early seral conditions would not occur. There would be no thinning treatments within the matrix, late successional reserve and RR LUAs. No road renovation and construction would occur. Roadside noxious weeds and non-native species would continue to be removed under existing weed control programs consisting of either manual or mechanical means.

Past, Present, and Reasonably Foreseeable Future Actions

Watersheds (WS) are defined at the United States Geological Survey (USGS) Hydrologic Unit Code 10 digit (HUC10) level. Sub-watersheds (HUC12) are “nested” within the larger corresponding watersheds. Steam Donkey Echo is located in three sub-watersheds (SWS) of the Wildcat Creek and Wolf Creek watersheds (WS). The majority of the project is within the Upper Wildcat Creek SWS, the remaining area within the Lower Wildcat Creek SWS and Lower Wolf Creek SWS.

BLM harvest in these sub-watersheds has been relatively low in the last decade (see table 1). BLM harvest in the last decade includes about 30 acres of regeneration harvest in the Upper Wildcat Creek SWS (0.2% of SWS), 47 acres of regeneration harvest in the Lower Wildcat Creek SWS (0.2% of SWS), and 86 acres of thinning (0.4% of SWS) and 72 acres of regeneration (0.4% of SWS) in the Lower Wolf Creek SWS. BLM thinning projects (analyzed in the Rethin EA) that will occur within the next five years include: about 51 acres in the Lower Wildcat Creek SWS (0.2% of the SWS), about 450 acres in the Upper Wildcat Creek SWS (3.4% of SWS), and about 40 acres in the Lower Wolf Creek SWS (0.2% of SWS**)**.

Table 1- BLM harvest in the last decade and BLM active/sold harvest units (by sub-watershed)

BLM lands only:	Sub-Watershed	Regeneration Harvest Acres	Thinning Acres	Timber sale/ Project name
Harvested in the last decade	Upper Wildcat	30	0	Badger One
	Lower Wildcat	47	0	Rusty Nel Regen.
	Lower Wolf	0	0	
Active/Sold harvest units	Upper Wildcat	0	450	Wild Fish Thin Units 1 &2; Pataha Ridge units 1, 2, &3, Wild Badger thin, Power Up thin.
	Lower Wildcat	0	51	January 9th thin, Cedar Shake thin, Big Canyon
	Lower Wolf	0	40	Eames Swing thin # 1

Forest harvest (all owners) over the last 40 years (1972 to present) has ranged from a yearly average of about 170 acres/year (Upper Wildcat creek SWS) to 240 acres/year (Lower Wolf creek SWS), about 1% of each sub-watershed per year. Harvest in the last ten years has been lower than the longer term average due to variable market conditions in the three sub-watersheds. This trend is anticipated to continue into the future. A review of standard industrial practices, as well as aerial photography and driving through adjacent lands reveals that most of the privately, or state owned lands within the vicinity will be managed on a 40-60 year rotation, with high intensity management.

Action Alternatives 2, 3, and 4

Untreated Areas

Of the 1,333 acres within the project area, approximately 1140 acres are not being considered for treatment under any alternative (approximately 85% of the project area).

Untreated areas include 1) un-thinned portions of the riparian reserves; 2) old growth stands 3) areas that do not meet silvicultural objectives for regeneration harvest or thinning at this time; 4) marbled murrelet occupied habitat consisting of approximately 96 acres; 5) steep headwalls with slope stability concerns that have the potential to contribute to landslides; 6) one *Ramalina thrausta* site maintained without treatments to comply with survey and manage requirements (in unit 1B); and 7) existing root rot infestations (*Phellinus weirii*) in section 9. Because the area infested with root rot is located in late-successional reserve land use allocation, the LSR objective of increasing diversity by lowering conifer densities to enhance the process of shrub and mid canopy development, is already underway in this area, no further management intervention is needed in this root rot pocket at this time.

LSR land use allocations in section 9

- *Density management* thinning to reduce canopy cover and the relative density of conifers would occur on approximately 109 acres in alternatives 2 and 3 and on approximately 90 acres in alternative 4. Relative density is a means of describing the relative degree of inter-tree competition in stands of differing average tree size and stand density of conifers over 8 inches DBH. For this project, the reference level of competition was defined by Curtis Relative Density using square feet per acre (basal area) and the quadratic mean diameter, expressed as a percentage times 100. Stands would be thinned to a relative density in the mid 20's to open the overstory canopy cover enough to allow for intermediate canopy development and diverse shrub and forbs, thus promoting late successional reserve characteristics.
- *CWD and snags* would be clumped and would consist of approximately 3 to 6 trees per acre (TPA). Clumps would be between ¼ acre to 1 ac in size, depending on proximity to marbled murrelet habitat
- CWD and snags would be located within un-thinned areas known as "skips".
- *Hardwoods* would be reserved on LSR and adjacent riparian reserves.
- *Road construction and renovation/improvement* in LSR lands and would occur as follows:
    - For alternatives 2 and 3 approximately 1,355 feet of new road construction including one cross drain installation would occur.
    - For alternative 4 no new road construction would be considered in LSR lands.
    - For all alternatives approximately 9,616 feet of road would be renovated or improved.
    - There would be no new road construction in adjacent riparian reserves.

- **Riparian reserve treatments:** *Density management in riparian reserves* adjacent to LSR: Eleven acres in riparian reserves adjacent to LSR lands would be considered for thinning. A 150 foot no-treatment buffer on either side of all streams would be implemented.

Matrix land use allocations:

Alternative 2: *This alternative considers traditional regeneration harvest with reforestation at stocking levels to maximize coniferous tree growth, prescribed fire over the entire regeneration harvest area, scattered green trees, coarse wood and snags, hardwood removal and full riparian no harvest buffers. Approximately 84 acres in matrix would be treated.*

- *Regeneration harvest* would occur on approximately 70.5 acres and *commercial thinning* on about 2.5 acres of matrix LUAs.
- **Riparian reserve treatments:** *Density management* would not occur in riparian reserves adjacent to matrix land use allocations. Riparian reserve land use allocations would remain un-treated under this alternative except for the 11 acres adjacent to the LSR.
- *Reforestation* in regeneration harvest areas: All areas that are being considered for regeneration harvest would be re-planted with a stocking level of 400 to 600 trees per acre (TPA) with primarily Douglas-fir. Monitoring will be conducted to ensure stocking levels meet 1995 RMP direction.
- *Green tree retention* in regeneration harvest areas: 6 to 8 green conifer trees per acre would be well distributed within regeneration harvest areas.
- *Coarse woody debris (CWD) and snags would be scattered within the regeneration harvest units:* A minimum of 240 linear feet of logs per acre greater than or equal to 20 inches in diameter would be retained as CWD and snags based on RMP standards. Sufficient snags (3.2 TPA) to support species of cavity nesting birds at 40 percent of potential population levels would be retained (USDI-BLM 1995, page 86)
- *Prescribed fire* (broadcast burning) would be applied across all matrix regeneration harvest acres (70.5 acres).
- *Matrix thinning.* In section 23 approximately 2.5 acres would be commercially thinned to a relative density in the low to mid thirties. Thinning to this density would release the residual dominant trees from competition to continue maximum growth.
- *Hardwoods* would be considered for removal in regeneration harvest areas and would be reserved within the thinning area. Two hardwood dominant areas (less than half acre in size) would be cleared and converted to conifer dominant areas.
- *Road construction and renovation/improvement* in matrix and adjacent riparian reserves would occur. Approximately 2104 feet of road would be newly constructed including two cross drains and approximately 4011 feet of road would be renovated or improved including seven cross drains. Approximately 100 feet of new road construction would occur in riparian reserves.

Alternative 3: (The Preferred Alternative) *This alternative considers regeneration harvest with planting to lower densities in areas not subject to prescribed fire, natural regeneration, clumped and scattered green trees, clumped and scattered coarse woody debris and snags, hardwood retention, commercial thinning and minimal riparian reserve thinning. Approximately 80.5 acres in matrix would be treated.*

- *Regeneration harvest* would occur on approximately 61 acres and *commercial thinning* on about 10 acres of matrix LUAs.
- **Riparian reserve treatments:** *Density management* would occur in approximately 9.5 acres of riparian reserves adjacent to matrix LUAs. No treatments would occur within 150 feet of streams except for streams 23-17 and 23-15 (see map 3 and 4). On these streams, portions of the headwall areas lie in the adjacent catchment area therefore, the no-treatment areas reach out 110 feet from the two streams. Hardwoods would be reserved within riparian reserves adjacent to matrix.
- *Reforestation* in regeneration harvest areas: Replanting would not be considered where prescribed fire would be applied (35 acres). Areas where prescribed fire would not be applied would be reforested with a stocking level of 200 trees per acre, consisting of western red cedar, western hemlock, and Douglas-fir. Monitoring will be conducted to ensure stocking levels meet 1995 RMP direction.
- *Green tree retention* in regeneration harvest areas: 6 green conifer trees per acre would be clumped within regeneration harvest areas and 2 trees per acre would be distributed within the regeneration harvest area.

- *Coarse woody debris and snags (scattered and clumped):* A minimum of 240 linear feet of logs per acre greater than or equal to 20 inches in diameter would be retained as CWD and snags would be retained based on RMP standards. Sufficient snags (3.2 tpa) to support species of cavity nesting birds at 40 percent of potential population levels would be retained (USDI-BLM, 1995, page 86), this translates to about 50% to 80% tolerance level (DecAID, 2014) for both coarse downed wood and snags.
- *Matrix thinning.* In section 23 approximately 10 acres would be commercially thinned to a relative density in the low to mid thirties.
- *The matrix thinning areas and adjacent riparian reserves* would retain 3 tpa of CWD (1 tpa) and snags (2 tpa) in clumps; no clumps would be placed within 150 feet of streams (approximately 30% tolerance level).
- *Prescribed fire* would be applied on 35 acres within regeneration harvest areas. The criteria used to demarcate prescribed fire to 35 acres include: fragile soils and slope/aspect - prescribed fire would be applied in areas with less than 30% slope, south and west facing slopes would receive higher priority. Burning techniques known as jackpot burning (see glossary) would be applied in this alternative.
- *Hardwoods* would be reserved in regeneration harvest areas as well as within the thinning area. Two hardwood dominant areas (less than half acre in size) would be reserved.
  Road construction and renovation/improvement in matrix and adjacent riparian reserves would occur. Approximately 2104 feet of road would be newly constructed including two cross drains and approximately 4011 feet of road would be renovated or improved including seven cross drains. Approximately 100 feet of new road construction would occur in riparian reserves.

Alternative 4**:** *This alternative considers commercial thinning with gaps, planting at low densities within gaps, coarse woody debris and snags, hardwood retention, and minimal riparian reserve thinning. Approximately 83 acres in matrix would be treated.*

- *Light to moderate thinning* would occur on all matrix acres to a relative density approximately in the mid-thirties. Gaps less than one acre would also be created within the thinning units. Thinning to this density would release dominant trees from competition to continue maximum growth.
- **Riparian reserve treatments:** *Density management* would occur in approximately 10 acres of riparian reserves adjacent to matrix LUAs. Alternative 4 has about 0.8 acres more thinning in riparian reserves adjacent to matrix lands than alternative 3 because one additional *Ramalina thrausta* sites is being partially thinned in this alternative.
- No treatments would occur within 150 feet of streams except for streams 23-17 and 23-15 (see map 3 and 4). On these streams, portions of the headwall areas lie in the adjacent catchment area therefore, the no-treatment area reaches out 110 feet from the two streams.
- *Replanting* within gaps would occur to a stocking level of about 200 trees per acre with red cedar, western hemlock, and Douglas-fir. Monitoring will be conducted to ensure stocking levels meet Eugene RMP direction.
- *Coarse woody debris and snags:* 3 trees per acre would be retained as coarse woody debris and snags in the thinning areas (matrix and riparian reserve) within clumps. Within five years after harvest the retained trees would be converted to coarse downed wood (1 tpa) and snags (2 tpa). No clumps would be placed within 150 feet of streams.
- *Prescribed fire* would not be applied.
- *Hardwoods* would be reserved. Two hardwood dominant areas (less than half acre in size) would also be reserved.
- *Road construction and renovation/improvement* in matrix and adjacent riparian reserves would occur. Approximately 2104 feet of road would be newly constructed including two cross drains and approximately 4011 feet of road would be renovated or improved including seven cross drains. Approximately 100 feet of new road construction would occur in riparian reserves.

3.0 Affected Environment

3.1 Aquatics – Issue 1

Fisheries

Fish Distribution - The Siuslaw Watershed 4th Field Hydrologic Unit Code (HUC) and Wildcat Creek Watershed 5th Field HUC both support Oregon Coast coho salmon (Oncorhynchus kitsutch), fall Chinook salmon (Oncorhynchus tshawytscha), steelhead trout (Oncorhynchus mykiss), sea run cutthroat trout (Oncorhynchus clarkii clarkii), pacific lamprey (Lampetra tridentata) and western brook lamprey (Lampetra richardsoni). Cutthroat and non-salmonids comprise the resident fish community. Chum salmon (Oncorhynchus keta) were reduced in numbers in the last century and early in this century, and are present only as remnant runs low in the basin

The National Marine Fisheries Service (NMFS) listed Oregon Coast coho salmon as threatened under the Endangered Species Act (ESA) on February 11, 2008 (73 FR 7816), critical habitat was also designated on February 11, 2008 (73 FR 7816).

Table 2. Distance from units to coho habitats

EA unit No.	*Section*	*Stream No.*	*Distance from unit to Coho Critical Habitat (feet)*
1A	*9*	*9-1*	*1,555*
1C	*9*	*9-6*	*1,440*
1D	*9*	*9-8*	*1,315*
2A	*23*	*23-12*	*6,550*
2B	*23*	*23-41*	*1,550*

Aquatic habitat – Large Woody Debris (LWD) - Section 9 - On BLM land within stream reach 9-1 (map 3) current LWD levels are low, however, a large volume of hardwoods and Douglas fir have recently fallen into the stream, while other trees are currently bridged across the stream and may soon fall in. Key pieces of LWD in stream reaches of tributary 9-6 are currently below the USFWS and NMFS standard of >80 per mile, but well above Oregon State guidelines of 48 trees or greater per mile.

Section 23 - Both the East and West forks of Bulmer Creek within the boundary of Unit 2 contain adequate numbers of key pieces or large wood.

No woody debris has been placed in any streams adjacent to and associated reaches as part of a restoration effort. Table 3 shows the results of recent stream habitat surveys which include observations of available key pieces.

Table 3. Wildcat Creek Tributary Habitat Surveys

Stream number	*Habitat Detail (%)*			*Large Woody Debris (volume = cubic meters/100m)*		*Dominant Habitat Features (%)*		
	Bedrock	*Sand*	*Gravel*	*Volume**	*Key Pieces*	*Pools*	*Riffles*	*Rapids*
9-1	*3*	*17*	*56*	*14.3*	*1 (16/mile)*	*18*	*21*	*44*
9-6	*5*	*20*	*49*	*23.1*	*4 (64/mile)*	*38*	*29*	*13*
23-2	*1*	*21*	*34*	*22.8*	*12 (192/mile)*	*45*	*14*	*34*
23-12	*3*	*16*	*59*	*21.3*	*5 (80/mile)*	*50*	*32*	*3*

* LWD Volume: <20 undesirable, >30 desirable; Key Pieces; <1 undesirable, >3 desirable.

Riparian Conditions Riparian stands mostly consist of hardwoods, there are limited numbers of large conifers within the riparian stands. A few areas with high conifer densities are present within these riparian stands. The current vegetation in riparian stands provides adequate shade for maintaining current stream temperatures (see hydrology section below).

Hydrology - Issue 1

Project area and treatment area

The project area is located in the Oregon Coast Range. The main streams in the project area are tributaries of Wildcat Creek, Bulmer Creek (tributary to Wildcat Creek), and Cattle Creek (tributary to Pataha Creek). The project area is about 2 miles southeast of Walton, Oregon.

This area typically has cool, wet winters and warm, dry summers. Annual precipitation averages about 60 inches. Most of the precipitation and runoff is in the form of rainfall between November and March. The largest stream flows normally occur during this period when storm fronts are strongest (USDI, 1996, USDI, 1999). The closest United States Geological Survey USGS stream gaging station (#14307620) for stream flow reference is downstream near Mapleton, Oregon on the Siuslaw River.

The area is mountainous with side slopes that are typically 40% to 75%. Gently sloped topography (0-20%) is found in the vicinity of the ridges and on topographic benches. The project area elevations are 550 feet to 1,500 feet with about half of the proposed treatment areas below 1,200 feet.

There are about 8.1 miles of streams within the project area. This includes perennial and intermittent 1st order streams and perennial 2nd and 3rd order streams that were field evaluated (2012 and 2013). Most (~88%) of the streams are headwater 1st or 2nd order tributaries and most of the streams have perennial flow except for the upper reaches of some of the 1st orders. The 1st and 2nd order streams are generally moderately steep to steep (10% to 40% gradient); narrow and confined; have moderate amounts of channel coarse woody debris, are located on moderate to steep topography, and have substrates that are fine material to large gravel.

The larger 2nd and 3rd order channels generally have: substrate of fine material to small cobble, channels 4 feet to 8 feet wide, gradients of 12% to 18%, and moderate channel confinement. The lower reaches of stream 9-6 have gradients of 4% to 7%. Hardwoods are a common component in the riparian areas, particularly along streams 9-6, 23-2, 23-12 (see attached map 3 and 4) and the associated tributaries. Large Woody Debris (LWD) is more in abundance in the larger 2nd and 3rd order channels.

Areas that are closest to the streams have the highest potential of contributing LWD to the channels/banks. Most (~95%) of the wood that falls into streams from adjacent areas occurs within 80 to 150 feet of channels (Spies, et al., 2013). Other research indicates that more than 90% of wood input typically originates within 100 feet of channels (Johnston et al., 2011, Benda and Bigelow 2014, Van Sickle and Gregory 1990). Tree density in these areas (within one site potential tree distance of channels) within the project area varies from about 100 trees per acre (previously thinned stands) to about 215 trees per acre (un-thinned stands).

Solar radiation is generally considered the most important source of radiant energy to impact stream temperature (Beschta 1997, Boyd and Sturdevant, 1997). Streamside and upland areas within the project area are currently well shaded (canopy cover of 65% to 90%). Most of the streams in the analysis area are in areas of moderate to steep topography where the hill slopes would shade the streams in the early to mid-morning and from late afternoon to evening. These are times when solar position above the horizon is low. Upland stands can provide shading in the early morning hours and evening hours when solar position is low on the horizon. Stream banks, woody debris (channels/banks), and stream side shrub layers also provide shading to the streams within the project area.

All the streams originate within the project area except for two streams that originate on recently harvested state land (west of Unit 2). These two streams have vegetated buffer widths of 80’ to 150’ with retention of tall second growth trees in the buffers. Impacts to shading and the potential impacts to stream temperature from loss of shading are minimal and are currently restricted to these streams which represent less than 2 % of the stream length in the project area. Stream temperatures recorded in 2014 (spring, summer, fall) in Wildcat Creek (about 1 mile northeast of unit 2) were within state water quality standards and did not exceed 64 degrees for any recorded hourly period.

Roads

The road system, drainage structures (culverts), and road sediment delivery potential were evaluated in the field (2011-2013) on all the access roads (16.3 miles). Approximately half of the access route is in the Upper Wildcat Creek SWS with the remainder in the Fern Ridge Lake SWS, Upper and Lower Wolf Creek SWS, and Lower Wildcat Creek SWS.

Compaction can reduce soil infiltration and potentially change the timing and/or magnitude of flows. Road densities range from 3.3 miles/square mile (Lower Wildcat Creek SWS) to 5.4 miles/square mile (Upper Wildcat Creek SWS) and road occupy 2.2 % (Lower Wildcat Creek SWS) to 3.6 % (Upper Wildcat Creek SWS) of the SWS total area. A site scale assessment was also made by examining five catchments (smaller drainage areas) in the project area. Roads currently occupy about 1.5 % to 2.3 % of these catchments.

The roads are in the low risk category (0 % to 4 % area covered by roads) for a "threshold of concern" for hydrologic impacts (peak flows) under the Oregon Watershed Enhancement Board (OWEB) assessment method (WPN 1999) for the project area and sub-watersheds. Other research has indicated that peak flow increases were statistically significant where impermeable surfaces account for more than 12% of a drainage area but were small and statistically insignificant when less than 5% of the total acres (Harr et al., 1975, Harr, 1976).

The roads are predominately located on/near ridge tops or on upper mid-slopes. Road surface on the main roads was in very good condition during field evaluations. In-unit roads are more variable in surfacing depth and condition. Some of these roads are not used or are only occasionally used. The road surfacing on the access roads is durable as most (~ 98 %) have gravel surface. Gravel surface is much less susceptible to erosion than natural surface roads.

Forest roads can have the potential for increased sediment delivery to streams. Sediment delivery from roads occurs where drainage is routed *directly* into stream crossings or *indirectly* where cross drain culverts (relief culverts) are near a stream. Road segments that deliver sediment and ditch flow to streams are "connected" to the stream system.

The road inventory results indicate that only about 0.15 miles of the access route currently has the potential to deliver sediment to streams. Sediment potential is indirect (via cross drains) from three short road segments. Sediment delivery from these locations probably only occurs rarely during infrequent, high rainfall events because of the vegetative filtering between the culverts and streams and the short road lengths that are indirectly "connected" to these locations. This delivery would occur when background turbidity levels are already very high from high stream flow. Turbidity from these segments would be expected to be indistinguishable from the background levels under these high flows.

Precipitation

The project area is in the rain dominated hydrologic zone as peak flows are typically associated with rain events. Snow is not a significant contributor to annual precipitation but is possible at any elevation within the project area. In general, rain-on-snow (ROS) events are most likely to occur in large, open areas that experience rapid release of water in the snow packs during unusually warm, high intensity rain (and wind) events at elevations that are most susceptible to snow events (rain-on-snow precipitation zones). Peak flows are defined as greater than or equal to a 1 year recurrence interval flood. This level is used because flows smaller than this are not likely to affect stream channel morphology (Grant et al., 2008).

Areas that are most susceptible to snow accumulation ROS events in this portion of the Coast Range are above 2000 feet elevation (Greenberg and Welch 1998). The project area and the adjacent sub-watersheds (SWS) are low risks for peak flows from ROS events. This is because these areas are rain dominated lower elevation areas with very little (less than 1%) open area (<30% canopy cover) in the areas most susceptible to snow accumulation (rain-on-snow zone) in the SWS areas. The project area does not have any area in the rain-on-snow zone.

A recent review of the research in the rain dominated areas in western Oregon/Washington found that measurable peak flow responses are generally only detectable when at least 29% of an area is harvested (Grant et al., 2008) and that rain dominated areas are less susceptible to peak flow increases than those in the rain-on-snow zone. The 29 % value is a conservative value for peak flow response as the first detectable reported value from all the studies occurred at 40 % harvested area and the mean value of the studies occurred at 45 % harvested area. The report suggests that the mean value is often more appropriate for larger "basins" (>2500 acres) and less intense treatments such as thinning and "small" patch cuts (<25 acres). The current vegetative

condition was recently determined by the BLM area hydrologist from aerial photography, harvest records, and forest inventory. The project area and sub-watersheds (Upper Wildcat Creek, Lower Wildcat Creek, and Lower Wolf Creek) are all currently below 22% harvested. These values are below the levels associated with minimum peak flow detection (29 %) even for small catchment areas. These sub-watersheds are all over 13,000 acres in size.

Harvest

Harvest can reduce evapotranspiration (ET) losses but the effect diminishes as trees and crowns re-occupy a harvested area. Stream flow increases from lower ET are most common in smaller storms in late autumn and early winter and typically disappear once soil moisture recharges (Grant et al., 2008). These storms have flows that are unlikely to impact channel morphology (Grant et al., 2008, Ziemer, 1998). The largest storms usually occur mid-winter in the analysis area when ET demands are the lowest and differences between treated and untreated stands are the least. Peak flow effects vary for different stream types (Grant et al., 2008). The cascade and step pool channel types, the predominant channel types in the project area, have the lowest risk of channel response to peak flow changes (Grant et al., 2008).

The post-harvest recovery rates (increase in ET rates) in moist forests, as in the project area, typically occurs when regenerated stands are about 10 to 30 years old (Ager and Clifton, 2005, Moore and Wondzell, 2005). These stands are considered hydrologically recovered when this occurs.

The Oregon Department of Environmental Quality (ODEQ) is the delegated state agency to protect water quality in Oregon. Water quality standards are in place to protect beneficial uses of water in the state. Streams that don't meet State standards for water quality for one or more parameters are listed as water quality limited on the ODEQ 303 (d) list. The last approved biennial report is the 2010 report. The 2012 report has been completed by ODEQ and is currently under review by the Environmental Protection Agency (EPA). There were no changes from the 2010 report proposed by ODEQ in the 2012 report within the project area. Table 4 lists the 2010 (2012 ODEQ proposed) water quality limited streams near the project area. The Siuslaw River is located about 9 miles downstream from the southern boundary and about 14 miles downstream of the northern boundary of unit 1. Wildcat Creek is located about 1.5 miles east of unit 2 and about 0.25 miles north of unit 1.

Table 4. Water Quality Limited Streams (ODEQ) in the vicinity of the project areas in the Wildcat Creek, Wolf Creek, and Upper Siuslaw Watersheds.

Stream/Waterbody	River Mile	Parameter	Season	Watershed
Siuslaw River	5.7 to 105.9	Dissolved Oxygen	June 1- Sept. 14	Upper Siuslaw
Siuslaw River	5.7 to 105.9	Dissolved Oxygen	Sept. 15-May 31	Upper Siuslaw
Siuslaw River	0 to 106	Temperature	Year around: non-spawning	Upper Siuslaw
Siuslaw River	5.7 to 105.9	Fecal Coliform	Year around	Upper Siuslaw
Siuslaw River	0 to 58.4	Biological Criteria	Year around	Upper Siuslaw
Siuslaw River	60.2 to 105.9	Biological Criteria	Year around	Upper Siuslaw
Wildcat Creek	0 to 18.8	Dissolved Oxygen	October 15-May 15	Wildcat Creek

Dissolved oxygen (DO) levels within the project area are unknown but the project area streams have moderately steep gradients, and turbulent flow. This type of stream rapidly replenishes DO (Ice, 1978). Forest management activities typically do not have little an effect on conductivity or pH (EPA, 1991).

Fecal coliform levels within the project area are unknown but the factors associated with elevated levels are not known to occur within this area. Elevated fecal coliform is usually associated with inadequate sewage treatment, poorly functioning septic fields, high concentrations of animals, or by inadequate waste disposal by recreational users.

Yearly timber harvest (all land owners) has averaged about 1 percent of each SWS since 1972. Yearly BLM harvest has averaged less than 0.3 percent of each SWS since 1972. Reasonably foreseeable future actions for private industrial lands include timber harvests (primarily clear-cuts) - typically on a 40 to 60 year rotation. Other landowners (state and private non-industrial) might also harvest their lands but not necessarily on a 40 to 60 year rotation.

The project area is the geographic scope for direct and indirect effects for issue 1 (impacts to ACS objectives). Cumulative effects are analyzed at the sub-watershed scale for issue 1. The geographic area for vegetation treatments are the three sub-watersheds (Upper Wildcat Creek, Lower Wildcat Creek, and Lower Wolf Creek) in which these activities would occur. The geographic areas for analysis of timber haul effects; and road

construction, road maintenance and road improvements are the sub-watersheds (Upper Wildcat Creek, Lower Wildcat Creek, Lower Wolf Creek, and Upper Wolf Creek) where impacts to issue 1 are possible. These areas are the non-paved road segments only as initial analysis indicated that there are no proposed activities that would impact the paved road segments. A portion of the (non-paved) haul route is within The Fern Ridge Lake SWS (Long Tom River WS) but the initial analysis indicated that there would be no vegetation treatment and no access segments with sediment delivery so no further analysis of this sub-watershed was conducted.

3.2 Silviculture – Issues 2, 3 and 4

Project area and treatment area

The project area consist of stands in two sections (9 and 23) of the Oregon Coast Range within the Wildcat Creek 5th field watershed, and a few acres (<10 acres) in the Wolf Creek 5th field watershed. The project area consists of stands primarily (>95%) in the 31-80 year old range (see *Table 5: Comparing reference to the existing conditions of early seral habitat*). Approximately 34 acres in the southeast corner of section 9 could be considered old forest, with a scattered overstory of large trees greater than 200 years old, and a second story of approximately 76 to 78 year old trees. Although the stand is within the project area, it is excluded from the treatment area. The treatment area consists only of acres that have previous commercial timber harvest or density management treatments. The vegetation in the two sections where treatments are being proposed are dominated by Douglas-fir (*Pseudotsuga menziesii*), with smaller components of western hemlock (*Tsuga heterophylla)* and western red cedar (*Thuja plicata)*. Hardwoods such as golden chinquapin (*Chrysolepsis chrysophylla*) tend to exist on the ridge tops and rocky areas, while bigleaf maple (*Acer macrophylla)* and red alder (*Alnus rubra)* are generally found in riparian areas, areas of slope instability or previously disturbed from past management. The dominant understory vegetation consists of salal (*Gaultheria shallon*), hazel (*Corylus cornuta)*, vine maple (*Acer circinatum)*, Oregon grape (Mahonia nervosa), huckleberry (*Vaccinium parvifolium*), sword fern (*Polystichum munitum)*, and rhododendron (*Rhododendron macrophyllum)*. All stands within the treatment area are growing at an estimated rate of 1,000 board feet per acre per year (1MBF/AC/YR).

Section 9 has two distinct stand types, or strata, within the proposed treatment area. The treatment area was broken into two strata due to differences in stand metrics (trees per acre, average diameter based on mean basal area (QMD), densities, etc.) caused by natural disturbance and past management techniques.

Stratum one is dominated by Douglas-fir, with minor components of chinquapin, red alder, western hemlock and western red cedar. Understory vegetation and coniferous saplings are sparse to moderate, with some western hemlock and western red cedar regeneration growing where gaps have naturally occurred. Stratum one consists of stands that have not been treated since establishment. These stands have higher densities, volumes and basal areas, with smaller overall QMD's in comparison to the thinned units. Stratum One has reached culmination of mean annual increment (CMAI), which is a requirement for consideration of regeneration harvest on matrix LUA (USDI-BLM, 1995, p.85). The average standing volume in stratum one is 70 thousand board feet per acre (MBF/AC).

Stratum Two incorporates stands that were thinned in 1991. These stands have moderate to high levels of understory development, with hardwoods and young conifers growing where light was made available from the past thinning. Since the thinning in 1991, over story trees have been growing well, but current densities are moving the stand towards higher competition and canopy closure, which will slow growth of dominant trees and suppress the emerging second story. There are areas of laminated root rot (*Phellinus weirii)* in the unit between and adjacent to the 18-7-16 and 18-7-9.1 roads. Mortality is occurring in small pockets due to the root rot; Douglas-fir and other saplings are growing in. The root rot area is not being considered for thinning or regeneration harvest because the area is within LSR. Regeneration harvesting is not allowed in LSR (USDI-BLM, 1995), and the rate of tree mortality caused by the root rot is opening the stand enough to facilitate late successional structural characteristics without management intervention. The average standing volume in stratum two is 58 MBF/AC.

Section 23 also has two strata within the proposed treatment areas. Stratum one consists of stands which were *pre-commercially* thinned in 1974, but have not been *commercially* thinned. Stratum one has the highest density, basal area and trees per acre (TPA), and lowest QMD among all the stands being considered for treatment. There is also a small portion of stratum one that can be considered a sub unit, and is delineated as unit 2a. The unit has the same over story characteristics, but due to salvage logging in the late 1960's, a component of younger trees grew in where openings were created by harvest activity. These stands have similar vegetative

structure as section nine, with Douglas-fir being the dominant over story species, and minor components of western hemlock and western red cedar mixed throughout. Understory vegetation is sparse to moderate, with some hardwood and coniferous saplings growing in areas where gaps have formed due to natural mortality. This stratum has also reached CMAI and has an average standing volume of 62 MBF/AC. Unit 2a within stratum 1 has an average standing volume of 40 MBF/AC.

Stratum two was commercially thinned in 1998. Current densities are providing growing space for the over story trees, and providing for light reaching the forest floor to induce understory vegetative development. Douglas-fir is the dominant over story species, with western hemlock and western red cedar comprising a minor component. Hardwoods, shrubs, and saplings are growing between over story trees where light is available below over-stories with less than about 75% canopy cover. The most westerly previously thinned area will be excluded from the project because there is not a need to thin; however, the area just east has sufficient stocking to support economically viable commercial thinning in lands allocated to General Forest Management Area. The average standing volume for Stratum 2 within section 23 is 55 MBF/AC.

Sub-Watershed area

The geographic scope of the cumulative impact analysis includes the Upper Wildcat, Lower Wildcat, and Lower Wolf Creek 6th field sub-watersheds. Approximately 22,400 acres of BLM administered land exist within these sub-watersheds. Douglas-fir dominates the BLM lands in the sixth field area, with minor components of hemlock, red cedar, and various hardwoods. Approximately 75% of this sixth field area is in the young management age class (31 to 80 years old) with approximately 21% above 80 years of age, and 4% younger than 30 years old. Historically, stands that were harvested before 1955 (stands older than 60 years of age) typically underwent clear cutting, broadcast burning for removal of competing vegetation, then naturally regenerated by adjacent stands or seed trees left on site. Those stands that are younger than 60 years were typically clear cut, broadcast burned for the removal of competitive vegetation, and then artificially regenerated via planting. All BLM stands were managed for high yield timber production, creating homogeneous plantations of primarily Douglas-fir. Although approximately 4% of the SWS area is in early seral habitat (typically younger than 30 years old in a plantation forest), it is not considered complex high quality early seral habitat, which is defined in this project as stands with less than 30% canopy cover of trees > 10” dbh and contain large remnant conifers and hardwood trees and a variety of snag and down wood amounts and decay classes (Swanson et al., 2014). Approximately 15,700 acres out of the BLM administered 22,400 are within the LSR land use allocation. These acres will be managed to enhance the late successional forest characteristics, moving young or mature stands into old growth over time.

Within BLM administered lands in the SWS, approximately 541 acres either have, currently, or are projected to be commercially harvested by thinning, with an estimated yield or volume coming from those partial harvests of 10 MMBF. It could be assumed that an average of 1MMBF would be harvested per year if past, present, and future harvests were averaged over a decade.

There are approximately 25,800 acres of privately owned lands within the three sixth field watersheds. Vegetation and species composition is similar to the BLM lands described above. These lands have historically been managed for high yield production forestry. A typical regeneration rotation would take place when the stands reached 40-60 years old. Broadcast burning was commonly prescribed post-harvest to remove competing vegetation and prepare the soil for planting or natural seeding. Stands that are older than 60 years were typically naturally regenerated, while stands that are less than 60 years were typically planted. Stands that are directly adjacent to the project area (Sections 9 and 23), appear to continue to be managed on this standard industrial practice of high yield forestry. Although approximately 36% of private ownership within the subwatersheds is early seral habitat, the management practices preclude it from being complex high quality early seral habitat because of practices which remove all shrubs, forbs and hardwoods via site preparation and herbicides, this significantly diminishes the persistence and quality of early seral habitat.

Approximately 5,000 acres of state-owned lands are within the three sub-watersheds. Vegetation and species composition is similar to the BLM lands described above. These lands were also historically managed for high yield forestry, with typical rotations around 60 years, site preparation, and seeding or planting. The Oregon Department of Forestry owns land directly adjacent to the project areas (Section 9 and 23). Based on visual observation, thinning and regeneration harvest has recently taken place. The regeneration harvests have variable retention, with an apparent effort to maintain existing ecological function by retaining pockets of residual trees and implementing areas of variable density thinning prescriptions. As described above, the intensive forest

management practices diminish the quality of the early seral habitat, and therefore the early seral habitat on state lands could be considered low in quality.

3.3 Carbon Storage – Issue 3

Global climate change and carbon sequestration are difficult discussions at smaller scales, such as the project area, because the actions are too polarized in scale to give accurate context. Conversely, using larger scales, such as the world, continent, or even state, shrinks the impacts from the actions to be indistinguishable. For the carbon analysis, the scale of western Oregon allows for a discussion of effects, without distorting or diluting the analysis. Effects were modeled for 50 years through analysis in the 1994 FEIS (USDI-BLM 1994, p.3-9 and 4-9) and 2008 FEIS (USDI-BLM, p.4-537 to 4-543), which is hereby incorporated by reference.

The analysis quantifies the net effect of the action alternatives on greenhouse gas levels by comparing changes in carbon storage that would occur under the action alternatives to the carbon storage that would occur under the no action alternative, as suggested in IM-2010-012 (USDI, 2010). Specifically, this analysis estimates the carbon flux associated with implementation of the action alternatives roughly fifty years from the present, incorporating: a) differences in carbon storage in live, dead, and organic soil carbon pools; b) the intermediary flux from wood products produced by the Proposed Action through this period; and c) "secondary" C fluxes associated with logging and hauling systems. At the scale of western Oregon, considering the cumulative effects of both forest succession (a carbon sink) and harvest (a carbon source) under the NWFP in the Plan Area, carbon stores would be predicted to be 427 million tonnes.

Project area and treatment area

For this project, only carbon stored, sequestered, and emitted directly by harvest operations and growth of trees was calculated. All other sources of carbon sinks and emissions were considered to be constant. For further detail on the scope of the carbon storage analysis, see Issue 3.

The analysis for carbon storage, emissions, and sequestration was based on computations in the 2008 RMP revision, which determined that carbon stored on BLM-administered lands in western Oregon O&C lands totals 427 million tonnes. This represents 1% of the total carbon stored in forests and harvested wood in the United States, and 0.02% of the global carbon storage in vegetation, soil and detritus (USDI-BLM, 2008). Total standing carbon of live trees within the project area was estimated to be 17.3 thousand tonnes of carbon. These estimates were derived using current inventory data on stand ages, estimated volume per acre, and the assumptions and equations used in the 2008 FEIS for carbon storage.

Sub-Watershed Area

The planning area for the project contains three sixth field watersheds (Upper and Lower Wildcat Creek and Wolf Creek). Approximately 22,400 acres are administered by the BLM within the three watersheds. Total carbon stored in the live trees on BLM administered lands within the planning area was estimated to be approximately 5.7 million tonnes of carbon. These estimates were derived using current inventory data on stand ages, estimated volume per acre, and the assumptions and equations used in the 2008 EIS RMP Revision for carbon storage (USDI-BLM, 2008).

3.4 Botany - Issue 2

Project area and treatment area

Common vascular plants in the project area (sections 9 and 23) include community dominants such as Douglas-fir, big-leaf maple, California hazel, ocean spray, vine maple, salal, sword fern and dwarf Oregon-grape. A large number of other species were documented in botany surveys; over 140 species in section 23 and over 160 species in section 9. Many of the community dominant shrub species have increased with canopy thinning or removal.

Early seral species can be found in the project area particularly along roadsides, in previously thinned areas, and in riparian tree fall areas on steep slopes. Characteristic early seral species include bracken fern, and legumes such as *Lotus aboriginus, Vicia gigantea and Lupinus latifolius*. Tree fall areas along steep slopes in riparian areas support *Rubus leucodermis*, a common shrub that invades disturbed areas, and other species. A previously thinned area has areas where the canopy is open and recent dead trees because of continued root rot mortality. Small trees such as *Rhamnus purshiana* and *Prunus emarginata* have invaded and are common in thinned areas, while shrubs and sword fern are quite dense.

Late seral herbs often occur in the units, but appear to have declined in the previously thinned areas. Late seral species found include orchids (*Corallorhiza maculata, Goodyera oblongifolia, Listera cordata, Calypso bulbosa*) and herbaceous Ericaceae (*Chimaphila spp., Pyrola spp., Monotropa uniflora*); these taxa are often mycotrophic or partially mycotrophic species (Tendersoo et al., 2007), possibly explaining their seral status and tendency to decline because of thinning (e.g. Thysell and Carey, 2001). Mycotrophic species are those plants that obtain their energy from fungi instead of through photosynthesis.

Over 110 species in section 23 and over 110 species in section 9 of lichens and bryophytes were documented in botany surveys. Douglas-fir trees on windswept ridges have abundant lichens. Cyanolichens are sparse however, and pin lichens are limited due to char on the bases of many of the large, old Douglas-fir. Heavy brush growth in some areas limits bryophyte growth that could otherwise be present. Steep slopes of bedrock have characteristic bryophytes.

Sub-Watershed Area

An assessment of vegetation responses in regeneration areas was completed in the nearby Rusty Nel and Badger One timber sales by a BLM botanist to examine the effects past regeneration harvests had on early seral species response. Rusty Nel and Badger One timber sales underwent regeneration harvest in 2005 and 2004 respectively and are located within the SWS where the Steam Donkey Echo project lies. A large number of characteristic early-seral species were found that evidently dispersed into the site, including *Sambucus mexicana, Ribes sanguineum, Anaphalis margaritacea, Rubus leucodermis,* and *Salix scouleriana*. Some early-seral species, such as *Ceanothus sanguineum, Lupinus latifolius* and *Lotus aboriginus* probably had long-lived seed banks that responded to disturbance. Often much of the biomass on these sites was from persistent, "mid-seral" or community dominant species, such as *Rubus ursinus, Acer macrophylum, Holodiscus discolor, Polystichum munitum, Gaultheria shallon* and *Corylus cornuta.* Many persistent forest-floor herbs were found, but some (such as *Viola orbiculata, Trillium ovatum,* and *Linnaea borealis*) appeared to have declined from their usual abundance, while others were probably absent. Species that had declined or had become absent would be considered late-seral species. Lichens and bryophytes were also relatively sparse, although bryophytes of open, mineral soil sites were found.

The three relevant SWSs contain the same mix of species as described in the project area. Community dominants can be found in all successional stages, but the shrubs are especially abundant where canopy cover is lessened. Early seral species are found along roadsides and invade recent harvest areas and areas of natural tree mortality. On BLM land, 77 acres of recent regeneration harvest and 541 acres of active thinning occur in the sub-watersheds (Table 1). Additionally, older thinning units can contain early seral species. In the project area, the Four Square Thin occurred about 23 years previously over 141 acres, and other old thinnings undoubtedly occurred in the watershed. The 21% of BLM administered land in the SWSs in late seral condition (over 80 years) would provide the best habitat for the late seral herbs mentioned above. Private lands contain community dominant species and early seral plant species, although they are less frequently found where dense canopy closure has occurred in plantations, or in areas recently burned or sprayed with herbicides. Although the early seral plant species exist within these private plantations, the early seral habitat would be considered low quality due to limitations in the persistence from canopy closure, lack of hardwoods and legacy tree structural diversity. However, private lands contain little or no late-seral habitat.

3.5 Wildlife – Issues 2, 5 and 6

Habitat complexity – Issue 2

The public lands administered Eugene District BLM need more complex/high quality early, mid, and late seral forest habitat types in order to support goals on BLM lands for conservation of special status species; the recovery of ESA listed species and preventing the listing of other species. The following table compares this historic reference conditions with conditions at various scales, and the shortage of early and old growth forest is apparent at all of these scales.

Table 5: Comparing reference to the existing conditions on BLM lands

Habitat types	Reference condition from the Oregon Coast Range (Wimberly 2002)	Existing section 9*	Existing section 23*	Existing condition for three sub watersheds	Existing condition for Siuslaw Resource Area
Very early seral (pre-forest): grass, forb, shrub, sapling (<15 years old)	10%	0%	0%	0%	0.2%
Early seral (pre-forest): shrub, pole (15-30 years old)	10%	0%	7%	4%	7.8%
Mid seral: Young (31-80 years old)	20%	95%	95%	75%	58%
Late seral: Mature (81-200 years old)	20%	0%	0%	3%	15%
Late seral: Old Growth (>201 years old)	40%	5%	1%	18%	19%

***FOI and field verification**

Marbled murrelet habitat – Issue 5

Project area and treatment area

The marbled murrelet is a seabird that nests in forests, their populations are strongly associated with inland nesting habitat (Raphael, et al., 2014). High quality marbled murrelet habitat occurs within 35 miles of the Oregon coast line and usually consists of multi-layered multi-species canopies with multiple nesting platforms (USDI-FWS, 1997). The project is located in the Oregon Coast Range (about 30 to 33 miles from the Oregon coast line). The marbled murrelet population, estimated at 6,360 birds, does not appear to be declining (Strong, 2013 page 6, 10) in the Oregon Coast Range.

Marbled murrelets nest primarily in very large conifer trees. These trees usually have crowns that were open grown long enough to grow large limbs that murrelets often use for nesting (Dodson, et al., 2012). The murrelet recovery plan states that suitable nesting platforms in Oregon are usually about 140 feet above the ground and on large limbs, averaging 13.3 inches in diameter, have overhead cover, and a flight path below the level of the platform. Twenty one sampled nests in the Pacific Northwest indicate canopy closure averaged about 50% (USDI-FWS 1997, p. 34). These large limbs are in very large trees (average 65 inch diameter at breast height) that are in stands with 2-3 canopy layers. The more suitable platforms there are in an area, the higher the potential for occupancy (Nelson and Wilson, 2002).

The presence of hardwoods appears to have a positive influence on the development of large platform limbs on adjacent conifer trees (personal experience - Siuslaw resource area wildlife biologist). Most marbled murrelet nests are found an average of 140 feet above the ground, which is above the height of mature hardwood trees. Hardwoods reduce the density of conifer trees, which probably helps maintain open growing conditions for conifers.

There are about 250 potential murrelet nest trees in section 09. About 200 of those have been confirmed on the ground and mapped with GPS. The other 50 (mostly in old growth stands) are not located within the proposed action. The majority (over 80%) of the trees confirmed on the ground are in dense Douglas-fir plantations with an average height of about 150 feet. About 20% are in areas with more than 30% hardwood canopy cover (satellite imagery from IVMP 2006).

Surveys for marbled murrelets were completed in 2012 and occupancy was confirmed within section 9. The occupied behaviors triggered creation of the marbled murrelet occupied site (USDI-BLM 1995, p. 62): "protect a 0.5 mile radius of all contiguous existing and recruitment habitat for marbled murrelets (i.e., stands that are capable of becoming marbled murrelet habitat within 25 years). These areas will be managed as late successional reserves." The murrelet occupied site contains 543 acres and about 98% of the potential murrelet nest trees in section 09. The majority of these important trees are in the occupied habitat (96 acres) that was delineated within the occupied site. Active management is encouraged within the marbled murrelet occupied site to promote restoration of suitable habitat from younger "recruitment habitat," but timber management is prohibited in the areas delineated as occupied marbled murrelet habitat (USDI-BLM, p. 62). The area delineated as a

marbled murrelet site consists of second growth Douglas-fir forest with scattered potential nest trees. Portions of these stands are being considered for thinning. High quality suitable habitat for murrelets is located in small old growth stands in sections 09 and 23, no actions would occur within these areas. Sections 09 and 23 are in the range of the marbled murrelet, but are not within critical habitat designated for the marbled murrelet.

Sub-Watershed Area

Based on estimations from review of lidar data, about 11% of the acres in the sub-watersheds are suitable murrelet nesting habitat; 92% of it is on BLM land, 7% on State land, and 1% on private land. Of this, about 75% is old growth forest on BLM land, and the remainder is single or small patches of potential murrelet nest trees scattered in stands 60-110 year old stands on BLM lands and what appears to be similar aged stands on State or private lands. Nine sections contain 1,700 acres of occupied murrelet sites on BLM land, and one state section contains a 170 acre murrelet management area.

Northern spotted owl habitat – Issue 6

Project area and treatment area

The recovery of the threatened northern spotted owl may depend on the maintenance and restoration of high quality habitats (Irwin, et. al. 2012; USDI-FWS, 50 CFR part 17, 2012; Wiens, 2012). Olson *et al.,* (2004) and USDI-FWS (2011) concluded that while mid-seral and late-seral forests are important to spotted owls, a mixture of these forest types with younger forest and non-forest may be best for spotted owl survival and reproduction in the Central Oregon Coast Range. The 2012 revised recovery plan describes foraging habitat as separate from nesting/roosting or dispersal and describe spotted owls using the edge as well as interior of diverse early seral habitats.

Important prey species for spotted owls are associated with high quality habitats that contain snags, down wood, conifer and deciduous vegetation, multi-layered canopies, grasses/forbs, or shrubs (Carey et al., 1999; Johnson & O'Neil, 2001). Hagar (2007) found 90% of the diet of northern spotted owls is composed of small mammals that are associated with non-coniferous vegetation; these animals include northern flying squirrels, wood rats, and other rodents. Spotted owl habitat quality improves where habitat elements increase, such as old forest, hardwood patches, multi-layered multi-species canopies, number of trees >31inch dbh, number of snags and down wood >20inch dbh, and a high incidence of large live trees with various deformities (e.g., large cavities, broken tops, mistletoe infections, and other evidence of decadence) (USDI-FWS, 2012). An important habitat element for flying squirrels is the canopy density at 30 feet above the ground in forest stands (Wilson, 2010). Spotted owls are ambush predators that usually perch about 20-40 feet above the ground and wait for opportunities to pounce on prey. Canopy density 20-40 feet above the ground is probably important to the security of spotted owls while they hunt so canopy there is an important element of high quality habitat for the northern spotted owl (USDI-FWS, 2012).

Habitat choice by spotted owls is influenced by hardwood trees and understory shrubs that produce fruit and mast supplies for the owls' small mammal prey, and early seral habitats can be important for spotted owl foraging (Irwin, et al., 2012, p. 208 & 210).

In sections 9 and 23 only 3% is high quality nesting/roosting habitat in old growth forest, and 10% is moderate quality foraging habitat in hardwood dominated forests (Wiens et al., 2014). These areas are not being treated. Most of these sections are best described as very low quality foraging habitat for the spotted owl because stands are about 40-80 years old with more than 75% overstory conifer canopy cover and simplified stand structure. Section 09 has 25% and section 23 has 1% of moderate or high quality nesting or foraging habitat. The stands being proposed for treatments meet the definition of dispersal habitat that is occasionally used for foraging (USDI-FWS, 2012, p. 71885, 71906, 71907).

The Revised Recovery Plan for the Northern Spotted Owl (USDI-FWS, 2011) recommends a variety of actions to conserve and recover the species to the point where it can be removed from the list of threatened and endangered species protected by the Endangered Species Act. Two relevant recommended actions are Recovery Action 10 and Recovery Action 32, described below.

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

The USFWS recommends maintaining spotted owl sites by maintaining core areas (½ mile around a nest) with at least 50% (250 acres) high quality nesting/roosting or foraging habitats and maintaining the provincial home range (1.5 miles around a nest in Oregon Coast Range) with at least 40% high quality habitat (USDI-FWS, 2012). See Table 6 for current habitat conditions.

The majority of the home ranges of the potentially active sites were surveyed without detecting resident spotted owls so, these sites are probably not active, though there is a low probability that they might be active. Surveys to protocol were completed within 1.5 miles of harvest treatment areas, and surveys of other areas are ongoing. There are no active nest sites within 1.5 miles of treatment areas. The Pataha Creek pair site was active in 2014, but was not active in 2013 or 2015; this site center is about 1.3 miles from the nearest proposed treatment area.

Table 6: Percent habitat within spotted owl sites

Spotted owl site name (status)	Existing high quality habitats (RA32)		Existing habitat (nesting/roosting or foraging)	
	% of core	% of HR*	% of core	% of HR
Pataha Creek (active)	19%	11%	66%	62%
Oat Creek (not likely active)	34%	14%	67%	51%
Potential Site 37 (not likely active)	15%	10%	58%	56%

*HR=home range

The 2012 revised recovery plan separates foraging habitat from nesting/roosting or dispersal habitat and describes spotted owls using the edge as well as interior of diverse early seral habitats. About 96% of the project area has adequate canopy cover and space below the canopy to be considered spotted owl habitat; however, most of this habitat is in young forest with low habitat complexity/quality. Over 80% of sections 9 and 23 (the project area) are described as very low quality foraging habitat or dispersal habitat for the spotted owl because stands are about 40-80 years old with simple stand structure caused by high overstory conifer canopy cover (>75%). Section 09 has only 25% and Section 23 has only 1% moderate or high complexity/quality nesting or foraging habitats. Old growth forest (see table 5) is high quality habitat as well as stands with at least 30% hardwood canopy cover are considered moderate to high quality in this analysis. Areas proposed for treatments meet the definition of low quality foraging habitat or the definition of dispersal habitat that is occasionally used for foraging (USDI-FWS, 2012) because they have high conifer overstory canopy cover and very low amounts of middle story trees, hardwood trees, shrubs, or dead wood.

Recovery Action 32 – Maintain and restore older and structurally complex multi-layered conifer forests. Spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on federal and non-federal lands across its range. 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 project is not located in RA32 stands. The 34 acre old growth stand in section 09, and two small old growth patches in section 23, are not part of treatments proposed under the action alternatives.

Sub-Watershed Area

Currently, BLM administered lands within the Siuslaw resource area (SRA) have very small amounts of high quality early seral habitats, approximately 60% less than historic levels. Additionally, very early seral habitats (grass, forb, and shrub) are approximately 90% less than historic abundance (see table 7).

Table 7: Comparing reference to the existing conditions of early seral habitat on BLM administered lands

Habitat types at the section scale	Reference condition from the Oregon Coast Range (Wimberly 2002)	Existing sec 9*	Existing sec 23*	Existing condition for SRA	Existing condition for three 6th fields#
Very early seral (pre-forest): grass, forb, shrub, sapling (<15 years old)	10%	0%	0%	0.2%	0%
Early (pre-forest): shrub, pole (15-30 years old)	10%	0%	7%	7.8%	4%
Young (31-80 years old)	20%	95%	88%	58%	75%
Mature (81-200 years old)	20%	0%	0%	15%	3%
Old Growth (>201 years old)	40%	5%	1%	19%	18%

*FOI and field verification; # Three 6th field watershed include Upper and Lower Wildcat Creek and Lower Wolf Creek.

Grass, forb, shrub (early seral), are below historic levels while young (mid seral) forest habitat is well above historic levels. Since implementation of the Eugene District RMP in 1995, there has been a 90% decline on the Siuslaw resource area of habitats needed by animals that use relatively open grass, forb, or shrub habitats. Approximately 58% of the Siuslaw resource area and about 75% of the three SWS, consist of young (31 to 80 years old) forests.

The existing simplified forests on BLM managed lands are the result of light or no disturbance that have caused development of high canopy cover in conifer forests and limited the amount of snags and down wood. High over-story conifer canopy cover limits development of complex multi layered multi species canopies (Chan, et al., 2006). The complexity and quality of various habitat types is important for species persistence. Fire historically had a strong influence on the stand scale complexity of habitats on Siuslaw resource area (Impara, 1997, p. 210; Poage, 2005; Poage et al., 2009).

There are State of Oregon administered lands adjacent to both sections 09 and 23 of this project. Recent regeneration harvest has occurred on state land in section 4, adjacent to northwest corner of section 9, and thinning and regeneration harvest occurred in section 22 west of section 23. Thinning will improve habitat quality for 10-20 years (based on review of 2014 aerial photos), and created openings will provide habitat for species that use grass, forb, and shrub habitats for about 10-15 years, but improved habitat quality is not likely to persist because these State lands are managed for timber production.

On private lands regeneration harvest usually occurs at about age 40-60. After harvest, the majority of these areas are intensely managed to suppress grasses, forbs, shrubs, and hardwood trees because they compete with conifer trees and can adversely affect economic goals of landowners. Forest habitat quality for wildlife (spotted forage species) is very low, especially where herbicides are used to effectively eliminate or suppress grasses, forbs, and deciduous shrubs or trees. Quality habitats appear to be limited to narrow buffers on some streams or adjacent to roads. Currently 53-65% of the three sub watersheds support dispersal of spotted owls.

Northern spotted owl critical habitat (CHU) units

Two spotted owl critical habitat units (CHU) overlap the Siuslaw resource area: ORC2 and ORC3. The project area is located within the spotted owl CHU number ORC3. Approximately 74% of the Siuslaw resource area is within spotted owl CHUs. Critical habitat was designated in 2012 in the critical habitat rule (USDI-FWS, 2012).

Table 8: Critical Habitat Units

Siuslaw RA Critical Habitat (CH) sub-units	Total Acres	Acres high quality habitat (RA32)	% that is high quality (RA 32) habitat
ORC 2	41,716	12,318	30%
ORC 3	76,591	24,353	32%
Not CH	42,341	8,091	19%
Siuslaw Resource Area	160,648	44,762	28%

Barred owls

Barred owls (*Strix varia*) are native to eastern North America, but have moved west into spotted owl habitat. The barred owl's range now completely overlaps that of the northern spotted owl (Gutiérrez et al., 2004). Barred owls are considered generalists and make use of a variety of vegetation and forage species (Wiens 2014). Existing evidence suggest that barred owls compete with northern spotted owls for habitat and prey with near total niche overlap and that interference competition (Dugger et al., 2011, Van Lanen et al., 2011, Wiens 2014) is resulting in increased northern spotted owl site abandonment, reduced colonization rates, and likely reduction in reproduction (Dugger et al., 2011, Forsman et al., 2011, Olson et al., 2005, Wiens, 2014), ultimately resulting in probable range-wide population reductions (Forsman et al., 2011).

4.0 Environmental Consequences – ***direct, indirect and cumulative effects*** *(all specialists reports are incorporated by reference and are available for inspection upon request)*

Geographic and temporal scale of analysis

Project scale (sections 9 and 23) and site or stand/treatment scale analysis are used to convey direct and indirect effects. The Council on Environmental Quality (CEQ) gives the following guidance: The geographic and temporal scale of the analysis in the EA is important to ensure that adequate information about the cumulative consequences of actions is clearly apparent. For this EA the most relevant geographic scale of cumulative effects analysis is three sub-watersheds (SWS) within which the project is located. Most of the treatments would occur in the Upper Wildcat Creek SWS the other two SWS have a few acres of treatments. Some analysis expands into the watershed (WS) scale as well. Occasionally there are also references to the entire Siuslaw Resource Area to present more general information about past practices. For the temporal scale of analysis for cumulative effects the active or sold BLM harvest units for the next five years and BLM harvest for the past decade have been considered. All past forest harvest activities within 40 years in the Upper Wildcat Creek SWS have been considered as well.

4.1 Issue 1: What are the effects of timber harvest and associated activities on the attainment of aquatic conservation strategy (ACS) objectives?

Actions proposed within the Riparian Reserves (RR) and adjacent uplands may affect attainment of ACS objectives. ACS objectives were developed under the Northwest Forest Plan incorporated into the District RMP (1995 Eugene District RMP) to maintain and restore ecological health of watersheds and aquatic ecosystems on public lands. Analysis of this issue will compare how each alternative contributes toward attainment of ACS objectives 1-9.

Aquatic Conservation Strategy Objectives:

The objectives were analyzed at project area scale for direct and indirect affects for the ACS objectives because some impacts (sediment/turbidity, temperature) are more likely to be detectable at this small scale. The project area consists of the proposed treatment areas in two sections (9 and 23) of the Oregon Coast Range within the Wildcat Creek 5th field watershed and the Wolf Creek 5th field watershed.

Cumulative effects are analyzed at the sub-watershed scale for issue 1. This scale is the smallest scale that contains the entire project area and that encompasses potential downstream impacts with other projects/activities. The geographic area for vegetation treatments are the three sub-watersheds (Upper Wildcat Creek, Lower Wildcat Creek, and Lower Wolf Creek) in which these activities would occur. The geographic areas for analysis of timber haul effects; and road construction, road maintenance and road improvements are the sub-watersheds (Upper Wildcat Creek, Lower Wildcat Creek, Lower Wolf Creek, and Upper Wolf Creek) where impacts to issue 1 are possible. These areas are the non-paved road segments only as initial analysis indicated that there are no proposed activities that would impact the paved road segments. A portion of the (non-paved) haul route is within The Fern Ridge Lake SWS (Long Tom River WS) but the initial analysis indicated that there would be no vegetation treatment and no access segments with sediment delivery so no further analysis of this sub-watershed was conducted.

The time scale for analysis varies by ACS objective from immediately after project initiation (harvest, yarding, and road activity) to several decades after project initiation (vegetation altering activities, future LWD recruitment). Other planned (uncompleted) BLM projects in the vicinity of the project area were analyzed in the Rethin EA and would be completed in the next five years (USDI-BLM, 2013 Rethin EA). These projects include: thinning in RR (143 acres in the Upper Wildcat SWS, 9 acres in the Lower Wolf SWS), snag/LWD creation (about 350 trees) in RR (approximately 300 trees in the Upper Wildcat SWS), the removal of 4 barrier culverts (Upper Wildcat SWS), reduction in road sediment delivery miles (0.5 miles Upper Wildcat SWS), decommissioning of about 0.6 miles of road with sediment delivery potential (Upper Wildcat SWS), long term reduction in culvert failure risk (up to 490 cubic yards Upper Wildcat SWS), short term sediment delivery increase from haul of less than 1% (of background levels), and long term sediment delivery decrease from road improvements of less than 1% (of background levels Upper Wildcat SWS). The Rethin EA analysis concluded that all ACS objectives would be maintained at the SWS and WS scales.

Reasonably foreseeable future actions for private industrial and state lands include harvests (primarily clear-cuts) - typically on a 40 to 60 year rotation. Other landowners might also harvest their lands but not necessarily on a 40 to 60 year rotation. Yearly (non-BLM) harvest has averaged less than one percent of each SWS since 1972.

ACS 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.*

Alternative 1- No Action
Stand canopies would gradually become dense and closed, which would stagnate tree growth over time. Reduced sunlight reaching the forest floor would eventually stagnate and/or eliminate understory vegetation and impact structural diversity and species richness. Recruitment of snags and woody debris would continue to occur.

These stands would develop some diversity and complexity over the long term (many decades) through natural processes or when other management action takes place. The areas close to streams would continue to supply woody material of all sizes to the channels over time.

Alternatives 2, 3, 4
This ACS would be maintained (short and long term). The large number of untreated acres within the project area would continue to develop as under Alternative 1. This would include about 94% (alternatives 3 or 4) to 97% (alternative 2) of the RR acres. (1 and 2 site potential tree distance)

Direct and Indirect Effects:
There would be an uncut width of at least 150 feet around the streams adjacent to the treatment area (alternative 2). Alternatives 3 and 4 would be identical to this except for an additional treated area) that includes thinning harvest that is about 120 to 150 feet from stream 23-17. Tree harvest from this small area (approximately 0.1 acres) is estimated to be about 10 trees and post-harvest canopy cover in this area would be remain high (above 60 %). This additional area and is located in a different catchment (opposite side of the ridge) from stream 23-17.

The untreated areas under all action alternatives would continue to provide woody debris of all sizes to streams and upslope areas as under alternative 1. These areas would continue to: protect stream shading, protect stream channel/bank stability, provide organic material input to streams, and provide erosion control. Stream microclimates would remain unchanged or within natural variability because the wide, uncut areas and substantial canopy cover in the treated areas would provide adequate shading to the streams and the riparian areas.

Thinning in RR would vary from about 10 (alternative 2) to 20 acres (alternatives 3 and 4). This thinning would be more than 150 feet from all streams except for the small area (alternatives 3 and 4) described above. Thinning in the upslopes areas, by alternative, would be about 115 acres (alternative 2), 120 (alternative 3) or 155 acres (alternative 4). Thinning (in RR and upslope) would: enhance tree growth of the retained trees; promote understory vegetative development, vigor, and diversity; promote the retention of fuller crowns and larger limbs; reduce suppression mortality and slower growth; and enhance the development of emerging second story and multi-species canopies (Binkley, 1984). This would begin to occur after thinning and would enhance distribution, diversity, and complexity in the RR for about 10 to 15 years. Based on stand modeling, the thinning is estimated to increase the average diameter of the uncut trees by 4.4 inches (unit 1) to 4.8 inches (unit 2) fifty years after treatment in comparison to alternative 1 (Hann, 2009).

Existing down wood, snags trees with cavities, and large conifer trees would be retained (when there isn't a safety or operational issue) to maintain these stand elements in all the alternatives. Hardwoods would be reserved in all thinning areas under all the alternatives. Hardwoods would be reserved in the regeneration harvest areas under alternative 3 but not under alternative 2.

Alternatives 2 and 3 would include regeneration harvest (71 acres and 61 acres respectively) and alternative 4 would include the creation of about 10 acres cumulatively of small gaps (< 1 acre in size) which would promote early seral habitat and more heterogeneity within the stand project area. These changes to habitat would occur in the upslope areas as regeneration harvest would not occur in the one or two site potential tree RR. The untreated RR areas would remain on the current trajectory for habitat conditions under alternative 1.

The early seral habitat created under Alternative 3 would be more complex and longer lasting (20 years or more after harvest) than under alternative 2 (10 to 15 years after harvest) or alternative 4 (approximately 10 years after harvest).The persistence of this habitat would be longer lasting under alternative 3 because about half the acres would be naturally regenerated and the rest of the acres would be replanted at lower densities than under alternative 2. Mixed coniferous species would be replanted in these areas (alternative 3) and in the gaps (alternative 4) to provide a diversity of tree species. Future pre-commercial thinning of the regeneration harvested areas would potentially extend some of the early seral conditions for another 10 to 15 years for alternatives 2 or 3.

Cumulative Effects: Regeneration harvest or gap creation would not occur in the Lower Wildcat Creek SWS or the Lower Wolf SWS under any of the alternatives so there would no cumulative effect in these areas to early seral habitat. The benefits of thinning in these two SWS are also minimal at a sub-watershed scale. The small amount of thinning under all alternatives (< 20 acres Lower Wildcat Creek SWS, < 5 acres Lower Wolf SWS) represent less than 0.1 % (Lower Wildcat Creek SWS) and less than 0.03 % (Lower Wolf Creek SWS) of the SWS areas.

The recent (previous 15 years) thinning on BLM land and reasonably foreseeable future BLM thinning in these SWS also total a small portion of the sub-watersheds and minimal benefit at that scale. These totals are about 65 acres (0.3 % of the SWS area) for the Lower Wildcat SWS and about 40 acres (0.2 % of the SWS area) for the Lower Wolf Creek SWS.

Regeneration harvest in the Upper Wildcat Creek SWS for the alternative (two) with the most acres (71) of benefit to early seral habitat represents about 0.5 % of the SWS area. Alternative 3 would add a similar number of acres (61) and would be the only alternative to produce complex early seral habitat which is currently lacking within the SWS area. Other recent (previous 15 years) BLM regeneration harvests (similar to alternative 2) total about 150 acres (about 1 % of SWS area) in this sub-watershed. There are no other planned BLM regeneration harvests in this sub-watershed.

The 40 year average for clear-cut (early seral habitat) on other landowners' property in this sub-watershed is about 140 acres per year (approximately 1 % of SWS area). This trend in cutting is expected to continue for the reasonably foreseeable future. The effect would be similar to alternative 2 in that the created habitat would be primarily short term (10 to 15 year) low complexity early seral. Currently about 1,600 acres of other landowners property in this SWS is in low complexity early seral condition (clear cut in the last 15 years). This represents about 12% of the total SWS area. Newly harvested stands would provide some low complexity early seral habitat while old stands would lose this benefit when canopy overstory is greater than about 75 %.

The proposed thinning (approximately 125 acres- alternative 2, 140 acres- alternative 3, and 175 acres alternative 4) would add some short term (10 to 15 years) diversity and complexity at the project scale. The cumulative effect for this (Upper Wildcat Creek) SWS would be fairly limited (about 1 % or less of the SWS area for all alternatives).

These benefits would be added to similar BLM thinning projects in the SWS that have occurred recently or are reasonably certain to happen in the future. These other BLM projects within the Upper Wildcat Creek total about 450 acres which is about 3 % of the total BLM-owned SWS area.

Exact figures on thinning (recent and reasonably foreseeable future) on other landowners' property in the SWS are unknown but most of the historic activity has been clear-cut harvest when stands are 40 to 60 years old and it

is expected that this trend would continue. Harvest on private/state lands in this sub-watershed has averaged about 1 % (per year) of the SWS area over the last 40 years.

ACS 2: *Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.*

Alternative 1- No Action
Spatial and temporal connectivity within the planning area would be maintained in their current state. No barriers would be removed under this action. The drainage network would remain as is and the adjacent forest stands would continue to develop under the current trajectory.

Alternatives 2, 3, and 4
Spatial and temporal connectivity (aquatic and terrestrial) would be maintained at the site and SWS scales. There would be treated and untreated corridors between stands.

Direct and Indirect Effects: New stream crossings or barriers would not be added or removed so there would be no associated impacts to spatial or temporal connectivity within the project area. Water quality and flow are unlikely to be measurably impacted so there would be no alteration of migration routes along streams. The wide, uncut areas around all stream channels would maintain migration corridors for riparian and aquatic dependent species.

Suppression mortality would continue to occur in untreated RR that would supply snags and different size down wood over time as under alternative 1. The untreated skip areas would retain connectivity and areas of refugia in the upslope areas. The improvement in over story and understory variability in the thinned RR and the continued supply of small and large wood from the untreated RR would provide refugia for aquatic and riparian associated and dependent species and would maintain terrestrial and aquatic connectivity (lateral, longitudinal, and drainage) over the long term (several decades).

Cumulative Effects: The action alternatives would not result in a cumulative effect to the spatial and temporal connectivity as there are no direct or indirect effects that would impact the lateral, longitudinal, and drainage connections (floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia). Chemically and physically unobstructed routes would be available to aquatic and riparian-dependent species as under alternative 1.

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

Alternative 1- No Action
The physical integrity of the aquatic system would be maintained. Snags/woody debris would occur over time. The physical integrity of streams would improve over the long term (decades) as LWD is recruited into channels.

Alternatives 2, 3, 4
This ACS would be maintained at all scales. These alternatives would improve the physical integrity over the long term (decades) as LWD is recruited into the channels as under alternative 1. Most (greater than 99 %) of the existing trees that have the potential for future recruitment into the channels would be retained.

Direct and Indirect Effects:
Harvesting and yarding –There would be no direct alteration of the physical features of project area streams. The wide uncut areas adjacent to all streams would protect the physical integrity of the banks and channels. Yarding corridors are not needed across streams. Some cable lines would cross some of the channels but trees would not be cut. Some breakage of tree limbs is possible from line tensioning but this would not impact physical integrity. Root strength would be maintained in stream side trees.

Road, culvert, and haul - No existing stream crossing culverts would be replaced, removed or added. Road construction length would differ between alternatives but would not impact this objective as only about 70 feet of construction would occur within RR (one site potential tree distance). This area is about 140 feet from the closest

stream (in another catchment) and has no direct or indirect connection with this stream (23-17) because it is on the opposite side of a ridge. Road drainage would be filtered by a vegetated slope that is more than 500 feet from the closest downslope stream. No direct road/stream connectivity exists on the entire (non-paved) haul route. Relief culvert additions would reduce indirect sediment delivery segments by about 0.13 miles but the benefit would be dispersed and there would not be a measurable impact on the physical integrity of the aquatic system.

Stream side areas would continue to supply coarse woody material to the channels as under alternative 1. Physical integrity would be maintained because of the wide untreated areas around all streams, the small amount of treated area within RR, and the dispersed nature of the treatment areas. RR treatment would only occur on about 3% (alternative 2) to 4% (15 acres - alternatives 3 or 4) of the total (1 site potential tree distance) RR. These areas are a minimum of 150' away from any stream channel (alternative 2) except for a small area (approximately 0.1 acres) that is about 120' to 150' away from stream 23-17 (opposite side of a ridge) under alternatives 3 and 4. Approximately 10 trees would be harvested in this small area. Trees in the deadwood, green tree retention, aggregate, and skip areas are outside the RR (1 site potential tree distance) for all streams. Regeneration harvest areas would not occur within the RR.

Density management in the outer portion of the RR would accelerate the development of larger (retained) trees more quickly than under alternative 1. Fewer trees would remain for future recruitment channels. The estimated reduction in harvested trees that have the potential of reaching a channel is less than 1 % fewer trees than under alternative 1. The potential impact on physical integrity would be negligible because of the small number of acres involved, the small reduction in the number of trees for potential future recruitment, the dispersed nature of the action, and the wide no cut areas (150 feet or greater except for the small area described above) around all streams. These no-cut areas would continue to be sources of wood recruitment (small and large sizes) over the short to long term (few years to several decades) throughout the project area as under alternative 1.

Cumulative Effects: The action alternatives are identical to alternative 1 in that future LWD recruitment would help create pools and backwater areas, improve stream bank and channel stability, improve groundwater storage, and increase storage capacity of sediment and smaller wood. The action alternatives would not result in a cumulative effect to the channels (shorelines, banks, bottom configurations) as there are no direct or indirect effects that would impact the physical integrity of the aquatic system.

ACS 4: *Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.*

Alternative 1- No Action
Water quality is likely to remain within the range that maintains biological, physical and chemical integrity of the stream system. Future water quality is dependent on the actions, interactions, or activities of: landowners, regulatory agencies, watershed councils, or others that occur in or are connected to the analysis area. Water temperature increases are possible on some streams draining private forest lands in the project area sub-watersheds. The Oregon Forest Practices Act allows some harvest of shade providing vegetation on private industrial lands.

There are no other planned BLM projects within the project area that would affect water quality. Other BLM projects in the project area sub-watersheds were analyzed in the Rethin EA and would maintain this ACS objective protect shade along stream reaches and maintain stream temperature. Riparian areas are improving on BLM managed land in the project area sub-watersheds as these areas are no longer managed for timber production. The remaining young stands (BLM lands) are recovering and would eventually provide increased shade levels.

Alternative 2, 3, 4
This objective would be maintained under these alternatives at all scales. Water quality would remain within the range that maintains chemical, biological, and physical integrity.

Direct and Indirect Effects:
Stream Temperature - Solar radiation is generally considered the most important source of radiant energy to impact stream temperature (Beschta 1997, Boyd and Sturdevant, 1997). Measurable changes to stream

temperatures would not occur because of the wide no harvest areas around all streams and the post-harvest retention of many trees in the adjacent areas would minimize changes to stream shading. Streams within the project area are currently well shaded (canopy cover of 65% to 90%). Most (~ 88 %) of the streams in the project area are 1st and 2nd order streams that have narrow channels (a few feet wide) that are also shaded by factors other than just over story tree cover. Hill slopes (topographic), stream banks, woody debris (channels/banks), and stream side shrub layers would also continue to provide shading as these areas would be unaltered.

Most of the streams (approximately two-thirds) would have no-cut areas of at least one site tree distance (220') from the channels. Regeneration harvest would not occur within the one and two site tree RR (220' to 440' from the channels). RR treatment would only occur on about 3% (10 acres-alternative 2) to 4% (15 acres- alternatives 3 or 4) of the total (1 site potential tree distance) RR. Thinned areas would be a minimum of 150' from any channel under alternative 2. Alternatives 3 and 4 would also have minimum buffer widths of 150' except for a small area (about 0.1 acres) that is about 120' to 150' from stream 23-17. Approximately 10 trees would be harvested in this area and canopy cover would exceed 60 % post-harvest. Stream temperature changes would not be measurable from these actions.

Research that examined clear-cut harvest indicates that for buffer widths of 150 feet to 225 feet effects to stream shading were either not detected or were minimal (Anderson *et al*., 2007, Groom *et al*., 2011a, 2011b; Leinenbach *et al*., 2013). These studies included some harvest within the "buffered" areas and the no-cut areas were much narrower (25' no-cut buffer) than proposed for this project. The low percentage of treated RR, the wide untreated buffers, and the relatively high post-harvest retention (49% to 66% canopy cover) of trees in the treated RR areas would maintain shading and water quality.

Stream temperature changes from road construction/renovation would not occur because very few trees would be removed within one site tree distance (220') RR of any channel. Road construction within RR would be limited to about 100 feet of road in the outer portion (a minimum distance of approximately 140' from the channel) of the RR of stream 23-17 (see maps 3 and 4). The action would occur above the initiation point of the stream and would not be adjacent or parallel to the stream. Only a few trees (approximately 5 trees) would be harvested in this area and canopy closure (greater than 60%) would be retained in this area.

Prescribed/Pile Burning-sediment and nutrients - Fire lines and active control during and after prescribed fire ignition will reduce the potential of fire creep or uncontrolled burning into any of the RRs. Broadcast burning would not occur within RR. There would be erosion control on fire trails, and the retention of larger fuels on the slopes (post burn). These wide areas (minimum of 220' from any channel) would absorb runoff and trap sediment, ash, or nutrients before they reach any stream channels.

Pile burning would be outside the RR (1 site potential tree distance – a minimum of 220') of all streams. Burned areas would be small and would be surrounded by much larger undisturbed (vegetated/organic material) areas. These areas would absorb runoff and trap sediment, ash, or nutrients before they reach stream channels.

Hazardous spills - The risk of petroleum products/hazardous material spills reaching streams is low. Refueling would not be allowed in close proximity to channels and the requirements for spill prevention and containment plans would minimize the risk of contamination of streams. Yarding would be prohibited on days with high rainfall amounts (> 1" in 24 hour period) and saturated soils to reduce the risk of a hazmat spill reaching a stream. Ground based equipment would be at least 225 feet (typically more than 300 feet) from any stream. This equipment would only be on slopes of 35% or less.

Dissolved Oxygen/pH/Conductivity -Measureable effects would not occur on DO/pH or conductivity levels as a result of these alternatives. Most of the project area streams have moderately steep gradients, and turbulent flow. This type of stream rapidly replenishes DO (Ice, 1978). The wide no-cut areas adjacent to all streams, the lack of yarding corridors, and the lack of direct stream connectivity reduce the potential for deposition of fine organic material other than in incidental amounts (branch fall from cable tensioning). Forest management activities typically do not have an effect on conductivity or pH (EPA, 1991).

Cumulative Effects: The alternatives are not expected to have any detectable on stream temperature, dissolved oxygen, conductivity, pH, hazardous material, or nutrient addition even at a project area scale and would not result in cumulative effects.

ACS 5: *Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.*

Alternative 1 – No action
The sediment regime would be maintained over the long term (decades) but sediment levels could vary from year to year. There would be no BLM increase in road use from haul or yarding/harvest activities and no expected increases in sedimentation. Sedimentation would continue to occur where there is road/stream connectivity until these areas are improved. New roads might be constructed to access private and state lands but road design and construction practices have been greatly improved over legacy road construction. New road construction practices require greater protection of water quality. Older legacy roads are likely to be improved or decommissioned over the long term (decades).

The other planned BLM projects (USDI-BLM 2013, Rethin EA) include activities with short term (< 1 year) increases in sediment but would result in lower long term (many decades) sediment delivery. The projects include the removal of 4 barrier culverts, reduction in road sediment delivery miles (0.5 miles), decommissioning of 0.6 miles of road with sediment delivery potential, long term reduction in culvert failure risk (up to 490 cubic yards), short term sediment delivery increase from haul of less than 1% (of background levels), and long term sediment delivery decrease from road improvements of less than 1% (of background levels). There is no new road construction associated with these projects. These projects would be completed under dry season conditions with erosion control methods utilized to minimize sediment delivery

Alternative 2, 3, 4
Direct and Indirect Effects: This objective would be maintained at the site and SWS scales.
Yarding and Harvest -The wide, no-cut areas around all channels would retain undisturbed vegetation/duff and un-compacted soils that provide sediment filtration around all streams. Buffer widths of at least 33 feet are an effective measure to prevent sediment delivery to streams in most cases (Rashin, *et al*., 2006). No yarding corridors across streams are needed for harvest and no disturbance would occur to stream banks and channels. There are no pathways for measureable increases to sedimentation to occur from the proposed yarding and harvest activities.

Ameliorated compaction from road/landing construction, and cable/ground yarding is estimated at about 3 (alternative 2) to 6 acres (alternative 4). Compacted areas would not produce measurable sedimentation because these areas would be dispersed (six catchments); the compacted areas would be ameliorated; erosion control methods would be applied as needed during the dry season; and all streams would have wide, uncut vegetated buffers that would filter (trap) erosion before it reaches any stream channel.

Road/landing Construction, Renovation, Improvement - Road construction would be outside the RR of all streams except for a short segment in the outer RR of stream 23-17. A relief culvert added at the start of this road would filter (trap) any erosion on to a gently sloped side hill away from any stream. The road renovation and improvements would reduce indirect delivery by about 0.13 miles. There are no (connected) stream crossings on the (non-paved) access routes and there would be no new stream crossings. There would be no increase in road/stream connectivity so sedimentation is not expected to increase.

Landings would be placed outside RR of all streams except for one possible location above stream 19-18. This area would be on an existing road and on a ridgeline and would be more than 100 feet from any stream. This area is on the opposite side of the ridge and a harvest area of only about 2 acres would be utilized by this landing. The areas between the landing and stream 9-18 would not be treated and the well vegetated slopes would filter (trap) any sediment.

Timber Haul - Haul over access roads is not expected to deliver measurable amounts of sediment to the stream system. There are no direct sediment delivery segments on the (non-paved) access route. There is one crossing over a channel with scour/deposition (stream 9-20 see map 3 and 4) but this channel is discontinuous with the rest of the stream network and is no risk to downstream sedimentation. The channel ends on a bench just below the road and does not continue down slope. The area between this stream and the closest stream (~ 300 feet downslope) would not be harvested and the existing vegetation/duff layers would adequately filter (trap) any road sediment. Paved roads are would not produce measurable sediment from haul (Reid and Dunne,1984) because of the resilient nature of the surfacing. All new roads used for winter haul would be rocked and additional rock would be added, where needed, to maintain existing road surfacing during the lifetime of the project.

Road and harvest activities are not expected to cause a detectable increase in sedimentation even at a project area scale. Future LWD recruitment from the untreated areas would maintain stream stability and improve channel storage of sediment, nutrients, and small debris as under Alternative 1.

Cumulative Effects: There would be no potential for cumulative effects for this ACS objective as there would not be direct or indirect effects that would produce a detectable change in sediment supply or transport at the project area scale.

ACS 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. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.*

Alternative 1- No Action
The flow regime would be maintained. Conditions that affect flows would be subject to the future actions of the BLM and other land owners (private timber companies, private land owners, and state) in the analysis area. Harvests on private industrial lands are likely to continue sporadically- typically on a 40 to 60 year rotation. The level of future harvest of other landowners land is unknown but the average yearly harvest (private and state land owners) in the project area sub-watersheds has averaged less than 1 % of these areas over the last 40 years. While new harvests would occur, older harvest areas would continue to recover hydrologically when the majority of the basal area is re-established (10 to 30 years post-harvest).

There are no other planned BLM activities at the project area scale that would affect this alternative. Planned BLM harvest in the project area sub-watersheds would be about 450 acres (thinning) in the Upper Wildcat Creek SWS (approximately 3 % of SWS area), about 51 acres (thinning) in the Lower Wildcat Creek (0.2 % of SWS area), and about 40 acres (thinning) in the Lower Wolf Creek SWS (0.2 % of SWS area).

New roads are likely to be constructed to access private/state forest lands. Roads no longer needed for access might also be decommissioned by landowners. The extent of future construction/decommissioning on private and state lands cannot be determined but existing roads are currently in the low risk category (0 % to 4 % area covered by roads) for peak flow impacts under the OWEB assessment method (WPN, 1999) for the project area and sub-watersheds. Road design and construction practices have greatly improved from legacy road practices as required on industrial and state forest land by the Oregon Department of Forestry. New roads are thus less likely to be connected to streams and so would be less likely to impact peak flows. Older legacy roads are also likely to be improved or decommissioned over the long term (decades) which would reduce road influence on peak flows.

The other planned BLM activities would not involve new road building but would result in a net decrease in road connectivity of about 1.1 miles (approximately 1 % of the SWS road miles) at a SWS scale (Upper Wildcat SWS) from road decommissioning. There would be no reduction of 0.13 miles of road/stream connectivity from adding cross drains as under the action alternatives.

Alternatives 2, 3, 4
These alternatives would maintain sufficient in-stream flows to create and sustain riparian, aquatic, and wetland habitat. Patterns of sediment, nutrient, and wood routing would be retained. The magnitude, timing, duration, and the spatial distribution of flows would be protected.

Direct and Indirect Effects:
Peak Flows – (Compaction) – The existing roads are in the low risk category (0% to 4% of total area) for peak flow impacts. The estimated ameliorated compaction from skid trails, roads, and landings is about 3 (alternative 2) to 6 acres (alternative 4). These areas would be dispersed in six catchments and additional compacted area would total about 0.2% (alternative 2) to less than 0.05 % (alternative 4) of the project area and less than 0.04 % of the Upper Wildcat SWS. These areas would have no connectivity (direct or indirect) to the streams and intercepted precipitation would be drained to the adjacent forest floor where it would quickly infiltrate. Flow alterations are not expected to be measurable at the project scale because of the low amount of widely dispersed compaction and the lack of connectivity with the streams.

Peak flows- (snow accumulation/melt- Rain-on-snow) - Snow is not a significant contributor to annual precipitation as the project area is in the rain dominated hydrologic zone. The most susceptible areas to ROS events are in the rain-on-snow zone which in this portion of the Oregon Coast Range is above 2,000' elevation (Greenberg and Welch 1998). The treatment areas are located below 1,500' in elevation with more than half of the area below 1,200'. The project area and the adjacent sub-watersheds (SWS) are low risks (WPN 1999) for peak flows from ROS events. This is because these areas are rain dominated lower elevation areas with very little (less than 1 %) open area (< 30 % canopy cover) in the areas most susceptible to snow accumulation (rain-on-snow zone) in the SWS areas. The project area does not have any area in the rain-on-snow zone.

Peak Flows- (Road/Stream Connectivity) - Road connectivity to streams can influence the timing of runoff and can increase or decrease peak flows (Wemple, 1994, Grant et al., 2008). An increase in road connectivity extends the stream network and speeds up the timing of water runoff which can alter peak flows. Similarly a decrease in road connectivity can improve existing conditions by decreasing the influence of roads on the timing and magnitude of flows. There is no direct road/stream connectivity on the non-paved haul route and there would be no new stream connectivity from the proposed road work.

Connectivity was determined for the entire haul route from field surveys. These surveys indicate that indirect connectivity would be reduced by about 0.13 miles on the proposed haul route within the addition of cross drains. Changes to the timing and/or magnitude to flows are not expected to be detectable even at a project area scale because the reduction in connectivity is dispersed across three different catchments, the existing connectivity is indirect, and the overall reduction is on a relatively short length of road. The paved portion of the haul route would not involve any increase or reduction in stream connectivity as no activities other than haul would occur.

Peak Flows- (*Harvest*) - The alternatives would be a low risk to peak flow changes from harvest under OWEB (WPN 1999) methodologies because the harvest would occur entirely within the rain dominated precipitation zone. Alternatives 2 or 3 would remove a similar amount of vegetation while alternative 4 would remove less overall vegetation. Large peak flows (flood flows) do not appear to be significantly affected by harvest or roads (Harr, 1976, Grant et al., 2008).

A review of the research in the rain dominated areas in western Oregon/Washington found that measurable peak flow responses are detectable only when at least 29% of an area is harvested (Grant et al., 2008). The mean value for flow change detection occurred when 45% of an area was harvested (Grant et al., 2008). The report suggests that the mean value is often more appropriate for larger "basins" (>2500 acres) and less intense treatments such as thinning and "small" patch cuts (<25 acres). The action alternatives fit the less intense treatments as described above because the proposed harvest treatments would be thinning and small patch cuts (< 1 acre to 17 acres) except for one regeneration harvest area under Alternative 2 which would be about 27 acres in size.

A very small number of acres would be harvested (thinned) in the Lower Wolf SWS (< 5 acres) and the Lower Wildcat SWS (< 20 acres) so impacts to flow were not analyzed in these areas. These sub-watersheds are currently well below 29% harvested area and the reasonably foreseeable future BLM projects would total less than 60 acres for either SWS (0.2 % of the SWS areas). The remaining harvest would occur in the Upper Wildcat SWS.

An analysis completed by the BLM area hydrologist indicated that the harvested area is currently below 22% of the Upper Wildcat SWS area. The proposed BLM harvest, other planned BLM harvest, along with the reasonably foreseeable future actions of other landowners (historic average harvest) indicated that the net area harvested would remain below 25% in the Upper Wildcat SWS for all alternatives. This level is below the 29% harvest level associated with detectable peak flow changes for small catchments and well below the 45% harvest level associated with larger catchments (>2,500 acres) and areas with less intense treatments. The sub-watershed areas in the project area exceed 13,000 acres. The net area harvested was simulated for a period of twenty-five years (2015 to 2040). This time period was chosen because it represents a time frame when significant hydrologic recovery would occur from the proposed action alternatives.

A project scale analysis was also conducted on four smaller catchments (in the project area) to examine net area harvested over the same time frame (as above) by including the proposed BLM harvest, other planned BLM harvest, along with reasonably foreseeable future actions of other landowners. The net area harvested would

remain below the 29 % harvest level associated with detectable peak flow changes for small catchments for all alternatives over the twenty five year period.

Low Flows - A short term (few years to <1 decade) beneficial increase in low flows is possible in some of the individual small drainages within the project area but would be difficult to detect with normal means of flow measurement even at the project area scale. Summer low flows can increase following a reduction in ET but the effect diminishes as forest regrowth occurs (EPA, 1991). The increase in flow can help maintain cooler stream temperatures during the summer months. Low flow changes would not be detectable at a SWS scale.

Cumulative Effects: There would be no cumulative effects for this ACS objective as there would not be direct or indirect effects that would produce a detectable change in the timing, magnitude, duration, and spatial distribution of peak, high, and low flows.

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

Alternative 1 - No action
Floodplain inundation and water table elevation in meadows and wetlands would be maintained. Passive addition of woody debris could occur over time as the stands mature and mortality occurs. This could improve floodplain inundation, pool frequency, groundwater storage, and channel aggradation on the larger streams in the long term (decades).

Alternatives 2, 3, and 4
Direct and Indirect Effects: This ACS would be maintained. No meadows were found within the project area. All streams would be buffered by wide, uncut areas. There would be no alteration of streams, wetlands, or floodplains.

No stream culvert restoration projects are proposed for any of the alternatives. Road construction/renovation and cross drain additions would not impact this objective because of the distances these operations would be from streams. Cross drain additions would be more than 120' from any stream. Only about 100 feet of road construction would occur within RR and it would be about 140 feet from the closest stream. There is no direct or indirect connection with this stream (23-17) because it is in on the opposite of a ridge. The rest of the new road construction, renovation, and improvement would not have any direct or indirect connectivity to the stream system. Passive addition of large in-stream wood would be identical to Alternative 1 in the uncut areas for these alternatives (long term – many decades) and would have the same benefits.

RR on about 10 (alternative 2) to 15 acres (alternatives 3 or 4) would be treated within 1 site potential tree distance of channels. Post treatment canopy closure would remain high (49 % to 66 %) in these areas. There would be an estimated reduction (in comparison to alternative 1) of less than one percent of the harvested trees within the RR (1 site potential tree distance) that would have had the potential to reach a channel. This assumes that 10 % of the trees from the outer portion of the RR (150' to 220' from the channel) have the potential of reaching a channel. This small reduction in available trees would have no measurable impact on the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands

Cumulative Effects: All action alternatives are beneficial in the potential of providing future woody debris as under alternative 1. Future LWD inputs would improve floodplain inundation, pool frequency, groundwater storage, and channel aggradation as under alternative 1. There would be no cumulative effects as there would be no direct or indirect effects that would alter the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

ACS 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.*

Alternative 1- No Action
Current rates of surface/bank erosion, channel migration, summer/winter thermal regulation, nutrient filtering, and delivery of coarse woody debris would be maintained. Structural diversity and species composition would initially

be reduced as canopies close. Suppression and mortality of overtopped trees and understory would increase. The over story and understory would develop diversity and complexity over the long term (many decades) through natural processes or when other action takes place.

Alternative 2, 3, 4
Direct and Indirect Effects: The species composition, distribution of coarse woody debris, and structural diversity of plant communities in the no-cut areas would be identical to alternative 1 and would be maintained. The wide, uncut areas around streams/wetlands and the lack of yarding corridors across streams would eliminate direct disturbance to the riparian plant communities other than incidental amounts of branch fall (from cable line tensioning).

Current rates of surface erosion, bank erosion, nutrient input and filtering, delivery of coarse woody debris, and channel migration would be maintained in the no-cut areas as under alternative 1. There would be no impact from road construction, renovation, or improvement to the riparian/wetland plant communities. There is no mechanism for these activities to have a measurable effect because they would not be in close proximity to any stream or wetland. Shading would be maintained by the retained trees in the uncut areas (RR) and the upslope areas which would provide adequate summer/winter thermal regulation. There would not be a discernable change in the timing, magnitude, duration, and spatial distribution of peak, high, and low flows that would impact bank erosion; channel migration; or patterns of sediment, nutrient and wood routing.

Approximately 10 (alternative 2) to 15 acres (alternatives 3 or 4) would be treated within the (1 site potential tree distance) of RR. Accelerated diameter growth and reduced mortality from competition would occur in the treated RR. There would be an estimated reduction (in comparison to alternative 1) of less than one percent of the harvested trees within the RR (1 site potential tree distance) that would have had the potential to reach a channel. This small reduction in available trees (outer 1 site tree RR) along with the wide, uncut areas around all streams would have no measurable impact on the species composition and structural diversity of plant communities in the riparian areas and wetlands or on physical complexity and stability.

Cumulative Effects: There would be no cumulative effects for this ACS objective. There would no direct or indirect effects that would produce a detectable change to species composition and structural diversity of plant communities in riparian areas and wetlands, summer and winter thermal regulation, nutrient filtering, surface and bank erosion, channel migration, or physical complexity and stability

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

Alternative 1- No Action
Riparian dependent native plants, invertebrates and vertebrate species would be maintained in this alternative. Without thinning RRs would self-thin and differentiate under the no action alternative but could take decades, if not centuries for natural processes to convert the Douglas-fir monoculture into complex habitat (Donato *et al*., 2012 p. 3).

Alternatives 2, 3, 4
Direct, Indirect, and Cumulative Effects: The actions proposed by this project, especially thinning and dead wood creation in Riparian Reserves, would help maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species by maintaining and restoring the distribution, diversity, and complexity of watershed and landscape-scale features, such as diverse plant communities, thermal regulation, and connectivity to which wildlife species, populations, and communities are uniquely adapted.

Effects on native riparian plants should be minimal under all alternatives and riparian dependent species would be maintained because no-cut riparian buffer widths are 120 feet or greater, except the 0.1 acres in section 23, and no corridors for yarding are proposed through riparian areas. Changes in shading, stream temperature and peak flow are expected to be minimal as well, hence indirect effects on species are not expected. Riparian forest communities consist of mostly hardwoods, and are not being considered for removal in riparian reserves. All of the alternatives would maintain habitat to support native riparian-dependent plants.

4.2 Issue 2: What is the effect of harvest, prescribed fire and reforestation on the persistence and complexity of early seral habitat?

Direct and Indirect silvicultural effects

Alternative 1

The spatial extent of early seral habitat, described in the analysis as stands under 30, is currently extremely low on the Siuslaw Resource Area. Complex high quality early seral habitat is defined as stands with less than 30% canopy cover of trees greater than 10 inches at diameter breast height (DBH), and contains large remnant conifers and hardwood trees with a variety of snag, down wood amounts and decay class (Swanson, 2014). Mid seral stands dominate the project area, and are largely single-storied Douglas-fir monocultures. Understory vegetation and young trees would continue to compete for the limited light and resources available under the overstory canopy. Overstory trees would continue to grow at a decreasing rate, perpetuating a closed canopy, with limited understory vegetation. Late seral habitat would eventually develop, but could take decades, if not centuries for natural processes to convert the Douglas-fir monoculture into complex habitat (Donato *et al.,* 2012 p. 3).

Without management action, the only means of introducing complexity would be natural disturbance (Rapp, 2002). Very small pockets of laminated root rot (*Phellinus weirii*) in section 9 would continue to slowly kill the Douglas-fir, and create small openings of mixed conifers and understory vegetation. Occasional natural debris flows and small landslides would also contribute to small-scale disturbance, creating early seral habitat. Stand replacing fire historically is infrequent in the Oregon Coast range. This coupled with modern fire suppression practices decrease the likelihood of the stand experiencing a moderate to high intensity wildland fire. In the event of wildfire, the stand would revert back to mostly early seral, with pockets of remnant trees and islands of mixed-seral forests.

Alternative 2

In alternative 2, regeneration harvest would convert mid seral stands to low-complexity early seral in the short term on approximately 70 acres. Post regeneration harvest site preparation by either prescribed burning or piling would ensure suitable planting sites with limited amounts of competing vegetation for new seedlings. Traditional reforestation and stand maintenance such as planting primarily Douglas-fir seedlings at approximately 400 trees per acre (depending on site conditions and seedling availability) and post-planting vegetation control would ensure coniferous seedlings occupy all growing space on the site. Coniferous dominance of the site would be promoted, with a goal of full canopy occupancy in five to ten years. Once the site is fully occupied (>75% canopy occupancy), and tree-to-tree competition begins to impede the growth of the saplings, a pre-commercial thin would most likely be implemented which would potentially delay full canopy closure by the conifers until age 20-25 years post planting.

These reforestation methods and prescribed burning contribute to maximizing a sustainable supply of timber (USDI-BLM, 1995); however, stand complexity would not persist. Under traditional reforestation techniques, the complexity that includes grasses, forbs, and shrubs of early seral conditions declines because of post-planting vegetation control and also because conifer overstory canopy cover increases. Almost no complexity remains when conifer overstory is greater than about 75%. Some elements of complexity, such as grasses, forbs, and shrubs may persist for 10-15 years (up to 20 -25 years if pre-commercially thinned), but they will not be abundant after about ten years.

Heterogeneity would be introduced into the project area because of the regeneration harvest. Schoonmaker and McKee (1988) studied clearcut sites in the western Oregon Cascades, and found that there was a peak in shrub and forb cover at age 10 to 20. They also studied the species diversity and community composition in sites that had been clearcut, burned and planted in the western Oregon Cascades. They documented the changes in diversity and composition over a 40 year timeframe and found that post-harvest cover of species found in pre-harvest stands was initially low, but rapidly increased over time. Under traditional reforestation techniques, the complexity that includes grasses, forbs, and shrubs of early seral conditions declines as conifer overstory canopy cover increases until very little complexity remains when conifer overstory is greater than about 75%. Some elements of complexity, such as grasses, forbs, and shrubs may persist for 10-15 years (up to 20 years if pre-commercially thinned), but they will peak and start to diminish after 10-20 years (Schoonmaker, McKee, 1988). Broadcast burning would contribute to some pioneer species, such as grass, forb, and shrub species that benefit from fire, to occupy the site for a short time (2-5 years), but reforestation maintenance treatments would remove any competing vegetation, and full Douglas-fir site occupancy would shade out most understory vegetation. If stands are pre-commercially thinned and pruned, they would maintain more complexity for 20-25 years because pruning would allow more light to reach below the over-story.

Habitat characteristics of the entire project area would improve indirectly post-treatment due to the heterogeneity created from the regeneration harvest. Natural disturbance is a key factor in the development of complex late

successional forests (Franklin, 2002, Frelich, 2002). The regeneration harvested areas mimic a natural disturbance event to some extent due to burning, green tree retention, and dead wood creation, thus providing some relatively high complexity to the entire project area for about 10 years and then declining complexity over time as over-story canopy closes. Snags would fall within about 30 years because they would be small when created, about 20" dbh (Ohmann, 2002). Green tree retention trees would continue to grow larger diameter boles and limbs as well as taller and wider crowns that maintain complexity but also adversely affect growth of understory trees nearby.

Assuming that optimization of timber values continues as objective of future prescriptions, then the reforested stand would progress into mid seral conditions as a Douglas-fir monoculture. Understory vegetation as well as secondary canopy development would be limited. By mid-seral age, the stand would progress similarly to the no action alternative, except for the green tree retention trees, which would be roughly 30-45" dbh 50 years after harvest.

Alternative 3
Treatments for regeneration harvest in Alternative 3 provides for complex early seral habitat (approximately 60 acres). Although low density reforestation measures would be taken to ensure coniferous stocking of the site after regeneration harvesting, non-traditional methods would be employed to achieve maximum heterogeneity and complexity, while still meeting minimum stocking requirements for future growth and yield of timber.

In alternative 3, post regeneration harvest, the following would contribute to the persistence of habitat complexity; hardwoods that remain wherever operationally feasible, retained super-story remnant trees, use of natural regeneration as the reforestation method where resource conditions allow for burning to prepare the site, and minimal vegetation control to ensure adequate conifer stocking. In areas that are not burned, prescribed planting of mixed conifers at approximately 200 trees per acre (depending on site conditions and seedling availability) would further contribute to persistence of habitat complexity.

Miller, Bigley, and Webster (1993) compared planted and naturally regenerated plots in 35-38 year-old Douglas-fir in western Washington and Oregon. They found that despite an average two year delay in planting, dominant Douglas-fir in planted stands on average take three fewer years to reach breast height than trees naturally regenerated. They also found less stems per acre of Douglas-fir, and more stems per acre of mixed species in naturally regenerated stands. Volume and diameter were higher in the planted plots over the naturally regenerated plots, which they attributed to the delay in establishment, and higher variability of stocking of the naturally regenerated stands (Miller, Bigley, & Webster, 1993). With this information, coupled with regional and historical observation of naturally regenerated stands, a delay in establishment of coniferous species of approximately 10 years is expected for the naturally regenerated units. Monitoring would be implemented for coniferous presence. Variation in stocking and density is anticipated in the areas of natural regeneration. Where densities exceed desired stocking levels (~200tpa), pre-commercial thinning would be prescribed to keep the conifer trees growing and the stand open. Similar monitoring and management would be employed for the planted areas.

The highest level of complexity and persistence of early-seral conditions is anticipated to come from the naturally regenerated units. These stands would be burned, which would prompt pioneer species, such as grasses and other fire-adapted plants, to occupy the site. Coniferous seedlings would eventually grow in, but delayed approximately 10 years (Miller, Bigley, and Webster, 1993) when compared to a traditional plantation of 400 trees per acre of Douglas-fir. Areas managed for mixed species would have more heterogeneity and complexity than single-species plantations as analyzed in alternative 2. Because the stand would be planted at low densities, early seral persistence would be expected for 20 or more years. Structural complexity in both planted and naturally regenerated areas would be affected at the time of harvest when openings are created, large remnant and other green trees including hardwoods are retained, prescribed burning is implemented, seedlings are planted, snags and down wood are created, and especially when vegetation is killed or retained with pre-commercial treatments. Gaps with no conifers, variation in stocking levels, hardwood establishment, remnant conifer retention, hardwood retention, and dead wood creation would all contribute to create and prolong high quality early seral conditions due to structural and species richness and complexity.

Alternative 3 reforestation methods, coupled with prescribed fire, would provide for complex stands from initiation (Donato, et al., 2012), which would in turn provide many options for complexity as the forest grows into mid and late seral conditions.

Alternative 4
A few acres of openings no-greater-than 1 acre would be created during harvest or during dead wood creation across the GFMA lands in alternative 4 (approximately 10 acres total). The remaining harvest acres would be thinned. Similar reforestation measures as alternative 3 would be employed in the created gaps, with mixed coniferous species planted at low densities (approximately 200 tpa). The effects of reforestation will be minimal in alternative 4 compared to the other two action alternatives. Hardwoods would be retained where feasible which would contribute to structural and species diversity. Prescribed fire would not be applied.

The few acres of small openings in Alternative 4 would create pockets of early seral conditions. Complexity within these pockets would increase but would be different in early seral forbs and shrub composition from Alternative 3 and Alternative 4 because no burning would be implemented. Gaps would be monitored for coniferous establishment. If establishment is not recognized within 10 years, additional action may be taken to ensure stocking levels meet the desired minimum (about 150 trees per acre). Early seral conditions would likely persist for the amount of time the residual trees on the perimeter of the opening grow and shade out the seedlings, and for the time it takes for the planted seedlings in the middle of the gap to become established, which would be approximately 10 years (Gray & Spies, 1997). With the small gap size (<1 acre), more edge and shading of seedlings would be present than the regeneration harvest units in Alternatives 3 and 4, which would provide for more shade-tolerant species surviving and persisting as an understory species in the shade zone of the residual trees in the perimeter. Because of this, the small early seral gaps would introduce more heterogeneity and species diversity into the thinning areas on a stand level, but the limited size in overall gap creation for Alternative 4 would have a very small impact on the quantity and quality of early seral habitat on a project and SWS level.

Cumulative silvicultural effects
It is the naturally regenerated stands that are considered complex high quality early seral habitat. Direct and indirect effects of the action alternatives to the persistence of complex quality of early, mid, and late seral habitat is beneficial on a stand level, but very minor when included with the incremental effects and compared to the distribution of seral stages across the 6th field watershed (SWS).

As described in the affected environment, the current distribution of seral stages across the sub-watersheds on BLM lands does not reflect the historical distribution. Private and some state lands within the SWS do contain early seral habitat, but the traditional reforestation practices employed by these landowners of planting at high densities to reach full coniferous occupancy do not achieve naturally diverse early seral conditions, or what could be considered complex, as described by Swanson *et. al*. (2011). They describe complex early seral conditions as highly diverse, trophic-rich, and function rich ecosystems. Donato *et al.,* (2012) argue that naturally regenerated stands are “born complex,” meaning the way a stand is initiated can contribute to a lifetime of stand complexity. They hypothesize that young stands can exhibit complex qualities typically associated with old growth forests. These young complex stands will typically persist longer than the planted and highly managed stands due to lower coniferous occupancy. Management actions taken on a stand, such as prescribed fire, pre commercial thinning, and planting etc., would influence the persistence (temporal scale) of the action alternatives.

Most past, current, and foreseeable actions on BLM within the 6th field watersheds are thinnings to promote primarily tree growth of the residual stands (541 Acres). Within these partial harvest thinning treatments, minor gaps (less than ¼ acre openings) would be implemented in a few of the sales, but none are regeneration harvest sales, which would convert the monoculture Douglas-fir plantations into complex early seral conditions as described above. Two regeneration harvests have taken place within the last 15 years, totaling approximately 126 acres. These timber sales were sold in 2003 and 2004, and were replanted in 2005 and 2006. This provides low-quality early seral habitat within the sub watershed. Coniferous dominance could be expected within 10-20 years, unless the sale areas are pre-commercially thinned, then the persistence of the early seral habitat in these areas could be expected to last for approximately 10 more years.

The most acres of early seral habitat will be created in Alternative 2 (approximately 70 acres); however, this early seral habitat could be considered low quality due to the predicted structural growth and complexity resulting from the reforestation management techniques. This coupled with past BLM regeneration harvests that can still be considered early seral habitat today within the SWS accounts for less than 0.9% of the BLM owned land base within the SWS. Alternative 3 would create the most acres of complex high quality and persistent early seral habitat (approximately 60 acres), which is lacking within the SWS area.

As described in the affected environment, most of the approximately 25,800 acres of privately owned lands within the vicinity will continue to be managed on a 40-60 year rotation, with high intensity site preparation and

vegetation management. These practices remove all shrubs, forbs and hardwoods via site preparation and herbicides, which significantly diminishes the persistence and quality of the early seral habitat. Approximately 36% of private ownership within the subwatersheds has been clear cut within the last 15 years, and could be considered low quality early seral habitat. The rest of the ownership is older than 16 years, and would be regenerated before late seral conditions occur.

As described in the Affected Environment, regeneration harvests and partial harvest thinnings are conducted on state lands, including those directly adjacent to the project area. Based on visual observation of the regeneration harvests adjacent to the project area, low quality early seral habitat within the area will increase, but be limited to 10-20 years due to intensive coniferous reestablishment. Higher tree retention in the regeneration harvest area on State lands will provide for some improved quality of mid and late seral habitat when compared to the industrial practices. The State of Oregon owns approximately 5,000 acres within the SWS analysis area. Of that, approximately 16% is low quality early seral habitat, 5% is very young (16-30 years) and 78% is in stands older than 30 years (less than 1% is non-forested).

Based on visual observation and a state ownership database that details timber harvests within the last few decades, an estimated average of 410 (0.7% of the SWS) acres per year will be clear-cut harvested between private and state lands in the SWS, converting mid seral stands to low-quality early seral habitat. This coupled with the past regeneration harvests of 126 acres, and the regeneration harvest in Alternative 2 would immediately create 606 acres, or approximately 1% of the SWS of low quality early seral habitat. The approximate 410 acres of new early seral habitat created each year on state and private will continue, but at described earlier, only persist for 10 to 20 years, depending on site preparation and density management techniques.

Direct and indirect botanical effects

Alternative 1
Under the no action alternative, slow progression into late-seral conditions would continue, with early seral species predominantly on roadsides and ownership boundaries, in tree fall pockets, and in areas of ongoing root rot. Community dominant shrubs and ferns would remain at intermediate levels.

All action alternatives
Vegetation effects of timber harvest and succession have been extensively studied. Halpern (1989) found that a majority (71-82%) of forest understory plants persisted after regeneration harvest and burning (persistent, or residual species), while a number of species colonized the sites (invading, or early seral species). It is expected that within 20 years after disturbance, some of the invading species would peak and then decline, while others continue to increase. Overall diversity in vascular plants tends to be highest after disturbance (Halpern, 1989), particularly due to the relatively high number of early-seral species. Even before canopy closure, community dominant shrubs can drive a loss in diversity (Halpern and Spies, 1995). Competitive taxa can form dense monocultures that can exclude less robust shade-tolerant understory taxa.

The implementation of the action alternatives would likely result in similar responses as for previous regeneration harvest units within the SWSs, in terms of types of early seral species dispersing into the site (see the affected environment section). Alternative 4 would be expected to have less dramatic effects on the vegetation than alternatives 2 and 3, due to the lack of regeneration harvest. Alternative 3, with natural regeneration, would have a sparser canopy cover; a canopy cover of regenerating Douglas fir would develop more slowly than in alternative 2. Hence invading early seral species, and mid-seral community dominant species, would persist for a longer period compared to Alternative 2. However, Alternative 2 has more extensive use of fire, hence a greater extent of invading early seral species in the earlier period is expected, before the dense replanting of alternative 2 diminishes early seral and community dominant species other than conifers.

For all alternatives ectomycorrhizal fungi, those forming connections between plant roots and fungi that are mutually beneficial, would decrease more with greater harvest intensity (Aubry *et al.,* 2009). The decline in fungi may explain the effects to orchids and herbaceous Ericaceae (plants in the heather family), which often feed or partially feed on fungi (Tendersoo *et al.,* 2007), and which tend to decline even with thinning (e.g. Thysell and Carey, 2001). Forest floor bryophytes (mosses, hornworts, liverworts and other non-vascular plants) are known to decline greatly with harvest, even at relatively low intensities (Aubry *et al.,* 2009). Epiphytes, or plants that grow on trees, would decline within the treatment area..

Cumulative botanical effects

The sub-watersheds, consist of about 25,800 acres of private lands and about 5,000 acres are owned by the State of Oregon. Generally private and state lands contain few complex early seral plant species. The BLM lands treated within these watersheds have a number of characteristic complex early seral plant species invading the sites (see affected environment section). The preferred alternative (alternative 3) would add about 60 acres of complex early seral habitat to the subwatersheds, which consist of about 53,000 acres of BLM, private and State of Oregon land. Alternative 2 would add low quality early seral habitat with alternative 4 adding only a small openings that would minimally contribute to low quality early seral habitat. Recent thinnings and regeneration harvest units on BLM land, and other young forest (under 30 years) including the recent Siuslaw River and Austa Fires, accounts for 9% of BLM land; this acreage represents only 4% of all ownerships

Direct and Indirect Effects wildlife effects

Alternative 1

The No Action Alternative would not contribute to the abundance, complexity and persistence of high quality complex early seral habitats. Conditions needed by numerous species associated with complex/high quality early seral habitat would not be attained or would take much longer to attain with alternative 1 than with the action alternatives. Natural disturbance would be the driving factor.

Action Alternatives 2, 3, 4

Early seral development

Early seral habitat would increase by 3% in section 09 in both alternatives 2 and 3; in section 23 early seral habitat would increase by 7% in alternative 2 and increase by 6% in alternative 3. Regeneration harvest in alternatives 2 and 3 would have direct beneficial effects from increasing the amount of early seral habitat. Although these are small percentage changes the presence of complex/high quality early seral habitat in areas with mostly homogenous habitat are useful for many species (Campbell & Donato, 2014; Donato *et al.*, 2012; Hagar J. C., 2007; Swanson *et al.*, 2014). Regeneration harvest in alternative 3 and would remove an over-abundant habitat type (young 31 to 80 year old stands) and replace it with complex/high quality early seral habitat; simple mid seral habitat would be replaced by complex early seral habitat, alternative 2 would provide for low quality early seral habitat. Early seral habitat development in alternative 4 would be restricted to gaps created within young stands – there would be about a 1/2% (one half) to 8/10% (eight tenths) increase in early seral habitat. See table 9 below.

Table 9: Habitat types in the project area

Habitat types at the section scale	Existing % of sec 9	Existing % of sec 23	Alt 2		Alt 3		Alt 4	
			Sec 9	Sec 23	Sec 9	Sec 23	Sec 9	Sec 23
Very early seral (pre-forest): grass, forb, shrub, sapling (<15 years old)	0%	0%	3%	7%	3%	6%	0.5%	0.8%
Early (pre-forest): shrub, pole (15-30 years old)	0%	7%	0%	7%	0%	7%	0%	7%
Young (31-80 years old)	95%	88%	92%	81%	92%	82%	94%	88%

The introduction of complex/high quality habitat early in stand development can carry through as stands age into late seral stands and provide for the needs of multiple species (Donato et al., 2012).

Early seral habitat quality

Special status wildlife species documented or suspected to occur within the Siuslaw resource area that are associated with complex/high quality early seral forest habitats include the Pacific pallid bat, Fringed myotis bat, Olive-sided flycatcher, Willow flycatcher, and Rufus hummingbird. These species are associated with hardwood trees or shrubs, and all except the hummingbird are associated with the insects produced by hardwood trees and shrubs – particularly deciduous species (Swanson, et al., 2014; Johnson & O'Neil, 2001; Ober, 2006; Ober & Hayes, 2008).

Prescribed burning tends to improve early seral habitat quality by increasing the abundance and diversity of grasses, forbs, and shrubs (Barbour et al., 1998). Alternative 2 includes regeneration harvest and 70 acres of prescribed burning; alternative 3 includes regeneration harvest and 33 acres of prescribed burning. Alternative 4 would thin or create small openings; these small openings would be about one acre in size and total about 10 acres, but would not include prescribed burning.

Although Alternative 2 would create 10 more acres of early seral habitat by regeneration harvest than alternative 3, the quality of this early seral habitat would be less than alternative 3 because alternative 2 would not (1) retain hardwood trees, (2) clump a majority of coarse wood and snags, (3) clump most green tree retention trees, (4) re-plant to a lower density with mixed conifer species and (5) include areas of natural regeneration where prescribed fire is used. Alternative 3 would produce complex high quality early seral habitat.

Hardwood trees, especially deciduous hardwood trees, are important to habitat quality because they are important to many species (Johnson & O'Neil, 2001). Clumping green tree retention maintains more protection for species needing higher moisture or shade, such as amphibians and certain lichens or mosses than dispersed retention (USDA-USDI, 1994, p. C-41) In alternative 3, green tree retention patches in matrix helps maintain connectivity of forest habitats within and across sections. Clumping dead wood in alternatives 3 and 4 substantially increases the quality of snag and down wood habitats (Mellen et al., 2014) compared to dispersing the same number of snags or down wood as in alternative 2. Natural regeneration in areas where prescribed fire is applied and replanting to lower densities with mixed conifer species in alternatives 3 creates a more heterogeneous habitat type contributing to complex/high quality early seral habitat. Although replanting to lower densities with mixed conifer would occur in gaps in alternative 4, the lack of prescribed fire and the small gap size would not contribute to effective complex/high quality early seral habitat, because the shading effect from the small gap size would retard light conditions suppressing understory vegetative development.

In alternative 3 shapes of individual areas of complex/high quality early seral habitat created by regeneration harvest are irregular and are designed to decrease the size of openings, this benefits the re-establishment and use of harvested areas by species that habituate adjacent forested areas (Baker et al., 2013). In alternative 2 there is less emphasis placed on designing the regeneration harvest areas to increase ecological value and improve biological connectivity.

Persistence of complex early seral habitat

Persistence of complex/high quality early seral habitat is influenced by reforestation techniques. In alternative 3, areas with natural regeneration and prescribed fire would maintain grasses forbs and shrubs for longer (about 10 years more) than in alternative 2. The aggressive reforestation plan in alternative 2 is likely to eliminate most grasses, forbs, shrubs, and new hardwood trees within about 10-15 years. The limited benefits of gap creation and light thinning in alternative 4 would only persist for about 10 years; benefits from openings created by harvest and dead wood creation would not persist for many decades, but these areas are small compared to the larger regeneration harvest areas of alternatives 2 and 3.

Persistent early seral habitat would have a positive effect on the availability of foraging sites for spotted owls. Habitat choice by spotted owls is influenced by hardwood trees and understory shrubs that produce fruit and mast supplies for the owls' small mammal prey, and early seral habitats can be important for spotted owl foraging (Irwin et al., 2012). Hagar (2007) found 90% of the diet of northern spotted owls is composed of small mammals that are associated with non-coniferous vegetation; these include northern flying squirrels, wood rats, and other rodents. Spotted owls are known to hunt the edges of openings (areas with early seral habitat) (USDI-FWS, 2012). Many special status species would benefit from the increase of high quality early seral habitat because of enhanced food sources and nesting habitat that would become available (Johnson, O'Neil, 2001; Swanson et al., 2014).

Cumulative effects

Complex early seral forest habitat is lacking within the three SWS. Low quality early seral habitat is found on less than 4% of 22,400 acres of BLM administered lands within the three SWS, this proposed action would add less than 1% of complex early seral habitat within the geographic scale of the sub-watersheds. Although the occurrence of this type of habitat would be minor at the sub-watershed scale the relevance of the habitat type would contribute to meet the purpose and need at the project level. Portions of other land ownerships have an early seral component mostly consisting of a monoculture of conifers. Private landowners manage timberlands for economic goals that lead to abundant but structurally simple early seral conifer plantations. These simple plantations are not likely to provide habitat for many early seral associated wildlife species because they lack important habitat elements needed by wildlife, especially hardwood trees and shrubs.

4.3 Issue 3: What effect do the actions have on carbon sequestration?

Secretarial Order No. 3289 (2001, amended 2009) directs all Departments to "consider and analyze potential climate change impacts when undertaking long-range planning exercises." (USDI-BLM, 2009) The 1994 PRMP FEIS (USDA-BLM, 1994, pp. 217, Appendix V.) considered climate change effects as part of long-term planning efforts at the Plan- scale (western Oregon). Although the 1994 PRMP FEIS recognized the possibilities of increased incidence of wildfire, insect outbreaks, shifting range of species including Douglas-fir, and forest species composition, it found "no scientific consensus about the extent or rate of global warming nor the probable effect on forest ecosystems in western Oregon" (p.217).

Forster et al., 2007 (p. 129-234), reviewed scientific information on greenhouse gas emissions and climate change, and concluded that human-caused increases in greenhouse gas emissions have likely exerted a substantial warming effect on global climate. Literature, however, has not yet defined any specifics on the nature or magnitude of any cause and effect relationship between greenhouse gases and climate change.

The U.S. Geological Survey, in a May 14, 2008, memorandum (USDI-USGS, 2008) to the U.S. Fish and Wildlife Service, summarized the latest science on greenhouse gas emissions and concluded that it is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. Although it is not speculative that changes in the affected environment will occur due to climate change, it is not possible to reasonably foresee the specific nature or magnitude of the changes (USDI/BLM 2008, p. 488). Given this uncertainty, this analysis is focused on calculating gas emissions and storage, in the context of carbon release and sequestration.

Forests fix and store carbon through photosynthesis and release carbon through respiration and decay, affecting atmospheric concentrations of carbon dioxide which thereby affect global climate. Values in this analysis, in terms of carbon stored and released, are generally expressed as tonnes, the unit of measure most commonly used in scientific literature to express carbon storage and release. One tonne of carbon is equivalent to 3.67 tons of carbon dioxide (U.S. EPA 2005).

The 2008 FEIS (pp. 488-490), incorporated by reference, described current information on predicted changes in regional climate, concluding that the regional climate has become warmer and wetter with reduced snowpack, and that continued change is likely.

Even though a causal link between the Steam Donkey Echo project and specific climate change effects cannot be assigned, the amount of carbon released or stored under the alternatives analyzed can be estimated. Site specific data from stand exams was input into the ORGANON Growth Model (Hann, 2009). The outputs from the model were then used to calculate amounts of carbon that would be released or sequestered, and the resulting net carbon balance that would result under the alternatives.

Modeling was conducted for intervals extending out 50 years. The net carbon balance for this project was analyzed by calculating: the amount of carbon held in live trees and other components of the forest stands (snags, down wood, soil carbon, etc.), the amount of carbon held in wood products and logging slash that gradually release carbon over time, and the amount of carbon released by the burning of fossil fuels and slash under the proposed action alternatives.

The action alternatives would result in a cumulative 50 year flux of greenhouse gasses (GHGs) to the affected environment on the average order of 2 thousand metric tons (megagrams (MG)) of CO_2 by 2066: at the scale of western Oregon, carbon stores are predicted to increase by 169 million MG under the NWFP by 2106 (USDI-BLM, 2008). Action area carbon flux estimates are quantified and described fully below. However, it is not possible with current science to estimate the effects of these GHG fluxes on the local affected environment. The USGS summarized science regarding the effects of local actions on climate change and concluded "Difficulties remain in simulating and attributing observed temperature changes at smaller than continental scales…It is currently beyond the scope of existing science to identify a specific source of CO_2 emissions and designate it as the cause of specific climate impacts at an exact location" (USDI-USGS, 2008). This memorandum (No. 2008435-DO) is incorporated by reference.

Greenhouse Gasses: Carbon Stores and Carbon Flux

As an aid to decision-making, this analysis estimates carbon flux to the analysis area associated with the action alternatives. Carbon flux is the rate of exchange of carbon between pools, the net difference between carbon removal and carbon addition to a system. For the atmosphere, this refers to carbon removed by plant growth, mineralization, dissolving in the ocean and other processes, balanced by carbon added through plant respiration,

harvest/volatilization, concrete production, fossil fuel burning, volcanic activity and other processes. Forest harvest may lead to flux of GHGs in addition to CO_2, principally N_2O and CH_4 (Jassal et al., 2008, Sonne, 2006). Due to lack of scientific information and lack of adequate models on the effects of forest activities in the Pacific Northwest on non-carbon GHGs, and the (presumably) minor contribution of these other gases to GHG flux associated with the action alternatives in relation to total flux estimation error, they are not addressed here. The indirect effects of carbon flux following timber harvest have been addressed below. Indirect effects of this carbon flux on climate change and the affected environment is also addressed below.

Carbon Flux of the Proposed Action

Estimates of carbon stores in the analysis area as a whole would be fraught with error, could complicate contrast between the alternatives, and would not facilitate decision-making. Instead, this analysis quantifies the net effect of the action alternatives on greenhouse gas levels by comparing changes in carbon storage that would occur under the action alternatives to the carbon storage that would occur under the no action alternative, as suggested in IM-2010-012 (USDI, 2010). Specifically, this analysis estimates the carbon flux associated with implementation of the action alternatives roughly fifty years from the present, incorporating: a) differences in carbon storage in live, dead, and organic soil carbon pools; b) the intermediary flux from wood products produced by the Proposed Action through this period; and c) "secondary" C fluxes associated with logging and hauling systems.

Analysis of carbon flux associated with changes in live and dead pools attributable to the Proposed Action ("a", above) used relatively simple tree-/stand-scale models available with ORGANON. This method considers changes due to succession and forest management in all major live and dead carbon pools within the action area (treated units). This ORGANON model does not directly incorporate microclimatic effects, dynamics of herb and shrub understory layers, stable soil pools, or the C flux associated with actual harvest equipment. Herb and shrub carbon pools are relatively small compared to total stores, and are similar between young and mature stands (USDI-BLM, 2008, p. App-29). Soil carbon represents 9-20% of total site carbon but is the most stable C store and the least likely to respond to disturbance. For example, 60-year old forests and 450- year old forests have similar soil carbon storage (Harmon, et al., 1990). Flux of carbon from merchantable wood products ("b", in previous paragraph) produced from the action alternatives during the 50 year analysis window was estimated following synthesis in USDI-BLM 2008, p. App-30. GHG emissions from forestry activities necessary to harvest these units ("secondary emissions", "c" in previous paragraph) were estimated following (WRI, 2010), and added to ORGANON estimates (see below).

4.3.1 Environmental Effects

The action alternatives would impact approximately 266-339 acres of forest, volatilizing some carbon, moving carbon from live tree pools to detritus and wood products pools, and storing some carbon in forest products while leaving some residual trees and growing replacement trees. Making a set of very broad assumptions and using the ORGANON model and assumptions similar to those developed in the 2008 RMP FEIS (USDI-BLM 2008); compared to the no action alternative, the action alternatives would result in a C flux of 2,574 MG, 2,842 MG, and 1,832 MG for Alternatives 2, 3, and 4 respectively over the 50 year time period from harvest until approximately 2066. The sum of forest treatment and harvest system flux is between 1-3 thousand metric tons. Calculations are summarized below (Tables 10-12).

Analytical Assumptions

Growth estimated in board feet modeled from stand exam data in ORGANON (Oregon Growth Analysis and Projection) growth and yield model were converted into carbon tonnes. The area for analysis was only the treatment areas, which encompass approximately 200 acres. The environmental effects analysis considers changes in carbon storage for live tree carbon post-harvest, 50 years, and 100 years after harvest.

The carbon within harvested wood is calculated based on factors presented in the 2008 Western Oregon Plan Revisions (USDI-BLM, 2008 FEIS). An internal carbon calculation spreadsheet was developed from the factors in the 2008 Plan Revision, and was used in the carbon calculations for this analysis.

This analysis focused on the effect of regeneration and thinning activities on carbon and carbon storage. Live trees were used as the primary indicator for carbon storage, and carbon sequestration changes. The carbon storage in carbon pools other than live trees was assumed to remain unchanged across alternatives for the purpose of this analysis.

Carbon emission from harvest operations assumes an average 30 miles haul distance and assumes fuel consumption associated with yarding and hauling logs to the mill at $2.65 per gallon of diesel fuel per thousand

board feet and 6 pounds of carbon per gallon of diesel fuel. Slash treatment operations assume an average of 0.5 tonnes of carbon emissions per ton of biomass treated. No other harvest activities were predicted or analyzed after the initial treatment.

Direct and Indirect Effects

Action Alternatives

Under the no action alternative, continued forest growth over the next 100 years would result in an average annual increase in live tree stand volume of approximately 0.8 MBF/acre/year, or 15,986 MBF. This equates to an increase in storage of approximately 21,197 tonnes of total carbon over the 100 year analysis period in comparison to the current conditions.

For all the action alternatives, emissions in the short term would include carbon released from harvested wood, slash disposal, biomass recovery, yarding and hauling. In the long term, harvested wood would continue to emit carbon at a predicted rate resulting in cumulative emissions. Trees would continue to grow and sequester carbon at different rates after harvest for each alternative based on prescription types.

Immediately following harvest, all action alternatives are significantly less in total net carbon than the no action alternative. At 50 years post-harvest, all action alternatives provide almost half of the total net carbon. 100 years post-harvest, Alternative 3 is close to meeting the total net carbon when compared to the no action alternative (alternative 3: 58,876 tonnes, no action alternative: 59,666 tonnes). Although total carbon sequestered and stored for all of the action alternatives is higher than the no-action alternative, when carbon emitted from the harvested wood and the initial emissions from harvest activities is taken into consideration, all fall below in total net carbon storage at year 100.

Cumulative effects

The stands not being thinned on federal lands would continue to sequester carbon at rates similar to the no action alternative. On adjacent private lands, stands would likely be clear cut harvested and then planted with conifers resulting in cycles of increased carbon emissions due to the harvest followed by rapid growth and seedling sequestration. Sequestration rates on private land would be similar to alternatives 2 and 3 up to the 50 years post-harvest.

A review of standard industrial practices, as well as aerial photography and driving through adjacent lands reveals that most of the privately, or state owned lands within the vicinity will be managed on a 40-60 year rotation, with high management. With this forest management practice, the net effect of harvest on adjacent lands would likely yield results similar to slightly worse than the carbon sequestration and emissions from Alternative 2, up to the 50 year period.

The total carbon in forests and harvested wood in the United States constitutes 1% of the total carbon in the world. The differences in carbon storage among the alternatives over time are too small to reveal differences when placed in the context of regional, nationwide or global carbon storage. On comparing action alternatives with the no action alternative, carbon storage in all action alternatives would be lower fifty years after harvest treatments than the no action alternative. 100 years after harvest, all alternatives would have lower live tree carbon storage, but Alternative 3 would have higher total carbon storage when combined with the remaining carbon stored in the harvested wood (40,443 total tonnes in alternative 3, 38,469 total tonnes than in the no action alternative).

Carbon sequestration from added growth overtime was also calculated.

Table 10. Stand level stored Carbon in metric tonnes for Alternative 2.

Present Stored Carbon	Alternative 2 in 50 Years	Wood Products derived from Proposed Action after 50 Years	No Action 50 years post-harvest	50 Year Flux (NA-A2+C in wood products)
17,284 (7,028) removable as wood products)	13,763	5,596	30,397	2,574

Table 11. Stand level stored Carbon in metric tonnes for Alternative 3

Present Stored Carbon	Alternative 3 50 Years	Wood Products derived from Proposed Action after 50 Years	No Action 50 years post-harvest	50 Year Flux (NA-PA+C in wood products)
17,284 (7,762 removable as wood products)	18,075	6,180	30,397	2,842

Table 12. Stand level stored Carbon in metric tonnes for Alternative 4.

Present Stored Carbon	Alternative 4 50 Years	Wood Products derived from Proposed Action after 50 Years	No Action 50 years post-harvest	50 Year Flux (NA-PA+C in wood products)
17,284 (5,003 removable as wood products)	20,207	3,984	30,397	1,832

GHG emissions from forestry activities necessary to harvest these units ("secondary emissions" including emissions from vehicles and equipment) have been estimated for all alternatives at 0.1411 MG CO_2/MBF (WRI, 2010). Applying this equation to the action alternatives suggests an additional 1,000-1,500 metric tons (MG) CO_2 release attributable to the action alternatives; this is consistent with Sonne (2006) predicted a relatively small C flux associated with harvest equipment. The sum of forest treatment and harvest system flux is roughly 3-5 thousand metric tonnes.

The difference in carbon between the action and no action alternatives would continue to decrease through time because the rate of carbon storage decelerates after a stand reaches the age of culmination of mean annual increment. When analyzed over a 20 year timeframe (when modeled stand-level carbon storage appears to be at a minimum, but where the percent of carbon stored as forest products is higher), the carbon flux is approximately 6.5 thousand metric tons.

Cumulative Affects

Cumulative effects are considered at a scale of western Oregon for 50 years. Global climate change and carbon sequestration are difficult discussions at smaller scales, such as the project area, because the actions are too polarized in scale to give accurate context. Conversely, using larger scales, such as the world, continent, or even state, shrinks the impacts from the actions to be indistinguishable. The scale of western Oregon allows for a discussion of effects, without distorting or diluting the analysis. Effects were modeled for 50 years through analysis in the USDI-BLM 1994 FEIS (3-9 and 4-9) and USDI-BLM 2008 FEIS (4-537 to 4-543), which is hereby incorporated by reference as summarized below.

The total 50-year carbon flux of the action alternatives compared to the no action would not produce measurable change in global climates considering current detection and modeling technologies. To place this carbon flux in context, the total 50-year carbon flux associated with the action alternatives would represent approximately:

- <0.01% of carbon stored on BLM-managed lands in western Oregon (USDI-BLM, 2008). BLM-managed lands in western Oregon support approximately 1% of the carbon stored in the western U.S., and 0.02% of global carbon stores in vegetation, soil, and detritus (USDI-BLM, 2008).

- Below the indicative threshold (25,000 metric tons) set by the EPA under a mandatory reporting rule for non-forestry regulated entities (74 FR 56373).

This EA is tiered to the USDI-BLM 1994 PRMP FEIS that considered carbon flux and climate change at the Plan scale. The USDI-BLM 1994 PRMP FEIS considered speculative and did not consider the indirect effects of carbon flux associated with the Plan on aspects of the affected environment including wildlife, economies, human health, and other resources (Appendix V, p. 217). The 1994 PRMP FEIS concluded that with implementation of any of the alternatives at the Plan level, "the overall impact on the global atmospheric carbon dioxide balance would be much less than 0.01 percent of the total" (p. 4-1). Based on the small estimated permanent flux of carbon that would be associated with the cumulative effects of the action alternatives following the 1994 PRMP

FEIS, the high uncertainty in any such estimate of carbon flux (and other sources of GHGs), and the response of global climate to these GHG's, conclusions in the 1994 PRMP FEIS remain valid and applicable to the cumulative effects of the action alternatives (USDI-BLM, 1994).

At the scale of western Oregon, considering the cumulative effects of both forest succession (a carbon sink) and harvest (a carbon source) under the NWFP in the Plan Area, carbon stores would be predicted to increase by 2106, from 427 to 596 million MG. This sequestration is less than under a "No Harvest" scenario, but does represent a gain in carbon storage. U.S. annual CO_2 emissions (circa 2008) were approximately 6 billion MG. The flux of approximately 5 thousand metric tons of carbon associated with the action alternatives (over 50 years) would represent far less than 0.00002% of this yearly flux. The difference in carbon storage in 50 years between alternatives would be too small to lead to a detectable change in global carbon storage, and existing climate models do not have sufficient precision to reflect the effects on climate from such a small fractional change in global carbon storage (USDI-BLM, 2008, p. 543). Currently, federal thresholds for carbon flux related to individual actions have not been established. Uncertainty associated with all estimates of carbon flux in this analysis would be predicted to be quite high (circa 30%: USDI-BLM 2008, p. 538). However, estimates of the magnitude and direction in carbon response are probably accurate, and these results may be instructive for comparing the effects of the alternatives on local (watershed-scale) carbon stores.

4.4 Issue 4: How would reforestation alternatives affect future growth and yield?

Direct and Indirect Effects

Reforestation techniques have a large impact in the development of a stand. Species composition, density, and time of establishment all play a role in growth and yield. Within the Steam Donkey Echo project, three different reforestation methods were proposed between alternatives: plant 400 trees per acre of Douglas-fir (alternative 2), allow for natural regeneration in areas that incur prescribed burning (alternative 3), and plant mixed species at low densities of approximately 200 trees per acre (alternatives 3 and 4) in areas where prescribed burning may not occur. Section 9 has a higher site class than section 23 (130 and 119 respectively), therefore projected growth is higher in section 9 than in section 23 for most scenarios.

Existing stand information was collected by stand exams, field verified, analyzed through EcoSurvey, and modeled through ORGANON (Oregon Growth Analysis and Projection) Growth and Yield Simulator. Each unit, with the designated prescription by alternative was grown in ORGANON for 100 years. An average mbf/ac was calculated, as well as the total predicted mean annual increment (MAI), presented as mbf/ac/yr. This analysis did not take into consideration log-value of the trees, only the total standing merchantable volume. Presumably, the reforestation methods that would incur a pre-commercial thinning would have higher merchantability with less knots and crooks from being open grown (as with the low-density thinning). It also did not address the potential for commercial thinning or an additional regeneration harvest.

No Action

The no action alternative can be used as a comparison for standing volume, and growth and yield when no harvest treatment is prescribed. Below are the results for standing volume grown out 100 years post the projected time of treatment. Because the issue is addressing only reforestation alternatives, and matrix is the only land use allocation that has reforestation prescribed to it, only the matrix lands are presented for the no action growth and yield analysis.

As expected, the growth of the stands in alternative one, as expressed by mbf/ac/yr (MAI), is stagnating. This can be seen in Table 12 where MAI at each period is either the same (1.0 for section 9 and 0.8 for section 23), or decreasing.

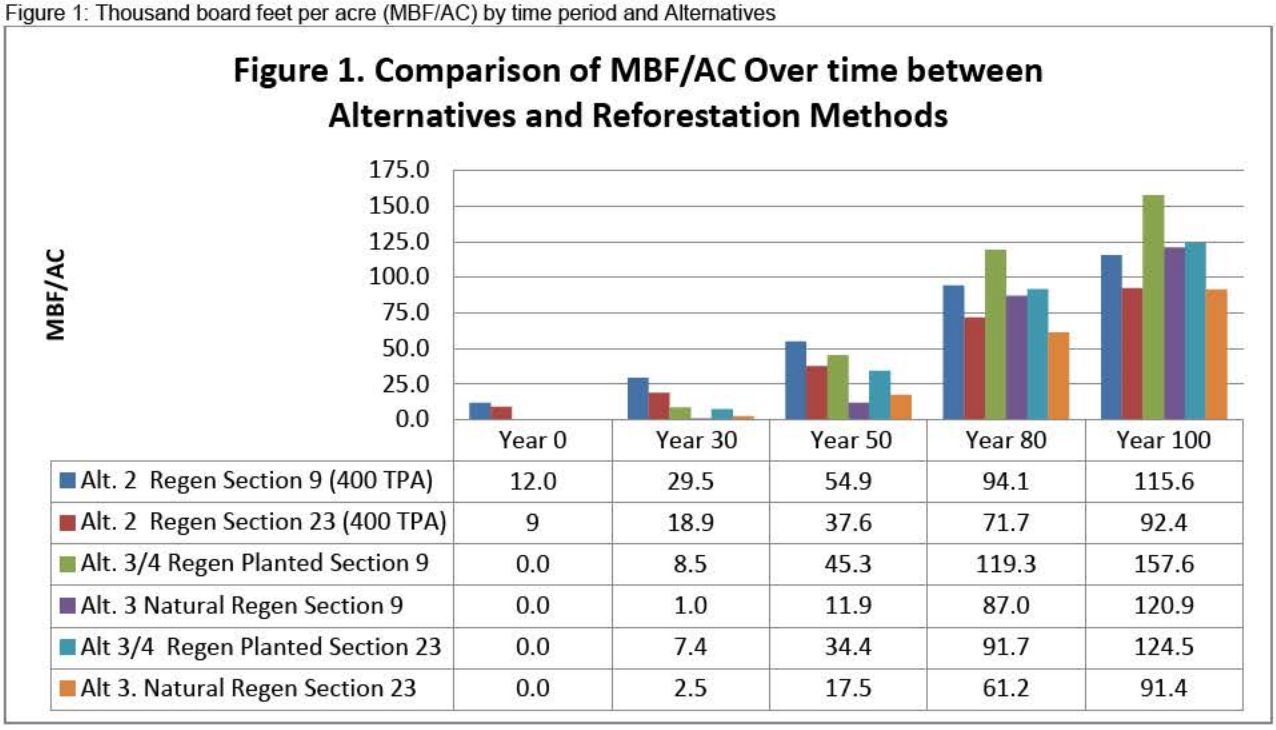
Table 13: No Action GFMA Growth and yield table. MAI is measured in mbf/ac/yr

	Unit	Standing MBF/AC Year 0 (age 75)	MAI year 0 (Age 75)	Standing MBF/AC Year 30 (age 105)	MAI Year 30 (age 105	Standing MBF/AC Year 50 (age 125)	MAI Year 50 (age 125)	Standing MBF/AC Year 80 (age 155)	MAI Year 80 (age 155)	Standing MBF/AC 100 (age 175)	MAI year 100 (age 175)
Alternative 1	GFMA Section 9	70.0	1.0	104.2	1.0	120.4	1.0	139.7	0.9	150.4	0.9
	GFMA Section 23	62.0	0.8	86.8	0.8	99.8	0.8	115.4	0.7	123.8	0.7

Action Alternatives

In alternative 2, all units would be harvested, but with approximately 6 to 8 trees per acre left for green tree retention, then prescribed burned, and replanted at approximately 400 trees per acre with Douglas-fir. The pre-commercial thinning that would most likely take place between 5 and 15 years post-harvest would reduce competition and densities to approximately 250 trees per acre (tpa). These units can be seen in the figures below under "Regen Section 9 (400tpa)" and "Regen Section 23 (400tpa)." Alternative 3 has natural regeneration as well as mixed species planting at low densities (approximately 200 trees per acre). This alternative aggregates the green trees, meaning they would be grouped in an area outside of the actual harvest area. Alternative 4 is primarily a thinning prescription over the treatment area. Gaps no greater than 1 acre in size would be created throughout the matrix thinning area, and replanted similarly to the areas being planted in alternative 3. Because a maximum of only 10 acres would be created in small gaps across the treatment area, alternative 4 was not analyzed separately for reforestation purposes in this Issue. Presumably, alternative 3, planting would yield very similar results in growth and yield calculations to alternative 4 gap planting. For modeling purposes, natural regeneration was assumed to delay coniferous occupancy by 10 years when compared to traditional reforestation methods (Miller, Bigley, and Webster, 1993). It was also assumed based on standard BLM forest practices that by age 25, approximately 250 trees per acre of coniferous species would occupy the site. For the mixed-low-density planting, 200 trees per acre were assumed to occupy the site, with no pre-commercial thinning (see alternative description of planting and reforestation Section 2).

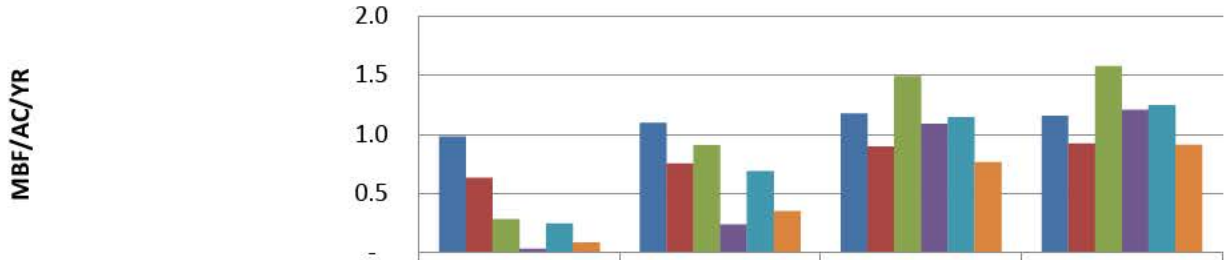
Figure 1: Thousand board feet per acre (MBF/AC) by time period and Alternatives



	Year 0	Year 30	Year 50	Year 80	Year 100
Alt. 2 Regen Section 9 (400 TPA)	12.0	29.5	54.9	94.1	115.6
Alt. 2 Regen Section 23 (400 TPA)	9	18.9	37.6	71.7	92.4
Alt. 3/4 Regen Planted Section 9	0.0	8.5	45.3	119.3	157.6
Alt. 3 Natural Regen Section 9	0.0	1.0	11.9	87.0	120.9
Alt 3/4 Regen Planted Section 23	0.0	7.4	34.4	91.7	124.5
Alt 3. Natural Regen Section 23	0.0	2.5	17.5	61.2	91.4

Figure 2: Mean Annual Increment (MAI) presented in cumulative mbf/ac averaged over the years in the time period.

Figure 2. Comparison of Mean Annual Increment Over Time Between Alternatives and Reforestation Methods



	MAI Year 30	MAI Year 50	MAI Year 80	Total MAI 100
Alt. 2 Regen Section 9 (400 TPA)	1.0	1.1	1.2	1.2
Alt. 2 Regen Section 23 (400 TPA)	0.6	0.8	0.9	0.9
Alt. 3/4 Regen Planted Section 9	0.3	0.9	1.5	1.6
Alt. 3 Natural Regen Section 9	0.0	0.2	1.1	1.2
Alt 3/4 Regen Planted Section 23	0.2	0.7	1.1	1.2
Alt 3. Natural Regen Section 23	0.1	0.4	0.8	0.9

At 30 years after treatment, the planted units would just be starting to pick up in mean annual growth. The naturally regenerated units would have barely any measurable volume due to the delay in site occupancy. At fifty years, the planted units all yield higher volume of standing timber than the naturally regenerated units. Alternative 2 reforestation methods (400 tpa), yields the highest amount of standing volume at this age. Some of this is from the residual 6 to 8 trees per acre that was left for green tree retention as well.

By 80 years post-harvest, the low-density planted areas (alternatives 3 and patches in alternative 4) overtake the high-density planted units in projected standing mbf/ac. At this point, because of the lower density at establishment, the trees have had more growing space, and are most likely larger. Natural regeneration shows growth within 10% of the average mbf/ac of the planted units. This could also be attributed to more growing space when compared to the high-density planting units. Although both the natural regeneration and high-density planting units were anticipated to have approximately 250 trees per acre when established (alternative 2 after pre-commercial thinning), the high-density planting units had the dispersed trees throughout the unit for green tree retention. This would inhibit the growth of seedlings under the shade of the residual trees.

By the 100th year after harvest, the high-density planting units would have hit culmination of MAI, where the other two reforestation types would still be increasing in MAI. In comparing section by section, and reforestation type, the natural and low-density planting are predicted to exceed the overall standing volume per acre of the high-density planting site.

Cumulative effects

The analysis of the action alternatives would not change when considering private lands because management actions on private lands would not affect growth and yield of BLM lands.

4.5 Issue 5: How would management actions benefit Marbled Murrelet habitat?

Direct and Indirect effects to marbled murrelet habitat

No action: Alternative 1

Alternative 1 would not contribute to the abundance, complexity, or persistence of high quality late seral habitats. There would be a lost opportunity to help maintain or improve conditions for marbled murrelet habitat. The quality of forest habitats would remain low for many years, which adversely affects the maintenance of existing nesting structure and the recovery rate of nesting habitat in LSR and RR where desired condition includes murrelet habitat. Desired habitat conditions for LSR and RR land allocations includes multi layered multi species stands that have

open grown trees with abundant nesting platforms (USDI-BLM, 1995 RMP) (USDA-USDI, 1994, p. B-1 to B-32). As plantation trees grow taller and eliminate overhead cover above potential nesting platforms, complex/high quality late seral forests with abundant murrelet nesting structure would not be attained or would take much longer to attain with alternative 1 than with the action alternatives.

Action alternatives: 2, 3, 4

Some activities may affect but are not likely to adversely affect marbled murrelets, and other activities may have adverse effects to the marbled murrelet. The Steam Donkey Echo project would not affect critical habitat for the marbled murrelet because none of the units are in critical habitat for the marbled murrelet. Adverse effects are minimized by project design features in the 2013-2014 biological opinion for north coast habitat modification (USDI-FWS, 2013)

Thinning may affect but is not likely to adversely affect marbled murrelets because thinned stands will retain nesting structure and sufficient levels of other trees to continue to function as buffer habitat to nest trees by providing wind firmness, microclimate and reduced predation. Also, canopy cover will be maintained at or above 40 percent and prescriptions are designed to reduce fragmentation. Thinned stands would retain about 50-70% canopy cover. Thinning would be within 100 yards of about 40% and outside 100 yards within 60% of potential nest trees in the project area. High quality suitable habitat for murrelets is located in small old growth stands in sections 09 and 23, no actions would occur within these areas.

Regeneration harvest may affect, and is likely to adversely affect murrelets by removing buffer habitat from about 3 acres within 100 yards of 4 trees with nesting structure. This effect is minor because these trees are not occupied by nesting murrelets, and over 98% of the trees with nesting structure in the project area would not be affected by regeneration harvest because all other trees with nesting structure are more than 100 yards away from regeneration harvest areas.

New road construction may adversely affect marbled murrelets because road construction would remove an unoccupied potential nest tree, the removal of one tree would not detrimentally affect the functionality of the rest of the potential nest trees in the area. Field surveys showed that approximately 250 potential nest trees are present in the project area. Road construction is not planned in any occupied suitable habitat, surveys have been completed for nesting structure within and in the vicinity of the regeneration harvest units and newly proposed roads. Thinning units that may not have had surveys completed comply with Level 2 policy for the management of younger stands with potential marbled murrelet nesting structure. There will be no disruption of murrelets from road construction because project design features limit timing of road construction.

Adverse effects to marbled murrelets are minimized by project design features that include surveys, retention of potential nest trees, and limits to canopy cover reduction and size of openings in thinning near potential murrelet nest trees in un-mapped LSR (occupied site). Short term effects on marbled murrelet habitat would be minimal from thinning especially since all alternatives and all treatments protect potential nest trees, the most important element of murrelet habitat over time. These trees are usually hundreds of years old and difficult to replace.

The Steam Donkey Echo project would not affect critical habitat for marbled murrelets because none of the units are in critical habitat for the marbled murrelet. The marbled murrelet occupied site includes about 500 acres of un-mapped LSR and would be managed with an emphasis on benefits to marbled murrelet habitat.

All action alternatives support recovery of the marbled murrelet. Thinning treatments in the unmapped LSR occupied site are designed to maximize benefits and minimize adverse effects to marbled murrelets. Long term, this project's moderate thinning in LSR would hasten restoration of high quality marbled murrelet habitat with multiple nesting platforms in stands with multi layered, multi species canopies. Thinning and creation of small openings in LSR would benefit marbled murrelets by helping maintain existing nesting platforms and structure on about 10% of the murrelet structure trees in the project area. Thinning would increase the amount of light and other resources reaching these trees and hasten development of future nesting platforms and structures. Benefits would persist for about 20 years from moderate thinning, and for many decades from creation of small openings.

After thinning in Late Successional Reserves (common to all alternatives), Riparian Reserves, and in Matrix, the stands would function to support marbled murrelet nesting because thinned stands would retain greater than 40% canopy cover (50% canopy cover in LSR and 65% in Matrix), and thinned stands would retain over 98% of potential nesting structure in the project area. Thinned stands will retain existing nesting structure and other trees to buffer nest trees by providing wind firmness, microclimate and reduced predation. About 10% of 250 potential marbled murrelet nest trees would be returned to relatively open growing conditions by thinning, but declining habitat quality would continue on about 60% of these 250 potential murrelet nest trees. About 30% (75 of 250) of potential nest

trees in section 09 would continue to function as they do now because they would remain in relatively open growing conditions in hardwood stands or in stands with moderate over-story canopy cover. Benefits from light thinning to relatively open growing conditions for maintenance or restoration of potential nesting structure would persist for about 10-15 years, and benefits from moderate thinning would persist for about 20 years until canopy cover returns to above 75-80%; benefits from gaps would persist for decades.

Regeneration harvest in Matrix for alternatives 2 and 3 would have direct adverse effects to marbled murrelet habitat by removing buffer habitat from near potential nest structure, and these effects would persist for about 50 years until trees regenerate and grow to at least about 100 feet tall, which is at least half the site potential tree height (USDI-FWS, 1997).

Green trees retained in regeneration harvest areas in Matrix lands for alternatives 2 and 3 would be expected to develop nesting platforms on limbs that would grow large because these trees would be completely or partially open grown. Dispersed green trees retained in alternative 2 would encourage completely open grown trees. Clumped green trees retained in alternative 3 would be partially open grown on the outside edges of clumps, or completely open grown where created snags and down wood create open conditions. Over the long term, epicormic branching may also occur (Collier & Turnblom, 2001), and would create suitable nesting platforms in less time than it requires to grow limb diameters that support nesting platforms. Epicormic branching and nesting platforms form when multiple small branches grow and fan out from the trunk of a tree from the same location. Epicormic branches are larger than about 1" in diameter where suitable platforms are observed, while single branches with nesting platforms are much larger. Average single branch size at the nests is 13.3 inches in one study (USDI-FWS, 1997) and 8 inches diameter in another study (Nelson & Wilson, 2002); however, nests have been found on limbs that support platforms as small as 4 inches.

Alternative 2 would have about 565 green trees retained and alternative 3 would have about 485 green tree retained in regeneration harvest areas. Most of these would be open or partially open grown, promoting large limb development after harvest, and should remain relatively open grown if the habitat complexity objectives in regeneration harvest areas are maintained through time.

Restoring or maintaining high quality early and mid seral habitats will increase the abundance of many species that use these high quality habitats. Some animals that prey on murrelet chicks, particularly birds in the jay family (corvids) would increase as well, especially in early seral habitat (Malt & Lank, 2007). However, increased numbers of avian predators does not always result in increased predation on murrelet nests (USDI-FWS, 2013, p. 76). Therefore the increased risk of mortality to murrelet chicks from creating early seral habitat is uncertain.

Prescribed burning in regeneration harvest areas would occur within ¼ mile of breeding marbled murrelets; however, these effects are not likely to cause nest abandonment. The intensity of adverse effects from smoke would probably be minor because only two small burning areas are within ¼ mile of occupied habitat, and these burn areas are not in the same drainage as the occupied habitat. It is reasonably certain that the majority of smoke would not drift to the occupied habitat within ¼ mile because prescribed burning considers wind to be a detrimental factor while burning and therefore burning would likely be restricted to occur during low wind conditions.

Road construction or the use of roads would remove an unoccupied potential nest tree. There are numerous unoccupied potential nest trees in the project area (about 250) and the possible removal of one potential nest tree would not reduce or impair future marbled murrelet nesting probabilities in the project area. Road construction will not occur in any occupied suitable habitat, and nesting structure will be surveyed or comply with level 2 policy for the management of younger stands with potential murrelet nesting structure. There will be no disruption of marbled murrelets from road work because operating restrictions would be applied as described in project design features. For example, heavy equipment and power tool use would be restricted during the critical breeding period within 100 meters of occupied habitat (see consultation document for this project for more details (USDI-FWS, 2013).

Cumulative effects

The effects determinations for marbled murrelet habitat from increasing the amount of complex early, mid, and late seral habitats would not be changed when cumulative effects are considered because there would be adequate murrelet habitat remaining within the SWS area, and the adverse effects to murrelet habitat from regeneration harvest of about 3 acres of murrelet buffer habitat within 100 yards of 4 potential nest trees would remain a minor effect because the 4 potential nest trees are un-occupied and the field analysis indicates that there are approximately 250 potential nest trees within the project area. The project sub watersheds contain about 6,000 acres of suitable habitat for the marbled murrelet across all ownerships.

Recent thinning on BLM and State land would promote development of murrelet nest trees on 1% (541 acres) of sub-watersheds on BLM lands and 0.5% (264 acres) of sub-watersheds on State lands.

Reasonably foreseeable BLM actions include nearly 500 acres of commercial thinning units in the sub watersheds, which are expected to maintain suitable murrelet habitat; i.e.; canopy cover greater than 40% and potentially suitable nest trees. These units include January 9th, Wild Badger, Eames Swing, Pataha Ridge, and Wildfish. About 25% of the acres would be in LSR where moderate thinning with gap creation would hasten restoration of complex late seral forest habitat suitable for marbled murrelet nesting, and the remaining 75% would be light thinning in Matrix that would benefit complexity and development of nesting structure for 10-15 years.

Based on estimates from review of LIDAR data and aerial photos, about 11% of the acres in the sub-watersheds are suitable murrelet nesting habitat; 92% of it is on BLM land, 7% on State land, and 1% on private land. About 75% of marbled murrelet habitat is old growth forest on BLM land, and the remainder is single or small patches of potential marbled murrelet nest trees scattered in stands 60-110 year old stands on BLM lands and what appears to be similar aged stands on State or private lands. BLM lands contain 1,700 acres of occupied murrelet sites, and State land contains a 170 acre murrelet management area. Recent thinning on BLM and State land would promote development of murrelet nest trees on 1% (544 of 53,000 acres) of sub-watersheds on BLM lands and 0.5% (264 acres) of sub-watersheds on State lands. There are about 15,700 acres of designated critical habitat for the marbled murrelet, in the sub watersheds; all on BLM land.

A review of aerial photography and driving through private and state timber lands reveals that the majority of these lands are managed for optimizing the value of timber, which can eliminate maintenance or development of suitable nesting habitat on private timberlands, and may reduce the quality of marbled murrelet habitat on State lands. Private timberlands are not likely to be occupied by marbled murrelets because suitable habitat is not likely to occur. Regeneration harvest usually occurs at about age 40 on private timberlands, which essentially eliminates the potential use by marbled murrelets because stands 40 and younger are not likely to support suitable nesting conditions.

Habitat quality for marbled murrelets on State lands is better than private timberlands because objectives for State lands include wildlife habitat. Stands on State lands are regeneration harvested on longer rotations, more and larger reserve trees are retained, and thinning occurs that improves habitat quality. Effects to marbled murrelet habitat quality on State lands could be beneficial to maintenance of suitable nesting structure in thinning areas. Effects to maintenance and development of nesting platforms could be indirectly beneficial where regeneration harvest retains trees with platforms or contributes to open growing conditions that are conducive to platform development.

Habitat conditions on adjacent lands could adversely affect habitat conditions within the project area by impacting wind firmness, microclimate and predation. These adjacent conditions, such as the recent regeneration harvest on State lands west of unit 2, were considered when evaluating and designing this project. The direct risk to potential nest trees from conditions on adjacent land would be minor because only two potential nest trees (<1% of potential nest trees in sections 09 and 23) are within 100 yards of BLM property boundaries; one tree is in section 09 and one tree is in section 23. Openings created on adjacent lands may also have indirect beneficial effects to the development of murrelet nesting platforms, because these platforms develop in relatively open growing conditions.

4.6 Issue 6: How would management actions affect northern spotted owls and their designated critical habitat?

This project would not appreciably reduce the conservation role of critical habitat stated in the critical habitat designation for the northern spotted owl. There are currently no active spotted owl sites likely to be affected by this project at the core area or home range scales. Barred owls have apparently displaced the spotted owls that historically used the Project Area.

Spotted owls need more complex high quality habitat to survive their competition with the barred owl and to support recovery. Olson *et al.,* (2004) concluded that while mid-seral and late-seral forests are important to spotted owls, a mixture of these forest types with younger forest and non-forest may be best for spotted owl survival and reproduction in the Central Oregon Coast Range. Hardwood trees are important to habitat quality (Glenn, Hansen, & Anthony, 2004; USDI-FWS, 2012; Wiens, Anthony, & Forsman, 2014). The desired amount of complex early seral habitat is not known, but the desired amounts of nesting or foraging habitats is at least 50% of core areas (0.5 miles

around the best activity center for a site) and at least 40% of home ranges (1.5 miles around the best activity center for a site).

Since Treatment Areas are in Critical Habitat for the northern spotted owl, all of the effects to spotted owl habitat described below are about critical habitat and are used to make the effects determination to critical habitat from this project.

Direct and Indirect Effects

No Action Alternative 1

Alternative 1 would not cause any direct adverse or beneficial effects to persistence or reproductive success of spotted owls. Indirect effects could be adverse to the persistence or reproductive success of spotted owls because alternative 1 would not contribute to the abundance, complexity, or persistence of high quality habitat. The abundance of high quality habitat appears to be important to the survival of the spotted owl in competition with the barred owl (Duggar, et al., 2011; Wiens, et al., 2014). There would be a loss in opportunity to improve conditions at landscape and stand scales for recovery of the spotted owl. The quality of forest habitats would remain low, which affects the recovery rate of desired habitat conditions for LSR and RR land allocations; i.e., multi layered multi species stands with snags and down wood (USDI-BLM, 1995 RMP) (USDA-USDI, 1994, p.B-1 to B-32). Complex/high quality late seral forests would not be attained or would take much longer to attain with alternative 1 than with the action alternatives. Current trend of declining local population would continue.

Action Alternatives

Development of diverse high quality forest habitat requires controlling the density of overstory trees (Chan, et al., 2006). High overstory conifer canopy cover means low habitat quality for the majority of species that use conifer forest habitats, including the northern spotted owl. Multi layered, multi species canopies provide high quality forest habitat, especially if hardwood trees and deadwood are major components. For example, two of the most important prey species for the spotted owl are strongly associated with multi-layered canopies and deciduous trees or shrubs: the flying squirrel (Carey et al., 1999, Carey et al., 2000; Smith 2007; Wilson 2010) and the woodrat (Carey, et al., 1999).

The action alternatives are designed to assure that no high quality habitat would be removed, no potential nest trees would be removed, and potential for disruption to nesting spotted owls would be avoided during the critical breeding period. Thinning in matrix and riparian reserve adjacent to matrix would maintain at least 60% canopy cover and have no short-term adverse effects and no long term beneficial affects because light thinning on the typical thinning interval of Siuslaw Resource Area (about 20 years) cannot restore multi layered multi species canopies.

Over 80% of stands on the Siuslaw Resource Area that are less than 120 years of age are low quality habitat because they rarely contain multi-layered multi-species canopies, diverse under-stories, or abundant large dead wood. This project emphasizes restoration of high quality habitat for the northern spotted owl by increasing early seral habitat and improving structural complexity in young stands thus increasing habitat quality; especially prey abundance.

RA10: Alternative 1 would continue the current trajectory of conditions within the nest patches and core areas of owl sites because no actions would occur in these areas similar to the action alternatives therefore not causing any direct adverse or beneficial effects to persistence of active spotted owl sites. The current trend of declining local population from competition with the barred owl and low amounts of high quality habitats would continue (USDI-FWS, 2012).

Potential for adverse or beneficial effects from the action alternatives on active or potentially active spotted owl sites would be minimal because no change would occur in nest patches and core areas and less than 1% of home ranges areas would be affected. The majority, but not the entirety, of the home ranges of the potentially active sites was surveyed without detecting resident spotted owls. Therefore, these sites are probably not active. However, there is a low probability that they might be active, thus the table below reveals the risk from this uncertainty is low to the persistence of these sites. The risk from habitat impacts to persistence of these potential sites is very low because only low quality habitat would be affected and adequate amounts of nesting/roosting or foraging habitat would remain after harvest at core and home range scales for all alternatives. See table 14 below for details.

Table 14: Percent habitat and treatments within owl sites

Spotted owl site name (status)	Existing high quality habitats (RA32)		Existing habitat (nesting/roosting or foraging)		Low quality foraging habitat treated (% of area)			
	% of core	% of HR*	% of core	% of HR	core	HR alt 2	HR alt 3	HR alt 4
Pataha Creek (active)	19%	11%	66%	62%	0%	<1%	<1%	<1%
Oat Ccreek (not likely active)	34%	14%	67%	51%	0%	<1%	<1%	<1%
Potential Site 37 (not likely active)	15%	10%	58%	56%	0%	<1%	<1%	<1%

*HR=home range

This project is consistent with recovery action 10 because of lack of activity in nest patches and core areas and adequate nesting, roosting or foraging habitats are maintained after treatments within the home range of the active and potentially active owl sites. Foraging, roosting, and nesting habitats in the Oregon Coast Range all have at least 60% canopy cover, and dispersal habitat has at least 40% canopy cover (USDI-FWS, 2012). The habitats in sections 09 and 23 (where forest management actions are planned) have limited contribution to RA10 because the habitat is low quality foraging habitat and dispersal habitat, and because none of the treatment areas are within the core area or nest patch of a resident (active) spotted owl site. Owl sites would retain suitable habitat on more than 50% of core areas and 40% of home range areas for the proposed action. Approximately 176 acres (less than 4%) of the Pataha site home range lie in the southern portion of section 9 of which about 35 acres are being thinned.

Surveys detected barred owls at several locations. The decline of the local spotted owl population appears related to the increase in the barred owl population (Wiens, 2012) (local data). Maintaining or restoring occupancy to spotted owls sites or establishing new sites will require increasing the amount of high quality habitats and may require control of barred owl population (USDI-FWS, 2011) (USDI-FWS, 2012).

Thinning would have indirect beneficial effects to recovery of spotted owls by improving the quality of foraging habitat for 10-25 years. The areas of moderate thinning in all action alternatives would reduce canopy cover below 60% and thus downgrade low quality foraging to dispersal habitat in the short-term (about 10 years); however, in the long term moderate thinning would benefit spotted owl critical habitat because structural complexity would increase for up to 20 years on about 100-120 acres. Small openings created in alternative 4 thinning areas would contribute to complex habitat and persist for more than 20 years, but these areas only cover about 5-10 acres.

Regeneration harvest would have adverse as well as beneficial effects because it would remove abundant low quality foraging habitat and create rare complex/high quality early seral habitat that would increase the abundance of prey for spotted owls in and adjacent to regeneration harvest areas.

Use by spotted owls may be limited to areas adjacent to regeneration harvest areas for 25-40 years and areas adjacent to moderately thinned areas in the action alternative for about 10 years. However, grouped green tree retention and dead wood patches in alternative 3 and skips in the moderate thinning may expand the area of use by providing safety cover in these patches with canopy cover greater than 60%. The complex early seral habitats created in matrix areas of alternative 3 would be higher quality habitat and persist longer than in alternative 2 regeneration harvest areas. These areas of alternative 3 should also be moderate or high quality foraging habitat for the spotted owl in 25-40 years when canopy height and closure is adequate to again support foraging. Regeneration harvest areas of alternative 2 would be simple conifer monoculture with large over story conifers in 25-40 years after harvest, which is low quality foraging habitat for the spotted owl.

Prescribed burning in alternatives 2 and 3 would have no adverse effects from smoke because burning would occur more than ¼ mile from active or potentially active known nest sites.

In all action alternatives for LSR thinning, canopy cover would be reduced to about 50% in low quality foraging habitat. This low quality foraging habitat may lose some of its functionality as foraging habitat and would function more as dispersal habitat (for about 10 years). Low quality foraging habitat would be removed (for 30 years) by regeneration harvest in alternatives 2 and 3. However, both sections would have adequate amounts of suitable nesting or foraging habitats after harvest to remain above thresholds for core area scale (more than 50% of each section). At least 75% of section 09 and at least 84% of section 23 would contain foraging or nesting/roosting

habitats after harvest in any of the action alternatives. However, neither of these sections has anywhere near 50% suitable complex/high quality, and only Alternative 3 is likely to lead to more high quality spotted owl habitat in about 30 years.

Road construction would remove structurally simple forest habitat that is 70-80 years old and create openings of about ¼ acre at eight locations, and about a ¾ acre opening at one other location in alternatives 2 and 3 for a total of 2.4 acres of road openings. New road construction is not being considered for LSR treatments in Alternative 4; therefore under this alternative approximately 20 acres of LSR would not be thinned. Approximately 1.5 acres of road openings would be created in alternative 4. Road renovation would occur on about 5.5 acres of existing road prism with small trees, shrubs, and grasses. Renovation will increase the amount of light reaching some existing roads by reducing the amount of small trees and shrubs, and renovation work on the road bed will reduce the amount of grasses and forbs at 6 locations ranging from about ½ acre to about 1½ acre openings. Stump-sprouting hardwood trees and shrubs as well as grasses and forbs on road edges will respond quickly to increased light from road work and where harvest is adjacent to road work. The abundance of small trees, shrubs, grasses, and forbs will initially decline from treatments, but they should also increase in abundance along roads as well as within harvest areas over a 10-20 year period.

In the short term, road construction would remove low quality spotted owl foraging habitat although stand scale habitat functionality would not change because each of the openings are too small to adversely affect habitat use. Disruption to nesting spotted owls from road work would not occur because no active sites are near proposed road work and because operating restrictions would be applied if road work is within disruption distance of an active site.

RA 32: Alternative 1 would not cause adverse or beneficial effects to RA32. The action alternatives would not cause adverse direct or indirect adverse effects to RA32 because activities would not occur in any RA32 stands. Beneficial indirect effects to RA32 would occur from LSR thinning in all action alternatives and from regeneration harvest in alternative 3 because these acres would likely function as high quality habitats in 30 to 40 years.

Cumulative effects

The effects determinations for spotted owls and their critical habitat from increasing the amount of complex early, mid, and late seral habitats would not be changed when cumulative effects are considered because the need for more high quality spotted owl habitat remains evident after analysis, and the adverse effects to spotted owl habitat from regeneration harvest of about 60 or 70 acres of spotted owl habitat that is very low quality habitat would remain a minor effect after comparing to other effects to spotted owl habitats in the sub watersheds. Since effects to spotted owl critical habitat is minor at the Project Area scale, and because only BLM has critical habitat, then the cumulative effects to critical habitat would also be minor.

There are no cumulative effects to potentially active sites from BLM's reasonably foreseeable actions (Rethin EA units) or from other ownerships because the Rethin units within the home ranges of potentially active spotted owl sites would retain at least 60% canopy cover and would not construct new roads (USDI-BLM 2013), and because impacts to potentially active spotted owl sites from other ownership or other BLM harvest described in the No Action alternative description were considered when evaluating existing conditions.

See cumulative effects to persistence of complex habitats (issue 2) for details about habitats because spotted owls use complex early, mid, and late seral habitats. Also, see the affected environment for spotted owl habitats for the baseline to compare the effects described above. State lands provide some suitable habitat for spotted owls, but private lands generally do not.

Thinning treatments in LSR lands on the Siuslaw resource area have included both light thinning with scattered dead wood creation and moderate thinning with creation of small openings and concentrations of dead wood to promote development of multi layered, multi species canopy layers. Thinning in Matrix lands has generally been light thinning with no dead wood or gap creation. Thinning projects within the Siuslaw resource area have been beneficial for improving the complexity of habitat conditions for spotted owls for about 10-15 years with light thinning, and for about 20 years with moderate thinning. Benefits to spotted owl habitat quality from small openings would persist for decades unless reforestation practices eliminate habitat complexity.

Habitat quality on private timberlands is lower than most other ownerships. Regeneration harvest usually occurs at about age 40 on private timberlands. The quality of habitats is low because the majority of private timberlands are intensely managed to suppress grasses, forbs, shrubs, and hardwood trees because they compete with

conifer “crop” trees and can adversely affect economic goals of landowners. Habitat quality for spotted owls in stands from ages 1-40 is very low, especially where herbicides are used to effectively eliminate or suppress grasses, forbs, and deciduous shrubs or trees because these are the habitat elements needed by most of the species that spotted owls prey upon. Furthermore, spotted owls may not use stream buffers on private timberlands to hunt the edges of early seral habitats because the buffers are generally too narrow (see southeast quarter of section 08 that is west of unit 1 for an example).

Habitat quality for spotted owls on State lands is better than private timberlands because objectives for State lands include wildlife habitat. Stands on State lands are regeneration harvested on longer rotations, more large reserve trees are retained, and young stands are thinned which improves habitat quality.

Critical Habitat Units: Cumulative, direct and indirect effects of action alternatives to spotted owls and their critical habitat is beneficial from improving habitat quality and complexity in early, mid, and late seral habitats. Some of the mid seral stands could be considered mature late seral habitat within 5-10 years. Cumulative effects to spotted owls and their critical habitat would be minor because regeneration harvest (alt 2 and alt 3) would remove low quality foraging habitat; most of the CHU and Siuslaw resource area consist of large quantities of low quality foraging habitat. Although 53% of the sub watersheds could be considered foraging habitat, only about 16% of the sub watersheds are likely to be used for foraging where there is higher quality habitats with multi layered multi species canopies and hardwoods. About 10% of the sub watersheds are nesting habitat, which is primarily on BLM lands. Alternative 3 would replace this abundant habitat with high quality early seral habitat which is not abundant within the critical habitat unit or Siuslaw resource area. Alternative 2 would provide complex early seral habitat, for about the first 15 years. Treatments under all action alternatives constitute about 0.2% of the critical habitat unit ORC3 in which the project lies. This project would not adversely affect the CHU (ORC3) (USDI-FWS, 2013 p. 140-141). Although short term affects maybe adverse at the stand scale due to the loss of current functionality of moderately thinned stands and of stands where regeneration harvest is being proposed, in about 30 years the moderately thinned areas and in about 25 to 40 years the regeneration harvest stands, would function as high quality foraging habitat. This would benefit spotted owls by increasing prey base habitat and improving opportunities for spotted owl nesting/roosting/foraging.

5.0 Tribes, Individuals, Organizations, and Agencies Consulted

Consultation with State Historic Preservation Office
Post-disturbance surveys, when conducted would follow standards based on slope as defined in Appendix D of the *Protocol for Managing Cultural Resource on Lands Administered by the Bureau of Land Management in Oregon*. These standards only mandate post-disturbance survey on slopes of 10% or less, or if professional judgment prompts such efforts due to topographic features or existence of nearby cultural resources. Ground disturbing work must be suspended if cultural material is discovered during project work until an archaeologist can assess the significance of the discovery.

If any other cultural and/or paleontological resource (historic or prehistoric site or object) is discovered during project activities all operations in the immediate area of such discovery shall be suspended until an evaluation of the discovery can be made by a professional archaeologist to determine appropriate actions to prevent the loss of significant cultural or scientific values.

Compliance with regulations for cultural resource protections: Section 106 of the National Historic Preservation Act (NHPA) of 1966 (amended in 1976, 1980, and 1992) is the foremost legislation governing the treatment of cultural resources during project planning and implementation. Other legal foundations include: Antiquities Act, Historic Sites Act, American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act.

Consultation with the Tribes
A scoping letter was mailed to the Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians; the Confederated Tribes of the Grand Ronde; and the Confederated Tribes of the Siletz Indians on September 24, 2013. We received no scoping comments. Copies of the EA will be mailed to them for public comment.

Consultation with USFWS
Consultation for the proposed action has been completed. The following effects determinations were issued by the USFWS.

Northern spotted owls
Thinning that retains at least 60% canopy cover would be not likely to adversely affect (NLAA); this is expected in matrix and riparian reserve adjacent to matrix, project design features would assure that no nesting/roosting or high quality habitat would be downgraded or removed, no potential nest trees would be removed, and potential for disruption to nesting spotted owls would be avoided during the critical breeding period. Prescribed burning in alternatives 2 and 3 may affect, but is not likely to cause direct adverse effects from smoke because burning would be more than ¼ mile from active or potentially active known nest sites.

May affect and likely to adversely affect (LAA) determinations were issued because canopy cover would be reduced to about 50% in low quality foraging habitat in LSR thinning and because low quality foraging habitat would be removed in Matrix. Low quality foraging habitat would be temporarily (about 10 years) downgraded to dispersal habitat in LSR thinning, and it would be removed (for 25-40 years) by regeneration harvest in alternatives 2 and 3. However, more than 50% of both sections would have suitable habitats after harvest; at least 75% of section 09 and at least 84% of section 23 would be foraging or nesting/roosting habitats after harvest. In addition, project design features would assure that no nesting/roosting or high quality habitat would be downgraded or removed, no potential nest trees would be removed, and potential for disruption to nesting spotted owls would be avoided during the critical breeding period.

Road work that reduces over-story canopy would increase the amount of early seral habitats along the edge of all roads and on much of the road surface of closed roads. Increasing the amount of early seral habitats in small openings would increase habitat complexity, thus habitat quality in stands. Alternative 4 would restrict new road construction in LSR, approximately 20 acres of LSR lands would not be thinned due to the lack of access from restricting road building. Although short term adverse effects from lack of thinning would not occur in these acres, the long term benefits of thinning would also not occur.

Minor adverse effects from road work to spotted owls (LAA) would occur because, although stand scale habitat functionality would not change, road construction would remove low quality spotted owl foraging habitat. Disruption to nesting spotted owls from road work would not occur because no active sites are near proposed road work and because operating restrictions would be applied if road work is within disruption distance of a site that could become active.

This project is consistent with Recovery Action 10 because it minimizes adverse effects to “reproductive pairs;” i.e. resident (active) spotted owl sites, and this project is consistent with Recovery Action 32 because it does not include treatments in high quality spotted owl habitats. Harm (take) would not occur to any active or potentially active spotted owl sites because adequate amounts of habitat would remain after treatments. Owl sites would retain suitable habitat on more than 50% of core areas and 40% of home range areas for the proposed action.

The project lies within designated northern spotted owl critical habitat. These actions constitute about 0.2% of the Critical Habitat Unit (CHU) ORC3 in which the project lies. This project would not adversely affect the CHU (ORC3) (USDI-FWS, 2013 p. 140-141).

Marbled murrelet
Regeneration harvest may affect, and is likely to adversely affect (LAA) marbled murrelets by reducing the quality of adjacent stands to provide murrelet habitat and by reducing canopy cover to less than 10% within 100 yards of about 4 unoccupied potential nest trees. This effect is minor and not likely to cause harm/take because all suitable habitat potentially affected by regeneration harvest was surveyed to protocol and no detections were made. Over 95% of the trees with nesting structure in the project area would NOT be affected by regeneration harvest since these trees are more than 100 yards away from regeneration harvest areas.

Prescribed burning in regeneration harvest areas may adversely affect (LAA) murrelets within ¼ mile of burning due to smoke that could disrupt nesting murrelets; however, these effects would not cause harm/take since these burn areas are not in the same drainage as the occupied habitat (EA p. 52). Harm (take) would not occur from this project

because there would be no disruption during the critical breeding period and no regeneration harvest would occur in marbled murrelet occupied habitat.

Minor adverse effects to murrelets (LAA) would occur because road construction may cause a need to remove an unoccupied potential nest tree. Road construction will not occur in any occupied suitable habitat, and nesting structure has been surveyed. Compliance with Level 2 policy for the management of younger stands with potential murrelet nesting structure has been followed. There will be no disruption of murrelets from road work because operating restrictions would be applied when needed.

A Biological Opinion and the Letter of Concurrence were issued by the USFWS for this project.

Consultation with National Marine Fisheries Service

Endangered Species Act (ESA)
Coho Salmon are listed as threatened under the ESA. The proposed action would have no effect on coho salmon and their designated critical habitat. The appropriate project design and mitigation features that would be implemented have been analyzed in this EA and support this conclusion. Consultation with National Marine Fisheries Service is therefore not required.

Essential Fish Habitat
The Magnuson-Stevens Fishery Conservation and Management Act requires federal agencies to consult with the Secretary of Commerce regarding any action or proposed action authorized, funded or undertaken by the agency that may adversely affect Essential Fish Habitat (EFH) under the Act. The proposed thinning action as described and analyzed in this environmental assessment would not adversely affect essential fish habitat.

6.0 List of preparers

Name	Title	Resource	Agency Represented
Peter O'Toole	Forester	Timber Sale Planning	BLM
Emily Timoshevskiy	Forester	Silviculture	BLM
Evan Wernecke	Civil Engineering Tech	Engineering	BLM
Sarah Diehr	Forester	Logging Systems	BLM
Leo Poole	Fish Biologist	Fisheries	BLM
Karin Baitis	Soil Scientist	Soils	BLM
Steve Steiner	Hydrologist	Hydrology	BLM
Doug Goldenberg	Botanist	Botany	BLM
Randy Miller	Wildlife Biologist	Wildlife	BLM
Kristin Allison	Fuels Specialist	Fuels	BLM
Tom Jackson	GIS Specialist	GIS	BLM
Sharmila Premdas	NEPA Planner	NEPA/Team Lead/EA writer	BLM
Heather Ulrich	Archaeologist	Archaeology	BLM

List of Citations

Ager, A., Clifton, C., (2005) Software for calculating vegetation disturbance and recovery by using equivalent clearcut area model. United States Department of Agriculture, Pacific Northwest Research Station. PNW-GTR-637. Portland, OR. 1-11

Anderson, P.D., Larson, D.J., & Chan, S.S., (2007). Riparian buffer and density management influences on microclimate of young headwater forests of Western Oregon. *Forest Science, 53*(2), 254-269.

Andrews, E.D. (1983). Entrainment of gravel from naturally sorted riverbed material. *Geological Society of America Bulletin, 94*(10), 1225-1231.

Andrews, E. D. (1984). Bed-material entrainment and hydraulic geometry of gravel-bed Rivers in Colorado. *Geological Society of America Bulletin, 95*, 371-378.

Asher, J. E., & Mullahey, J. J., (1997). Weed Science Society of America Congressional Briefing.

Aubry, K., Halpern, C., B., & Peterson, C.E., (2009). Variable-retention harvests in the Pacific Northwest: A review of short-term findings from the DEMO study. *Forest Ecology and Management, 258*, 398-408.

Aukema, J. E., & Caley, A. B., (2008). Effects of variable-density thinning on understory diversity and heterogeneity in young Douglas-Fir Forests. *USDA Pacific Northwest Research Station*.

Baker, S., Spies, T., Wardlaw, T., Balmer, J., Franklin, J., & Jordan, G. (2013). The harvested side of edges: Effect of retained forests on the re-establishment of biodiversity in adjacent harvested areas. *Forest Ecology And Management*, *302*, 107-121. doi:10.1016/j.foreco.2013.03.024

Barbour, M. G., Burk, J. H., Pitts, W. D., Gilliam, & Schwartz. (1998). *Terrestrial Plant Ecology - 3rd Edition.* Benjamin-Cummings Publishing Co.

Baitis, K. 2014. Personal communication with BLM Soils Scientist. Eugene District Bureau of Land Management. Springfield, Oregon

Benda, L., & Bigelow, P. (2014). On the patterns and processes of wood in Northern California streams. *Geomorphology, 209*, 79-97.

Beschta, R. (1997). Riparian shade and stream temperature: An alternative perspective. *Rangelands, 19*(2), 25-28.

Bilby, R., & Ward, J. (1991). Characteristics and function of large woody debris in streams draining Old-Growth, clear-cut, and Second-Growth Forests in Southwestern Washington. *Can. J. Fish. Aquat. Sci.*, *48*(12), 2499-2508.

Binkley, D., & Reid, P. (1984). Long-term responses of stem growth and leaf area to thinning and fertilization in a Douglas-Fir plantation. *Canadian Journal of Forest Research Can. J. For. Res., 14*, 656-660.

Boyd, M., & Sturdevant, D. (1997). Scientific basis for Oregon's stream temperature standard: Common questions. *Oregon Department of Environmental Quality.*

Brake, D.; M. Molnau and J.G. King. (1997) Sediment transport distances and culvert spacing on logging roads within the Oregon Coast mountain range. ASAE Annual International Meeting, August 10-14, 1997. Minneapolis, MN. 12

Burton, J., Ares, A., Olson, D., & Puettmann, K. (2013). Management trade-off between aboveground carbon storage and understory plant species richness in temperate forests. *Ecological Applications, 23*(6), 1297-1310.

Campbell, J. L., & Donato, D. C. (2014). Trait-based approaches to linking vegetation and food webs in early-seral forests of the Pacific Northwest. *Forest Ecology and Management 324*, 172-178.

Carey, A., Kershner, J., Biswell, B., & De Toledo, L. (1999). Ecological scale and forest development: Squirrels, dietary fungi, and vascular plants in managed and unmanaged forests. *Wildlife Monographs (ISSN:0084-0173); Supplement to The Journal of Wildlife Management, 63*(1).

Carey, A., & Fürth, F. (2000). Ecology of Northern Flying Squirrels: Implications for Ecosystem Management in the Pacific Northwest, USA (R. Goldingay & J. Scheibe, Eds.). *Biology of Gliding Mammals,* 684-684.

Chan, S., Anderson, P., Cissel, J., Larsen, L., & Thompson, C. (2004). Variable density management in Riparian Reserves: Lessons learned from an operational study in managed forests of western Oregon, USA. USDA Forest Service, Pacific Northwest Research Station, *For. Snow Landsc. Res. 78, ½,* 151-172.

Chan, S. S., Larson, D. J., Maas-Hebner, K. G., Emmingham, W. H., Johnston, S., Johnston, S. R., & Milkowski, D. A. (2006). Overstory and understory development in thinned and underplanted Oregon Coast Range Douglas-fir stands. *Can. J. For. Res. 36*, 2696-2711.

Clinton, B., Vose, J. & Fowler, D. (2010). Flat Branch Monitoring Project: Stream Water Temperature and Sediment Responses to Forest Cutting in the Riparian Zone. USDA Forest Service, Southern Research Station., Res. Pap*. SRS–51.*, 8.

Collier, R. L. & Turnblom, E. C. (2001). Epicormic Branching on Pruned Coastal Douglas-Fir. *WJAF 16 (2) Western Journal of Applied Forestry*, 80-86.

Corbett, E.S. & Lynch, J.A. (1985). Management of streamside zones on municipal watersheds. In riparian ecosystems and their management: Reconciling conflicting issues. USDA Forest Service GTR RM-120, pp. 187-190.

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

DecAID-Mellen, K. et al., (2012). DecAID, the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon. Version 2.0. [Online] available at: http://wwwnotes.fs.fed.us;81/pnw/DecAID/DecAID.nsf [accessed 2015]

Department of Natural Resources. (2011). *Standard Methodology for Conducting Watershed Analysis: Watershed analysis manual* (Version 5.0 Appendix C. pp.53). Olympia, Washington: Washington Forest Practices Board.

Dietrich, W., Dunne, T., Humphrey, N., & Reid, L. (1982). Construction of sediment budgets for drainage basins: Sediment budgets and routing in forested drainage basins, *GTR-PNW* (141), 2-23.

Dillaha, T. A., Sherrard. H., Lee, D., Mostaghimi, S. & Shanholtz, V.O. (1988). Evaluation of vegetative filter strips as a best management practice for feed lots. Journal of the Water Pollution Control Federation 60(7):1231-1238.

Dillaha, T.A., Reneau, R.B., Mostaghimi, S. & Lee, D. (1989). Vegetative filter strips for agricultural nonpoint source pollution control. *Transactions of the ASAE*, *32*(2), 0513-0519.

Dodson, E., Ares, A., & Puettmann, K. (2012). Early responses to thinning treatments designed to accelerate late successional forest structure in young conifer stands of Western Oregon, USA. *Can. J. For. Res., 42*, 345-355.

Donato, D. C., Campbell, J. L., & Franklin, J. F. (2012). Multiple successional pathways and precocity in forest development: *can some forests be born complex?* Journal of Vegetation Science 23 (2012) 576–584.

Dugger, K. M., Anthony, R. G., & Andrews, L. S. (2011). Transient dynamics of invasive competition: Barred owls, Spotted owls, habitat, and the demons of competition present. *Ecological Applications 21(7)* , 2459-2468.

Dugger, K., Wagner, F., Anthony, R., & Olson, G. (2005). The relationship between habitat characteristics and demographic performance of Northern Spotted owls in Southern Oregon. *The Condor, 107*, 863-878.

Environmental Law Institute. (2008). *Planner's guide to wetland buffers for local governments* (ELI Project No. 0627-01. pp. 31). Washington D.C., U.S.A.

Environmental Protection Agency (EPA) (1991). Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. (EPA Production No.910/9-91-001). Seattle, Washington: Environmental Protection Agency.

Environmental Protection Agency (EPA). (2005). *Emission Facts: Average carbon dioxide emissions resulting from gasoline and diesel fuel.* (EPA Production No.420-F-05-001). Washington D.C., U.S.A: Environmental Protection Agency.

Environmental Protection Agency (EPA). (2009). *Inventory of U.S. greenhouse gas emissions and sinks: 1990-2007* (pp. 2-3). Washington D.C., U.S.A: Environmental Protection Agency.

FEMAT (1993). USDA Forest Service, USDC National Oceanic and Atmospheric Administration, USDC National Marine Fisheries Service, USDI Bureau of Land Management, USDI Fish and Wildlife Service, USDI National Park Service, and Environmental Protection Agency. *Forest ecosystem management: an ecological, economic, and social assessment.* Report of the Forest Ecosystem Management Team.

Forsman, E., Anthony, R., Dugger, K., Ackers, S., & Andrews, L. (2011). Studies in Avian Biology No. 40. In *population demography of Northern Spotted Owls*. Cooper Ornithological Society.

Franklin, J. F. (1991). Ecological definitions of Old-Growth Douglas-fir forests. *Wildlife and vegetation of unmanaged Douglas-fir forests*, 61-69. Portland, Oregon: USDA Forest Service, Pacific Northwest Research Station.

Franklin, A. B., Anderson, D. R., Gutierrez, R. J. & Burnham, K. P., (2000) Climate, habitat quality, and fitness in northern spotted owl populations in northwestern California. Ecological Monographs, 70(4), p. 539–590.

Franklin, J. F. (2002). Disturbance and structural development of natural forest ecosystems with silvicultural implications, using Douglas-fir forests as an example. *Forest Ecology and Management*, 399-423.

Franklin, J. F., & Johnson, N. K. (2012, December). A restoration framework for Federal forests in the Pacific Northwest. *Journal of Forestry, 110*(8), 429-439.

Frelich, L. (2002). *Forest Dynamics and Disturbance Regimes: Studies from temperate evergreen-decidious forests.* Cambridge University Press.

Ghgprotocol.org,. (2010). *Wood Products | Greenhouse Gas Protocol*. Retrieved 1 September 2015, from http://www.ghgprotocol.org/calculation-tools/wood-products

Glenn, E.M., Hansen M.C., Anthony, R.G. (2004). Spotted owl home range and habitat use in young forests of western Oregon. *Journal of Wildlife Management*, 68(10, 33-50.

Grant, G., Lewis, S., Swanson, J., Cissel, H., & McDonnell, J. (2008). Effects of forest practices on peak flows and consequent channel response in Western Oregon: A state-of-science report for western Oregon and Washington. *General Technical Report* (PNWk-GTR-760).

Gray, A. (2005). Eight nonnative plants in western Oregon forests: Associations with environment and management. *Environmental Monitoring and Assessment,* 109-127.

Gray, A., Spies, T. (1997). Microsite controls on tree seedling establishment in conifer forest canopy gaps. *Ecology, 78*(8) 2458-2473

Greenberg, J., & Welch, F. (1998). Hydrologic process identification for Western Oregon. *Oregon Watershed Assessment Manual*.

Gomi, T., Moore, R., & Hassan, M. (2005). Suspended sediment dynamics in small forest streams of the Pacific Northwest. *Journal of the American Water Resources Association, 41*(4), 877-898.

Groom, J., Dent, L., & Madsen, L. (2011). Stream temperature change detection for state and private forests in the Oregon Coast Range. *Water Resources Research Water Resour. Res. 47, W01501*.

Groom, J., Dent, L., Madsen, L., & Fleuret, J. (2011). Response of western Oregon (USA) stream temperatures to contemporary forest management. *Forest Ecology and Management, 262*(8), 1618-1629. doi:10.1016/j.foreco.2011.07.012.

Guitierrez R, Cody M, Courtney S, Kennedy D., (2004) Assessment of the potential threat of the northern barred owl. In: final report: scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystems Institutes. Portland, OR

Hagar, J. C. (2007). Wildlife species associated with non-coniferous vegetation in Pacific Northwest conifer forests: A review. *Forest Ecology and Management 246*, 108–122.

Hall, J., Brown, W., & Lance, L. (1987). Streamside Management: Forestry and Fishery Interactions (O. Salo & W. Cundy, Eds.). *The Alsea Watershed Study: A Retrospective.* 399-416.

Halpern, C. (1989). Early successional patterns of forest species: Interactions of life history traits and disturbance. *Ecology, 70*(3), 704-720.

Halpern, C., & Spies, T. (1995). Plant species diversity in natural and managed forests of the Pacific Northwest. *Ecological Applications, 5*(4), 913-934.

Hann, D. (2009). *ORGANON user's manual version 8.4* (p. 129). Corvallis, Oregon: Department of Forest Resources, Oregon State University.

Harmon, M., Franklin, J., Swanson, F., Sollins, P., Gregory, S., & Lattin, J. (1986). Ecology of coarse woody debris in temperate ecosystems. *Advances in Ecological Research, 15*, 133-302.

Harmon, M., Ferrell, W., & Franklin, J. (1990). Effects on carbon storage of conversion of old-growth forests to young forests. *Science,* 699-702.

Harr, R., D. Harper, W., Krygier, J., & Hsieh, F. (1975). Changes in storm hydrographs after road building and clear-cutting in the Oregon Coast Range. *Water Resources Research Water Resour. Res., 11*(3), 436-444.

Harr, R., D. (1976). Hydrology of small forest streams in Western Oregon. *General Technical Report PNW-55*.

Harr, R. Fredrikson, L., & Rothacher, J. (1979). Changes in stream flow following timber harvest in southwestern Oregon. *USDA Forest Service Research, PNW-249*.

Harr, R. D., Levno, A., & Mersereau, R. (1982). Stream flow changes after logging 130-year-old Douglas fir in two small watersheds. *Water Resources Research Water Resour. Res., 18*(3), 637-644.

Harr, R. D., (1986). Effects of clear-cutting on rain-on-snow runoff in Western Oregon: A new look at old studies. *Water Resources Research Water Resour. Res., 22*, 383-392.

Harr, R., D. Coffin, B. (1992). Influence of timber harvest on rain-on-snow runoff: A mechanism for cumulative watershed effects. Interdisciplinary approaches in hydrology and hydrogeology*, American Institute of Hydrology*, 455-469.

Hubbert, K., Busse, M., & Overby, S. (2013). Effects of pile burning in the LTB on soil and water quality. *Final Report. U.S. Department of Agriculture, Forest Service Pacific Southwest Research Station. SNPLMA 12576*, 66-66.

Huff, R., Van Norman, K., Hughes, C. Davis, R., & Mellen-Mclean, K. (2012). Survey protocol for the Red Tree Vole, version 3.0. Portland, OR. U.S. Department of the Interior, Bureau of Land Management, Oregon/Washington, and U.S. Department of Agriculture, Forest Service Regions 5 and 6. 52 p.

Ice, G., (1978). Spatial and temporal patterns of fire in the forests of the Central Oregon Coast Range, (Doctoral dissertation). Department of Forest Engineering, Oregon State University.

Impara, P., (1997). Spatial and temporal patterns of fire in the forests of the Central Oregon Coast Range, (Doctoral dissertation). Department of Forest Science, Oregon State University.

Intergovernmental Panel on Climate Change. (2007). In climate change: The physical science basis: Contribution of Working Group 1 to the fourth assessment report of the Intergovernmental Panel on Climate Change. United Kingdom and New York, New York: Cambridge University Press.

Irwin, L. L., Rock, D. F., & Rock, S. C. (2012). Habitat selection by Northern Spotted Owls in mixed-coniferous forests. *The Journal of Wildlife Management 76(1):200–213; 2012; DOI: 10.1002/jwmg.218*, 200–213.

Jassal, R., Black, T., Chen, B., Roy, R., Nesic, Z., Spittlehouse, D., & Trofymow, J. (2008). N 2 O emissions and carbon sequestration in a nitrogen-fertilized Douglas fir stand. *J. Geophys. Res. Journal of Geophysical Research, 113*(G04013).

Johnson, D. H., & O'Neil, T. A. (2001). Wildlife habitat relationships in Oregon and Washington. Corvallis, Oregon: Oregon State University Press, 101 Waldo Hall, Corvallis, Oregon, 7331-6407.

Johnson, K., & Franklin, J. (2009). Restoration of Federal Forests in the Pacific Northwest: Strategies and management implications. *Institute of Applied Ecology*.

Johnston, N.T., Bird, S. A., Hogan, D. L. & Macisaac, E. (2011). Mechanisms and source distances for the input of large woody debris to forested streams in British Columbia, Canada. *Canadian Journal of Forest Research Can. J. For. Res.,* 41, 2231-2246.

Keim, R. F., Skaugset, A. E., & Bateman, D., S. (2002). Physical Aquatic Habitat II. Pools and cover affected by large woody debris in three Western Oregon streams. *North American Journal of Fisheries Management, 22*, 151-164.

Kintop, C. (2009). *Canopy cover estimator tool.* Roseburg: USDI Bureau of Land Management; Roseburg Resource Area.

Kintop, C. (2011). Regen ingrowth tree lists base data_N&J_11-16-2011. Roseburg, Oregon.

Krebs, C. J. (1985). *Ecology, The experimental analysis of distribution and abundance. Institute of Animal Resource Ecology,* The University of British Columbia. Harper Collins Publishers.

Kuusemets, V., & Mander, U. (1999). Ecotechnological measures to control nutrient losses from catchments. *Water Science and Technology, 40*(10), 195-202.

Leinenbach, P., McFadden, G., & Torgersen, C. (2013). Effects of riparian management strategies on stream temperature. *Science Review Team Temperature Subgroup*.

Lowrance, R., & Sheridan, J., M. (2005). Surface runoff water quality in a managed three zone riparian buffer. *Journal of Environment Quality, 34*, 1851-1859.

MacDonald, L., Smart, A., & Wissmar, R. (1991). Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. *EPA/910/9-91-001*.

Malt, J., & Lank, D. (2007). Temporal dynamics of edge effects on nest predation risk for the marbled murrelet. *Biological Conservation 140*, 160-173.

May, C., & Gesswell, E. (2003). Large wood recruitment and redistribution in headwater streams in the southern Oregon Coast Range. *Large Wood Recruitment and Redistribution in Headwater Streams in the Southern Oregon Coast Range, 57*, 135-149.

McDade, M., Swanson, F., Mckee, W., Franklin, J., & Sickle, J. (1990). Source distances for coarse woody debris entering small streams in western Oregon and Washington. *Canadian Journal of Forest Research Can. J. For. Res.,* 326-330.

Meleason, M., Gregory, S., & Bolte, J. (2002). Simulation of stream wood source distance for small streams in the Western Cascades. *USDA Forest Service GTR, PSW-GTR-181*.

Meleason, M., Gregory, S., & Bolte, J. (2003). Implications of riparian management strategies on wood in streams of the Pacific Northwest. *Ecological Applications,* 1212-1221.

Mellen, K., Marcot, B. G., Ohmann, J. L., Waddell, K., Livingston, S. A., Willhite, E. A., . Dreisback, T. (2014). *DecAID, the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon. Version 2.0.* Retrieved 2012, from http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAID.nsf

Miller, R. E., Bigley, R. E., & Webster, S. (1993). Early development of matched Planted and naturally regenerated Douglas-Fir stands after Slash burning in the Cascade Range. *Western Journal of Applied Forestry, 8*(1), 5-10.

Miller, D., & Burnett, K. (2007). Effects of forest cover, topography, and sampling extent on the measured density of shallow, translational landslides. *Water Resources Research Water Resour. Res., 43*(W03433).

Miller, D., Williamson, M., & Silen, R. (1974). Regeneration and growth of Coastal Douglas-Fir. U.S. Department of Agriculture, Northwest Forest and Range Experiment Station. Portland, OR.

Moore, R., & Wondzell, S. (2005). Physical hydrology and the effects of forest harvesting in the Pacific Northwest: A Review. *Journal of the American Water Resources Association J Am Water Resources Assoc, 41*(4), 763-784.

Muir, P., Mattingly, R., Tappeiner, J., Baily, J., & Elliot, W. (2002). Managing for biodiversity in young Douglas-fir forests of Western Oregon. *USGS, Biological Resources Division, Biological Science Report, USGS/BRD/BSR-2002-0006*, 76-76.

Nabel, M., Newton, M., & Cole, E. (2013). Abundance of natural regeneration and growth comparisons with planted seedlings 10–13years after commercial thinning in 50-year-old Douglas-fir, Douglas-fir/Western hemlock, Oregon Coast Range. *Forest Ecology and Management,* (292), 96-110.

Naiman, R., Balian, E., Bartz, K., Bi by, R., & Latterell, J. (2002). Dead wood dynamics in stream ecosystems. *USDA Forest Service GTR, PSW-GTR-181.*, 26-26.

Nelson, S., & Wilson, A. (2002). Marbled Murrelet habitat characteristics on state lands in Western Oregon. 151-151.

Ober, H. (2006). Functional relationships among vegetation, nocturnal insects, and bats in riparian areas of the Oregon Coast Range. (Doctoral dissertation). Department of Forest Science, Oregon State University.

Ober, H., & Hayes, J. (2008). Influence of forest riparian vegetation on abundance and biomass of nocturnal flying insects. *Forest Ecology and Management, 256*, 1124-1132.

Oregon Department of Fish & Wildlife. (2002). *Aquatic inventory reports* (p. 26). Corvallis Oregon: ODFW.

Ohmann, J. (2002). Decayed wood advisor. Retrieved July 23, 2015.

Olson, G., Anthony, R., Forsman, E., Ackers, S., Loschl, P., Reid, J. & Ripple, W. (2005). Modeling of site occupancy dynamics for Northern Spotted Owls, with emphasis on the effects of Barred Owls. *Journal of Wildlife Management, 69*(3), 918-932.

Olson, G., Glenn, E., Anthony, R., Forsman, E., Reid, J., Loschl, P., & Ripple, W. (2004). Modeling demographic performance of Northern Spotted Owls relative to forest habitat In Oregon. *Journal of Wildlife Management, 4;68*, 1039-1053.

Oregon Watershed Enhancement Board. (1999). *Oregon Watershed Assessment Manual* (pp. Chapter 4. Hydrology and water use (pp. 81). Salem Oregon: Watershed Professionals Network

Oregon Watershed Enhancement Board. (2011a). *Standard Methodology for Conducting Watershed Analysis Version 5.0* (Appendix B- Surface Erosion Module pp. 47; Appendix C- Hydrologic Change pp. 53). Salem Oregon: Watershed Professionals Network.

Palma, S., Morrison, T., & Woodward, D. (2008). Waterfront buffer zones: In *Vermont Legislative Research Shop* (p. 4). Burlington, Vermont: The University of Vermont.

Pechman. 2006. Northwest Ecosystem Alliance, et al., Plaintiffs, v. Mark E. Rey, et al., Defendants. United States District Court Western District of Washington. Case 2:04-cv-00844-MJP. Seattle, Washington.

Petts, G. (1996). *Applied river morphology* (2nd ed.) (D. Rosgen, Ed.). Pagosa Springs, Colorado: John Wiley & Sons. ISBN 0-9653289.

Poage, N. J. (2005). *Variability in Older Forest Structure in Western Oregon; [BLM LSOG conifer database] Open-file Report 2005-1385.* USDI U.S. Geological Survey.

Poage, N. J., Weisberg, P. J., Impara, P. M., Tappeiner, J. C., & Sensenig, T. S. (2009). Influences of climate, fire, and topography on contemporary age structure patterns of Douglas-fir at 205 old forest sites in western Oregon. *Can. J. For. Res. 39:* , 1518–1530.

Poggi, D., Porporato, A., Ridolfi, L., Albertson, J., & KATUL, G. (2004). The Effect of Vegetation Density on Canopy Sub-Layer Turbulence. *Boundary-Layer Meteorology*, *111*(3), 565-587.

Steam Donkey Echo

Pollok, M., & Kennard, P. (1998). *A low-risk strategy for preserving riparian buffers needed to protect and restore salmonid habitat in forested watersheds of Washington State* (p. 36). Bainbridge Island, Washington.

Raphael, M. G., Shirk, A. J., Flaxa, G. A. & Pearson, S. F., 2014. Habitat associations of marbled murrelets during the nesting season in near shore waters along the Washington to California coast, Journal of Marine Systems http://dx.doi.org/10.1016/j.jmarsys.2014.06.010, p. http://dx.doi.org/10.1016/j.jmarsys.2014.06.010

Rapp, V. (2002). *Restoring Complexity: Second-Growth Forests and Habitat Diversity.* USDA. Portland, OR: Pacific Northwest Research Station.

Rashin, E., Clishe, C., Loch, A., & Bell, J. (2006). Effectiveness of timber harvest practices for controlling sediment related water quality impacts. *JAWRA Journal of the American Water Resources Association*, *42*(5), 1307-1327.

Reid, L., & Dunne, T. (1984). Sediment production from forest road surfaces. *Water Resources Research*, *20*(11), 1753-1761.

Reid, L., & Lewis, J. (2009). Rates, timing, and mechanisms of rainfall interception loss in a coastal redwood forest. *Journal Of Hydrology*, *375*(3-4), 459-470.

Richards, L. (2010). Alaska Fisheries Science Center Publications Database2010223Alaska Fisheries Science Center. Alaska Fisheries Science Center Publications Database. Seattle, WA: National Marine Fisheries Service – NOAA Fisheries Last visited February 2010. Gratis URL: http://access.afsc.noaa.gov/pubs/search.cfm. *Reference Reviews*, *24*(5), 41-41.

Root, H., Mccune, B., & Neitlich, P. (2010). Lichen habitat may be enhanced by thinning treatments in young Tsuga heterophylla-Pseudotsuga menziesii forests. *The Bryologist,* 292-307.

Rosgen, D. L. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Rosso, A., McCune, B., & Rambo, T. (2000). Ecology and Conservation of a Rare, Old-Growth-Associated Canopy Lichen in a Silvicultural Landscape. *The Bryologist*, *103*(1), 117-127.

Rothacher, J. 1963. Net Precipitation under a Douglas-Fir Forest. Forest Science 9: 423-429

Rothacher, J. (1973). Does harvest in west slope Douglas-fir increase peak flow in small forest streams?

Schilling, J., Dugger, K., & Anthony, R. (2013). Survival and home-range size of Northern Spotted Owls in Southwestern Oregon. *Journal of Raptor Research, 47*(1), 1-14.

Schoonmaker, P., McKee, A. (1988). Species composition and diversity during secondary succession of coniferous forests in the western Cascades Mountains of Oregon. *Forest Science*, 960-979.

Schoonover, J., Williard, K., Zaczek, J., Mangun, J., & Carver, A. (2006). Agricultural sediment reduction by giant cane and forest riparian buffers. *Water Air Soil Pollut*, *169*(1-4), 303-315. doi:10.1007/s11270-006-3111-2

Sickle, J., & Gregory, S. (1990). Modeling inputs of large woody debris to streams from falling trees. *Canadian Journal of Forest Research*, *20*(10), 1593-1601. doi:10.1139/x90-211

Smith, W. (2007). The Northern Flying Squirrel: Biological portrait of a forest specialist in Post-European settlement North America. *Journal of Mammalogy*, *88*(4), 837-839.

Sonne, E., 2006. Greenhouse gas emissions from Forestry Operations. *Journal of Environmental Quality*, 35(4), 1439-1450.

Spies, T., M. Pollock, G. Reeves, & T. Beechie. (2013). Effects of riparian thinning on wood recruitment: a scientific synthesis. Science Review Team Wood Recruitment Subgroup. USDA FS, Pacific Northwest Science Laboratory, Corvallis, OR, and NOAA Fisheries Northwest Fisheries Science Center, Seattle, WA

Spittlehouse, D.L. (1998). Rainfall interception in young and mature conifer forests in British Columbia. In Proceedings of the 23rd conference on agricultural and forest meteorology (A buquerque, New Mexico), 171-174. Boston, MA: American Meteorological Society.

Strong, C. (2013). Decline of the Marbled Murrelet population on the Central Oregon Coast during the 1990s. *Northwestern Naturalist,* 31-31.

Swanson, M., Franklin, J., Beschta, R., Crisafulli, C., DellaSala, D., & Hutto, R. et al. (2011). The forgotten stage of forest succession: early-successional ecosystems on forest sites. *Frontiers in Ecology and the Environment*, *9*(2), 117-125.

Swanson, M. E., Studevant, N. M., Campbell, J. L., & Donato, D. C. (2014). Biological associates of early-seral pre-forest in the Pacific Northwest. *Forest Ecology and Management Volume 324*, 160-171.

Swift, L. (1986). Filter strip widths for forest roads in the southern Appalachians. *Southern Journal of Applied Forestry, 10*(1), 27-34.

Syversen, N. (2005). Effect and design of buffer zones in the Nordic climate: The influence of width, amount of surface runoff, seasonal variation and vegetation type on retention efficiency for nutrient and particle runoff. *Ecological Engineering*, *24*(5), 483-490. doi:10.1016/j.ecoleng.2005.01.016

Tappeiner, J., & Helms, J. (1971). Natural Regeneration of Douglas fir and White Fir on Exposed Sites in the Sierra Nevada of California. *American Midland Naturalist*, *86*(2), 358.

Tendersoo, L., Pellet, P., Kõljalg, U., & Selosse, M. (2007). Parallel evolutionary paths to mycoheterotrophy in understory Ericaceae and Orchidaceae: ecological evidence for mixotrophy in Pyroleae. *Oecologia*, *151*(2), 206-217.

Theis, W. S. 1995. *Laminated Root Rot in Western North America.* Portland, OR: USDA, Forest Service, Pacific Northwest Research Station.

Thompson, J. R., Duncan, S. L., & Johnson, N. K. (2010). Is there potential for the historical range of variability to guide conservation given the social range of variability? *Ecology and Society;* 14

Thompson, J. R., S. L. Duncan, and K. N. Johnson. (2008). Is there potential for the historical range of variability to guide conservation given the social range of variability? Ecology and Society 14(1): 18.

Thysell, D., & Carey, A. (2001). Manipulation of density of Pseudotsuga *menziesii* canopies: preliminary effects on understory vegetation. *Canadian Journal of Forest Research*, *31*(9), 1513-1525.

U. S. Army Corps of Engineers. (1991). *Buffer strips for riparian zone management* (p. 66). New England Division. Waltham, MA.

USDA-USDI. (1994). *Northwest Forest Plan Final Supplemental EIS & ROD for amendments to Forest Service and BLM Documents within the range of the Northern Spotted Owl and S&Gs for management of habitat for late successional and Old Growth Forest related Spp. w/in Range of the Northern Spotted Owl*. USDA, Portland, Oregon: USDA U.S. Forest Service and USDI, BLM.

USDA-USDI (1997). *Late Successional Reserve Assessment Oregon Coast Province – Southern Portion* (pp. RO267, RO268). Portland, Oregon: USDA U.S. Forest Service and USDI- BLM.

USDA -USDI (2001). *Record of Decision and Standards and Guidelines for amendments to the survey and manage, protection buffer, and other mitigation measures standards and guidelines* (pp. 2002 version 2.0). Portland, Oregon: USDA U.S. Forest Service & USDI-BLM.

USDA-USDI (2002). *Survey protocols for Category A and C Lichens*. Portland, Oregon: USDA, U.S. Forest Service & USDI-BLM.

USDA-USDI (2004) Final Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines. Portland, OR.

USDA-USDI (2005). *Northwest Forest Plan Temperature TMDL implementation strategies.* Portland, Oregon: U.S. Forest Service, R-6 Regional Office & BLM Oregon State Office.

USDA-USDI (2012). *Northwest Forest Plan temperature TMDL implementation strategies.* Portland, Oregon: U.S. Forest Service, R-6 Regional Office & BLM Oregon State Office

USDI-BLM. (1992). *Integrated Weed Management*. (Manual 9015: Release 9-321). USDI, BLM.

USDI- BLM. (1994). *Final Environmental Impact Statement for the Resource Management Plans of the Western Oregon Bureau of Land Management*. Portland, Oregon: USDI, BLM.

USDI-BLM (1995). *Record of Decision and Resource Management Plan*.(Appendix E). EugeneDistrict Office, Oregon: Oregon: USDI, BLM

USDI-BLM. (1996). *Wolf Creek Watershed Analysis*. Eugene District Office, Oregon: USDI, BLM.

USDI-BLM. (1999). *Wildcat Creek Watershed analysis*. Eugene District Office, Oregon: USDI- BLM.

USDI-BLM (2003). *Regeneration Stocking Surveys Handbook*: *(Instruction Memorandum No.* OR-2003-083)*.* Portland, Oregon: USDI-BLM.

USDI-BLM. (2008). *Final Environmental Impact Statement for the revision of the resource management plans of the Western Oregon Bureau of Land Management*. Portland, Oregon: USDI-BLM.

USDI-BLM (2008). *Western Oregon Plan Revision* (EIS *DRAFT).*

USDI-BLM (2009). *Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources.*(ORDER NO. 3289). Washington Division, D.C.: USDI-BLM.

USDI-BLM. (2010). *Analysis of greenhouse gas emissions and consideration of climate change in National Environmental Policy Act Documents.* (pp. Instruction Memorandum OR-2010-012). Washington Division, Washington D.C. U.S.A: USDI-BLM.

USDI-BLM. (2011). *Settlement agreement in litigation over the survey and manage mitigation measure in conservation Northwest et al. v. Sherman et al.,* (pp. *Instruction Memorandum No.OR-2011-063.* Case No: 08-1067-JCC). Washington Division, Washington D.C. U.S.A.: USDI-BLM

USDI-BLM. (2011). *Rethin environmental analysis* (pp.DOI-BLM-OR-E050-2011-0004-EA).Eugene District Office, Oregon: USDI-BLM.

USDI-BLM. (2011). *Best management practices to reduce sediment delivery from BLM roads in Oregon*.(pp. 12). Eugene District Office, Oregon: USD- BLM.

USDI-BLM. (2013) *Rethin Environmental Assessment*. Eugene District Office, Oregon: USD- BLM.

USDI-FWS. (1997*). Recovery Plan for the Threatened Marbled Murrelet (Brachyramphus marmoratus) in Washington, Oregon, and California*. Portland, Oregon: Region 1 U.S. Fish and Wildlife Service.

USDI-FWS (2011) *Endangered and threatened wildlife and plants: 12-month finding on a petition to list a distinct population segment of the red tree vole as endangered or threatened.* Federal Register; 50 CFR Part 17; (76) p. 63720-63762

USDI-FWS (2011) *Revised Recovery Plan for the Northern Spotted Owl (Strix occidentalis caurina).* Portland, Oregon: USD.

USDI-FWS (2011*) Policy for the management of potential marbled murrelet nesting structure within younger stands Issued by the Level 2 Team for the North Coast Planning Province.*

USDI-FWS (2012) *Revised Critical Habitat for the Northern Spotted Owl* (Final Rule, 50 CFR part 17; 77 FR 71876).

USDI-FWS (2013). *Habitat modification North. Coast*. (BO FY 2013-2014). Portland, Oregon.

USDI-USGS. (2008). *The challenges of linking carbon emissions, atmospheric greenhouse gas concentrations, global warming, and consequential impacts* (pp. Memorandum #2008438-DO, 2). , Washington D.C. U.S.A: USDI-BLM.

Van Lanen, N., Franklin, A., Huyvaert, K., Reiser, R., & Carlson, P. (2011). Who hits and hoots at whom? Potential for interference competition between barred and northern spotted owls. *Biological Conservation*, *144*(9), 2194-2201. doi:10.1016/j.biocon.2011.05.011

Van Sickle, J., and S.V. Gregory. 1990. Modeling inputs of large woody debris to streams from falling trees. Can. J. For. Res. 20: 1593-1601.

WPN (Watershed Professionals Network). 1999. Oregon Watershed Assessment Manual. June 1999. Prepared for the Governers Watershed Enhancement Board, Salem, OR. Chapter 4.

Wemple, B.,C. (1994). Assessing the role of logging-access roads in two large forested basins in the western cascades of Oregon. (M.S. thesis). Oregon State University. Corvallis, Oregon

Wenger, S. (1999). A Review of the Scientific Literature on Riparian Buffer Width, Extent, and Vegetation. Retrieved from http://www.rivercenter.uga.edulservice/rools/buffers/buffer_lit_review.pdf.

Wiens, D. J. (2012). Competitive Interactions and Resource Partitioning Between Northern Spotted Owls and Barred Owls in Western Oregon. *AN ABSTRACT OF THE DISSERTATION OF J. David Wiens for the degree of Doctor of Philosophy in Wildlife Science presented on March 2, 2012.* Corvallis, OR, USA: Oregon State University Library: http://ir.library.oregonstate.edu/xmlui/handle/1957/28475.

Wiens, D. J., Anthony, R. G., & Forsman, E. D. (2014). Competitive interactions and resource partitioning between northern spotted owls and barred owls in Western Oregon. *Wildlife Monographs 184:1-50 ;2014*.

Wilson, D. S. (2007). Density management and biodiversity in young Douglas-fir forests: Challenges of managing across scales. *Forest Ecology and Management*, 123-134.

Wilson, T. M. (2010). Limiting factors for northern flying squirrels (Glaucomys sabrinus) in the Pacific Northwest: A spatio-temporal analysis. *UNION INSTITUTE AND UNIVERSITY, publication No. 3470364* , 220 pages.

Wimberley, M. C. (2002). Spatial simulation of historical landscape patterns in coastal forests of the Pacific Northwest. *Can. J. For.*, Vol. 32: p. 1316-1328..

Ziemer, R. (1981). Storm flow response to road building and partial cutting in small streams of Northern California. *Water Resources Research*, *17*(4), 907-917. doi:10.1029/wr017i004p00907

Ziemer, R. (1998). Proceedings of the conference on coastal watersheds: the Caspar Creek story. In *Flooding and Stormflows* (PSW-GTR 168,pp.15-24.). Pacific Southwest Research Station, Albany, CA: USDA Forest Service.

GLOSSARY

Basal Area - The cross-sectional area of a single stem measured at breast height (4.5 feet above ground),, expressed as square feet; the cross-sectional area of all stems of a species or stand including the bark, measured at breast height and expressed as square feet per acre.

Best Management Practices (BMPs) - Design features and mitigation measures to minimize environmental effects.

Canopy Closure - The proportion of sky hemisphere obscured by vegetation when viewed from a single point.

Canopy Cover - The proportion of the forest floor covered by the vertical projection of the tree crowns. It is a measure of the cover created by the overstory tree canopies, and is measured in percentage form of all species greater than 8 inches DBH. The greater the cover, the less sunlight is available for vegetation development in the understory and forest floor.

Carbon Sequestration - The incorporation of carbon dioxide into permanent plant tissue.

Coarse Woody Debris (CWD) - Refers to a tree, or a portion thereof, that has fallen or been cut and left on the ground.

Complex high quality early seral habitat - Less than 30% canopy cover of trees > 10" dbh and contain large remnant conifers and hardwood trees and a variety of snag and down wood amounts and decay classes.

Cross drain culvert (aka Relief Drain) - Metal, plastic, or concrete pipe that helps to drain water off the road surface and ditch lines on to the adjacent terrain. These culverts are not stream crossing culverts.

Culmination of Mean Annual Increment (CMAI) - The age in the growth cycle of a tree or stand at which the mean annual increment (MAI) for height, diameter, basal area, or volume is at the maximum**.**

Decompaction - The mechanical ripping and/or tillage of roadbeds, landings and other compacted areas for the purposes of increasing infiltration and aeration.

Early Seral Stage – Refers to the series or relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage. Early seral stage is the period from disturbance to crown closure of conifer stands usually occurring from 0-15 years. Grass, herbs, or brush are plentiful. (RMP, p. 129)

Ectomycorrhizal – forming connections between plant roots and fungi that are mutually beneficial and necessary. Plants gain nutrients and water, while fungi gain carbohydrates.

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

Ephemeral Streams - Streams that contain running water only sporadically, such as during and following storm events or snow melt.

Epiphyte – A plant that grows on trees, deriving physical support but not functioning as a parasite.

Ground-Based Yarding - The use of logging equipment operating on the surface of the ground to move trees or logs to a landing where they can be processed or loaded.

Haul route - Road system used to access the project area.

Initiation Point - The headwater of a stream channel. This is the location where annual scour/deposition initiates.

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

Landing - A designated place where logs are placed after being yarded and awaiting subsequent handling, loading, and hauling.

Mycotrophic – feeding on fungi. Mycotrophic plants gain their carbohydrates from fungi, rather than sunlight.

Northern spotted owl (NSO) suitable habitat - Suitable habitats include foraging, nesting, and roosting habitats, which all have at least 60% canopy cover in the Oregon Coast Range.

Marbled murrelet potential nest trees - Conifer trees occurring within 50 miles of the Oregon Coast, ≥19.1 inches dbh and >107 feet height, has at least one platform ≥4 inches in diameter, ≥32.5 feet above the ground with adequate protective cover over the platform.

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

Mean Annual Increment (MAI) - the total increment of a tree or stand (standing crop plus thinnings) up to a given age divided by that age**.**

NSO nest patch - Nest patch is the immediate area within 300 meters of known or potential nest sites.

NSO core area - Core areas are the areas within ½ mile of nest sites with at least 50% (250 acres) nesting/roosting or foraging habitats.

NSO home range - Home ranges are the areas within 1.5 miles of nest sites with at least 40% (1,800 acres) nesting/roosting or foraging habitats.

Overstory - That portion of the trees, in a forest of more than one story, forming the upper or uppermost canopy layer.

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

Quadratic Mean Diameter (QMD) – a measure of the average mean diameter of all conifers greater than 8 inches at diameter at breast height (DBH). QMD is averaged based on the mean basal area. It is widely used in forestry due to the relationship between stand volume, number of trees, and stand basal area. QMD is the preferred average diameter measurement for expressing stand attributes.

Relative Density - the ratio, proportion, or percent of absolute stand density to a reference level defined by some standard level of competition. Used as a means of descr bing the relative degree of inter-tree competition in stands of differeing average tree size and stand density of conifers over 8" DBH. Relative density helps define the forest condition in different zones of ecological conditions. At Relative Density above 55, some trees become suppressed and die because of competition. Relative Density and Trees per Acre can provide insight into the degree of suppression mortality and amount of dead wood that is created, which is a facet of stand complexity.

Seral - One stage of a series of plant communities that succeed one another.

Skid Trails - Path through a stand of trees on which ground-based equipment operates.

Snag - A dead, partially dead, or defective tree.

Soil Compaction - An increase in bulk density and a decrease in soil porosity resulting from applied loads, vibration, or pressure.

Stratum or Strata - A distinct layer of vegetation within a forest community; a subdivision of a population, used in stratified sampling.

Stream buffer - A buffer along streams and identified wet areas where no material would be removed and heavy machinery would not be allowed.

Sub-Watershed-6th field (SWS) - One of the classification of watersheds used by the U.S. Geological Survey which are also known as 6th fields in the hierarchy of the classification system. Few to several Sub-watersheds are "nested" within the larger Watersheds and this scale is useful for analyzing some water-related issues. They are identified by an official name and unique twelve digit code (Hydrologic Unit Code).

Sustained Yield - the yield that a forest can produce continuously at a given intensity of management. Sustained yield management implies continuous production so planned as to achieve, at the earliest practical time, a balance between increment and cutting.

Trees per Acre (TPA) – describes the conifers per acre of all conifer trees greater than or equal to 8 inches DBH.

Watershed- 5th field - One of the classifications of watersheds used by the U.S. Geological Survey (USGS) that is useful for assessing water-related issues. This classification is known as the 5th field (Hydrologic Unit Code) in the hierarchy of the classification and these watersheds are typically 20 to 200 square miles in size. They are identified by an official name and unique ten digit code (Hydrologic Unit Code).

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

Yarding Corridors - Corridors cut through a stand of trees to facilitate skyline yarding. Cables are strung in these corridors to transport logs from the woods to the landing.

Comparison of key features of Alternatives in Matrix

Management actions in matrix	**Alternative 2**	**Alternative 3** **Preferred Alternative**	**Alternative 4**
Regeneration harvest in matrix	Traditional regeneration harvest; regeneration harvest all available acres	Regeneration harvest designed to increase ecological value	N/A
Thinning in matrix	Thinning in unit 2D, approximately 4 acres. Light to moderate thinning – RD[@] low to mid-30s	Thinning in some areas and in unit 2D. Light to moderate thinning – RD low to mid-30s	Light to moderate thin all matrix acres – RD in the low to mid 30s; with less than one acre gaps
Reforestation in matrix regeneration harvest areas	Full reforestation – replanting to 400 - 600 tpa	Natural regeneration – no replanting where prescribed fire is applied; replant to ~200 tpa where prescribed fire cannot be applied	Replant to ~200 tpa with western red cedar in gaps
Prescribed burning/site prep in matrix regeneration harvest areas	Full prescribed burning in all regen areas	Limit prescribed burning	None
Green tree retention in matrix regeneration harvest	Well distributed; 6 to 8 tpa	6 tpa clumped and 2 tpa well distributed	N/A
CWD and snag creation in matrix and adjacent riparian reserves – Alt 3 and 4 (no clumps within 150 feet of streams)	Scattered *Regen:* maintain Eugene District ROD standards; • *CWD* – 240 lineal feet per acre, 20" or more (approx. 3 tpa); • *Snags* –approx. 4 tpa;	Clumped *Regen*: maintain Eugene District ROD standards. • *CWD* – 240 lineal feet per acre, 20" or more (approx. 3 tpa); • *Snags* – approx. 4 tpa; *Matrix thinning:* 30% tolerance level (Decaid 2012) • *CWD* approx. 1 tpa • *Snags* approx. 2 tpa	Clumped *Matrix thinning:* 30% tolerance level (Decaid 2012) • *CWD* approx. 1 tpa • *Snags* approx. 2 tpa
Aggregates in the project area	Maintain 30% in aggregates	Maintain 30% in aggregates	Not applicable/none
Hardwoods in matrix	Remove hardwood trees (reserve hardwoods in 4 acres of matrix thinning)	Reserve hardwood trees	Reserve hardwood trees
Density management in matrix riparian reserves	No thinning in riparian reserves	Thin where feasible – maintain [^]ACS based on scientific evaluations	Thin where feasible – maintain ACS based on scientific evaluations
Road construction/renovation in matrix	As needed	As needed	As needed

Comparison of key features of Alternatives in LSR

Management actions in LSR	**Alternative 2**	**Alternative 3**	**Alternative 4**
Density management in LSR	RD in the mid-20s	RD in the mid-20s	RD in the mid-20s
CWD and snag creation in LSR, none in adjacent riparian reserves.	6 tpa (50% to 80% tolerance level) clumped on less than one acre; ¼ acre within 310 feet of potential [&]MAMU trees. Leave skips.	6 tpa (50% to 80% tolerance level) clumped on less than one acre; ¼ acre within 310 feet of potential [&]MAMU trees. Leave skips.	6 tpa (50% to 80% tolerance level) clumped on less than one acre; ¼ acre within 310 feet of potential [&]MAMU trees. Leave skips.
Density management in LSR riparian reserves	Thin where feasible – maintain ACS based on scientific evaluations	Thin where feasible – maintain ACS based on scientific evaluations	Thin where feasible – maintain ACS based on scientific evaluations
Hardwoods in LSR	Reserve hardwood trees	Reserve hardwood trees	Reserve hardwood trees
Road construction/renovation in LSR	As needed	As needed	No new roads in LSR

[@]RD – Relative Density; [&]MAMU – Marbled Murrelet; [^]ACS – Aquatic Conservation Strategy Objectives

Steam Donkey Echo ROAD Management TABLE

All decommissioning measures shall be completed during the dry season.

(aa) Purchaser shall decompact all natural surfaced roads and landings with decompaction equipment, such as a track mounted excavator with a thumb that is capable of moving logging slash, during the dry season.

(bb) Purchaser shall construct drainage dips, waterbars and/or lead-off ditches, and remove all culverts and cross drains as directed by the Authorized Officer.

(cc) Place logging slash greater than 6 inches in diameter, as directed by the Authorized Officer.

(dd) Purchaser shall block at entry points using stumps, slash, and/or cull logs, or earthen barricades, as directed by the Authorized Officer.

								Natural Surface Road				Rock Road		
		RATIONALE						(aa)	(bb)	(cc)	(dd)	(bb)	(cc)	(dd)
Road Number	Existing surface		Storm Proofing	Unit #	Fuels	Winter Haul Avail	Rocking	Decompact	Drainage	Logging Slash	Blocking	Drainage	Logging Slash	Blocking
SECTION 9														
18-7-9.10 (new)	brush		yes	9		yes	Opt to not rock	X	X	X	X	X		
Spur A (new)	brush		yes	9		yes	Opt to not rock	X	X	X	X	X		
18-7-9.1	rock		yes	9		yes	yes					X		
18-7-9.11 (new)	brush		yes	9		yes	Opt to not rock	X	X	X	X	X		
18-7-9.12 (new)	brush		yes	9		**	**	X	X	X	X	X		X*
18-7-9.13 (new)	brush		yes	9		yes	Opt to not rock	X	X	X	X	X		
Spur B (new)	brush		yes	9		yes	Opt to not rock	X	X	X	X	X		
18-7-9	rock		yes	9		yes	yes					X		
18-7-9.9	rock		yes	9		yes	yes					X		
18-7-9.2	rock		yes	9		yes	yes					X		
SECTION 23														
18-7-23.6	rock		yes	23		yes	yes					X		EB
18-7-23.6 ext (new)	brush		yes	23		yes	Opt to not rock	X	X	X	X	X		
18-7-23.9	dirt		yes	23		yes	Opt to not rock	X	X	X	X	X		
18-7-23.10 (ren/new)	dirt/brush		yes	23		yes	Opt to not rock	X	X	X	X	X		EB*
18-7-23.11 (new)	brush		yes	23		yes	Opt to not rock	X	X	X	X	X		

Storm proofing roads and placing them in a self-maintaining condition consists of site-specific measures to stabilize roadside slopes, prevent erosion of soil and/or sediment delivery to streams by reducing the concentration of water on the road prism and ditchlines, before blocking. If culverts are left in place, deep drainage ditches (water bars) should be angled in the roadbed in to positions above and below where necessary to prevent the culvert from plugging from any debris.

*Remove cross-drains prior to blocking road.

**Road drainage needs to be assessed during saturated conditions to determine if road should remain dirt and be built and decommissioned in one season or if it can be rocked.

EB = earthen barrier

Rocked roads may remain open for recreational hunting use, however they will be storm proofed for low maintenance and to minimize risk to any resource damage.

Roads leading to units are behind locked gates, no OHV issues.

Roads

Name/Number	Action	Road Control	RWA/Easement
18-6-21.0 Seg. A	Use	BLM	Maintained by OTI
18-6-21.0 Seg. B	Use	OTI	RWA E-310
18-6-21.0 Seg. C Potion	Use	BLM	Maintained by OTI
18-6-8.0 Seg. A1A-A1B	Use	ROS	RWA E-308 / Free Use
18-6-8.0 Seg. A2-A3	Use	OTI	RWA E-308 / Free Use
18-6-8.0 Seg. B	Use	BLM	Maintained by OTI
18-6-8.0 Seg. C	Use	OTI	RWA E-308 / Free Use
18-6-8.0 Seg. D	Use	BLM	Maintained by OTI
18-7-9.0	Renovation	BLM	
18-7-9.0	Improvement	BLM	
18-7-9.1	Renovation	BLM	
18-7-9.1	Improvement	BLM	
18-7-9.2	Renovate	BLM	
18-7-9.6	Use	ODF	Cooperative Agreement E-145
18-7-9.8	Renovation	BLM	
18-7-9.9	Renovation	BLM	Expired Permit 2812 E741 D
18-7-16.0 Seg. A-B	Use	BLM	
18-7-23.1 Seg. A	Use	BLM	
18-7-23.6	Renovation	BLM	
18-7-23.6 EXT	Construction	BLM	
18-7-23.9	Improvement	BLM	
18-7-23.10	Improvement	BLM	
18-7-23.10	Construction	BLM	
18-7-23.11	Construction	BLM	
18-7-24.1	Drainage Renovation	BLM	
18-7-9.10	Construction	BLM	
18-7-9.11	Construction	BLM	
18-7-9.12	Construction	BLM	
18-7-9.13	Construction	BLM	
Spur A	Construction	BLM	
Spur B	Construction	BLM	

OTI = Oxbow Timber I
ODF = Oregon Department of Forestry
ROS = Rosboro
BLM = Bureau of Land Management

Roads with wet weather haul allowed:

New construction:

Name/Number	Length (feet)	Rock	Buy-out?	Comments
18-7-9.10	319	Required	YES	Surfaced w/ 8” depth of 3”-
*18-7-9.11	305	Required	YES	Surfaced w/ 8” depth of 3”-/1-1/2” minus
*18-7-9.12	1050	Required	YES	Surfaced w/ 8” depth of 3”-/1-1/2” minus 1 cross drain installation
18-7-9.13	316	Required	YES	Surfaced w/ 8” depth of 3”-/1-1/2” minus
Spur A	227	Required	YES	Surfaced with 8” depth of 3”-
Spur B	203	Required	YES	Surfaced with 8” depth of 3”-
18-7-23.6 EXT	130	Required	YES	Surfaced with 8” depth of 3”-
18-7-23.10 por. 2	541	Required	YES	Surfaced w/ 8” depth of 3”-/1-1/2” minus 1 cross drain installation
18-7-23.11	368	Required	YES	Surfaced with 8” depth of 3”-

*Under EA alternative 4, Road 18-7-9.11 and Road 18-7-9.12 would not be built due to being located in LSR

- EA Alt 2 & 3 = Approximately 34.59 stations new construction
- EA Alt 4 = Approximately 21.04 stations new construction
- Subgrade: 14’ width, out-sloped where possible
- End haul waste material from full bench portions of Road 18-7-9.12 and Rd No. 18-7-23.11 is required
- Wet weather haul may be reanalyzed for Road 18-7-23.11 pending a storm which produces enough precipitation to better understand the ground water in the area of this proposed road

Renovation:

Name/Number	Length (miles)	Rock	Buy-out?	Comments
18-7-9.0 por. 1	0.52	Required	YES	Surfaced with 3” depth of 1-1/2” minus
18-7-9.1 por.1	0.57	Required	YES	Surfaced with 3” depth of 1-1/2” minus 2 cross drain installations
18-7-9.2	0.48	Required	YES	Surfaced with 3” depth of 1-1/2” minus 4 cross drain installations

				1 cross drain relocation
18-7-9.8	0.27	Required	YES	Surfaced with 3" depth of 1-1/2" minus
18-7-9.9	0.18	Required	YES	Surfaced with 3" depth of 1-1/2" minus
18-7-23.6	0.29	Required	YES	Surfaced with 3" depth of 1-1/2" minus

- EA Alt 2, 3 & 4 = Approximately 2.30 miles renovation.

Improvement:

Name/Number	Length (miles)	Rock	Buy-out?	Comments
18-7-9.0 por. 2	0.03	Required	YES	Surfaced with 8" depth of 3"-
18-7-9.1 por. 2	0.13	Required	YES	Surfaced with 8" depth of 3"-
18-7-23.9	0.09	Required	YES	Surfaced with 8" depth of 3"-
18-7-23.10 por. 1	0.04	Required	YES	Surfaced with 8" depth of 3"-

- EA Alt 2, 3 & 4 = Approximately 0.29 miles improvement.

Roads with dry season haul required:

Drainage Renovation:

Road Number	No. of Culverts	Required?	Buy-out?
18-7-24.1	2	YES	NO

- Average length of culvert is approximately 30 feet with a fill depth of 3-5 feet
- Surfacing gradation 1 1/2" minus; compacted depth 8"
- Approximately 30' road length per culvert to be replaced

Summary:
New Construction
EA Alt 2 & 3 = Approximately 34.80 stations new construction
EA Alt 4 = Approximately 21.60 stations new construction
Renovation
EA Alt 2, 3 & 4 = Approximately 2.30 miles renovation
Improvement
EA Alt 2, 3 & 4 = Approximately 0.29 miles improvement
Drainage Renovation
2 cross drain culverts added/replaced

Notes:
All road lengths estimated with string box, DMI, GPS, or GIS;
Logger's choice landings/spurs requested by Purchaser are subject to approval by the Authorized Officer.
Green trees are available for guy-lines at all roads except on BLM land at the end of Rd. No. 18-7-9.2.
Road Improvement - Work done to an existing road which improves it over its original design standard.
Road Renovation - Work done to an existing road which restores it to its original design.
Road Construction – Work done to create a road where one has not existed in the past.

Project Design Features

Silviculture

In areas of thinning common to all alternatives

- Vary leave tree spacing as needed to generally select and mark the larger diameter, more vigorous trees.
- In general, selected leave trees shall be of good form and relatively free of defect.
- Hardwoods, yew trees, and snags shall not be marked, and shall not be tallied towards the target basal area.
- Thinning activities would not occur during sap flow season (generally April 15-June 15) to limit bark/cambium damage to residual trees, unless waived by the Authorized Officer
- Log lengths would be restricted to a maximum of 40 feet in order to protect residual yarding, unless waived by the Authorized Officer.

Section 9 LSR thinning

Alternative 2, 3 and 4:

- In areas designated as LSR that were not previously thinned, thin all conifers from below to approximately 130ft^2 of basal area per acre to achieve an estimated Curtis relative density in the mid-to-upper twenties.
- In areas designated as LSR that were previously thinned, thin all conifers from below to approximately 120ft^2 of basal area per acre to achieve an estimated Curtis relative density in the mid-to-upper twenties.

Section 9 RR thinning adjacent to LSR (all action alternatives): Riparian reserves under consideration for treatment would be treated with the same prescription as the adjacent upland prescription.

Section 9 matrix thinning

Alternative 4: In areas designated as GFMA and planned for thinning, thin all conifers from below to approximately 150ft^2 of basal area per acre to achieve an estimated Curtis relative density in the low-to-mid-thirties.

Section 9 RR thinning adjacent to matrix

Alternative 4: Riparian reserves would be treated with the same prescription as the upland prescription.

Section 23 matrix thinning

Alternatives 2, 3 and 4: In unit 2D, thin all conifers from below to approximately 150ft^2 of basal area per acre to achieve an estimated Curtis relative density in the low-to-mid thirties.

Alternatives 3 and 4:

- In the west slope of unit 2a, thin all conifers from below to approximately 140ft^2 of basal area per acre to achieve an estimated Curtis relative density in the low-to-mid thirties.
- In matrix areas designated for thinning, thin all conifers from below to approximately 150ft^2 of basal area per acre to achieve an estimated Curtis relative density in the low-to-mid thirties.

Alternative 4: A small amount of openings each no greater than 1 acre would be created in matrix areas as seen on the EA map 1. Plant approximately 200 trees per acre of mixed coniferous species in a uniform pattern across the opening areas. Gaps would be monitored for coniferous establishment. If establishment is not recognized within 10 years, additional action may be taken to ensure stocking levels meet the desired minimum (about 150 trees per acre).

Section 23 RR thinning adjacent to matrix

Alternative 3: In riparian reserves adjacent to regeneration harvesting thin from below conifer trees to approx. 150ft^2 per acre of basal area. The estimated Curtis relative density would be in the low-to-mid thirties.

Alternative 4: Riparian reserves would be thinned with the same prescription as the adjacent upland treatment.

Section 9 and 23 regeneration harvest

Alternative 2:

- In areas designated for regeneration harvest remove all conifers except, leave 6-8 large and vigorous trees per acre scattered across the area to achieve green tree retention requirements. 240 linear feet of

logs per acre larger than or equal to 20 inches in diameter would be provided as coarse woody debris. Logs less than 20 feet in length would not be credited towards this total. Sufficient snags to support species of cavity nesting birds at 40 percent of potential population levels would be retained (1995 RMP, page 86).
- Remove all hardwoods.
- No riparian reserves that are adjacent to areas of regeneration harvest would be treated.
- Reforestation prescription: plant approximately 400 trees per acre of mostly Douglas-fir in a uniform manner across all of the regeneration harvest areas.

Alternative 3:
- Remove all conifers except legacy trees (Trees > 35 inch DBH) and hardwoods where operationally feasible.
- Green tree retention would be accomplished by aggregating the required trees per acre in locations that would capture ecological function of the stand. Six green trees per acre would be aggregated and two trees per acre would be scattered within the regeneration harvest areas. 240 linear feet of logs per acre larger than or equal to 20 inches in diameter would be provided as coarse woody debris. Logs less than 20 feet in length would not be credited towards this total. Sufficient snags to support species of cavity nesting birds at 40 percent of potential population levels would be retained (1995 RMP, page 86).
- In areas where conditions allow for prescribed fire post-harvest, reforest with natural regeneration.
- In areas where conditions do not allow for prescribed fire post-harvest, plant approximately 200 trees per acre of mixed coniferous species in a uniform pattern across the area.

Noxious Weeds and Invasive Non-native Species
- Clean all yarding and road construction equipment prior to arrival on BLM-managed lands to lessen the spread of noxious weed seed.
- Control existing false brome populations prior to project activity. Monitor weeds for at least 5 consecutive years after timber sale implementation, and control infestations discovered through monitoring as appropriate.
- Appropriate amounts of slash would be placed on closed roads such that ongoing noxious weed control efforts would not be inhibited.
- Sow native grass seed on decommissioned, tilled roads, and other areas as appropriate, after operations have been completed.

Soils, logging systems and hydrology design features

Logging sensitive area during rainy season (special yarding area)

No logging or refueling would occur on days that have excessive rainfall and soils are saturated within the riparian buffers in Unit 1 (section 9) above the 9-18 stream along the 18-7-9.2 road, and in Unit 2 (section 23) above the 23-40, 23-31 and 23-15 streams along the 18-7-24.1 and 23.10 roads.

General

All streams would receive a minimum buffer of 150 feet within which no thinning or harvest would occur except for a small area (estimated at about 0.1 acres) east of road 18-7-23.10. Thinning within the Riparian Reserves of streams 23-15 and 23-17 would occur in this location under alternatives 3 or 4. Thinning would not occur in this area under alternative 2. This area is located east of the ridgeline in a different catchment from these streams. The estimated minimum distance from these streams is 110 feet. Gaps and deadwood areas (snags and down wood creation) would be located a minimum of 1 site tree distance (220 feet slope distance) away from any stream.

Cable logging
- Limit road and landing construction, reconstruction, or renovation activities to the dry season.
- Road conditions would be monitored during winter use to prevent rutting of the rock surface. Haul may be restricted during conditions when fines (sand, silt or clay particles) are “pumped” to the surface.
- Retain organic matter including duff, litter and tops and limbs on the forest floor to provide soil stability and nutrient cycling.
- All cable yarding would be to designated or approved landings. Landings would be located to minimize impacts to reserve trees and soils.
- To minimize impacts, spacing of cable corridors should be kept to 150 feet apart at one end and limited to 12 feet in width. A cable system capable of 75 foot lateral yarding would be used.

- Minimum one-end suspension is required. Intermediate supports may be necessary to achieve the required suspension.
- Yarding over streams is not anticipated as determined from field surveys by the BLM logging specialist. If yarding over a stream does occur full suspension of the log would be required and, any trees cut in the corridors within riparian reserves would be retained on site to provide down wood.
- Cable corridors used for yarding in concave slopes above stream channel initiation points (headwall areas) should be 45 degrees of perpendicular to the centerline. This is to provide a sharp channel junction to dissipate the energy of any potential debris flows or torrents.
- Cable yarding system should be laid out to eliminate gouging (log dragging) to reduce concentration of drainage delivering to streams. Cable yarding corridors would be made erosion resistant if needed where severe gouging has occurred.
- Skyline cables may pass through riparian reserves, including untreated stream buffers, in order to gain additional lift or deflection of the skyline, and to attain the required suspension of logs during yarding.
- Directional felling and yarding away from streams would be required where feasible to provide for stream bank stability and water quality protection.

Ground based logging

- Operations would occur when soil moisture content provides the most resistance to compaction (generally less than 25%--during the dry season, typically, July 1 to October 15, as approved by the Authorized Officer in consultation with the Soil Scientist).
- Soil moisture contents would be monitored by the soil scientist on soils identified for ground based logging.
- No ground-based yarding would occur on sensitive soils as designated by the Soil Scientist.
- Retain organic matter including duff, litter and tops and limbs on the forest floor to provide soil stability and nutrient cycling.
- All skid trails would be pre-designated (mapped and flagged), approved by the Authorized Officer, and would occupy less than 10 percent of the ground-based yarding area. This can be accomplished by a minimum 150 foot spacing between skid trails, and limiting width of skid trails to 12 feet. Retain non-merchantable material (slash) on skid trails (where feasible) to reduce equipment use on bare soil and to minimize compaction. Excavation (gouging) on skid trails would not exceed one foot in depth. Trees would be felled to lead to the skid trail.
- Skid trails would be limited to slopes less than 35% with approval from the Authorized Officer.
- Use existing skid trails wherever possible.
- Logs would be skidded to designated or approved landings.
- Require felling of trees to lead to the skid trails and maximize winching distances.
- Use of low ground pressure (<6 psi) ground-based mechanical harvesting equipment would be limited to a single pass when operating outside designated primary skid trails, walking on downed slash to minimize soil disturbance.
- Ground-based yarding could occur in Riparian Reserves, however no ground-based yarding equipment would be operated within 75 feet of the harvest unit boundary. No skid trails would be constructed within 1 site tree distance (220 feet slope distance) of any stream. Trees could be felled to lead and winched to a skid trail.
- Immediately after project completion, during the dry season, compacted skid trails would be decompacted (laterally shattering the soil profile) using appropriate decompaction equipment. Care should be taken not to mix or displace the soil profile. The trails would be covered with slash and brush and blocked as needed. If decompaction cannot be accomplished the same operating season, all trails would be left in an erosion resistant condition and blocked.
- Drainage and erosion control measures, including water barring of skid trails, should occur prior to winter rains.
- There would be a special landing area (alternatives 3 or 4) east of road 18-7-23.10 in section 23. Harvested trees east of the road and within 1 site tree (220 feet slope distance) of streams 23-17 and 23-15 would be felled and yarded to the east. No decking of logs or landing construction shall occur on the 18-7-23.10 road where it passes through the Riparian Reserve. No skid trails would be allowed within the riparian reserve (RR). This area would not be harvested within RR under alternative 2.

Roads

- Drainage and soil erosion control practices would be applied to improved or renovated roads as needed. This may include, but is not limited to, dry season grading and ditch relief (cross drain) culvert replacements/removals; ditch relief additions (dry season); appropriate end haul and disposal area; proper dispersal of water from ditch relief culverts; removal of bank slough; and adding gravel lifts of sufficient quality and quantity to accommodate timber haul. Existing drainage ditches that are functioning and have a protective cover of non-woody vegetation would not be disturbed.
- Four cross drains (relief culverts) would be added to reduce (indirect) sediment delivery from road segments. The locations are on the 18-7-9.0 (one culvert), 18-7-9.2 (one culvert), 18-7-23.1 (one culvert) and the 18-7-24.1 (one culvert) roads. In addition, an existing cross drain culvert would be removed (18-7-23.1 road) to eliminate existing indirect sediment delivery to a stream. These culverts would be removed and/or replaced under dry conditions.
- Road and landing construction activities would be limited to the dry season, generally from May to October. Roads and landings would be designed and constructed to BLM standards, but be the narrowest and smallest sizes that would meet safety standards, objectives of anticipated uses, and resource protection. For this project, rocked and natural surface roads would typically have a running surface of 14 – 16 feet. New road construction would be located on stable locations, such as ridge tops, stable benches or flats, and gentle-to-moderate side-slopes. Erosion control measures would be concurrent with ground disturbance to allow immediate storm proofing.
- Stable end-haul (waste) sites would be located prior to end-hauling. These sites would be kept properly shaped, drained, and vegetated. These areas would be located away from stream channels, wetlands, floodplains, and unstable areas.
- Road drainage would be designed to minimize soil erosion. Energy dissipaters, culvert down pipes, or drainage dips would be used where water is discharged onto loose material and onto erodible or steep slopes. Cross drain culverts would be discharged at ground level on non-erodible material. Cross drain culverts would be spaced at intervals sufficient to prevent water volume concentration and accelerated ditch erosion. Concentrated drainage onto fill slopes would be avoided unless the fill slopes are stable and erosion proofed.
- Road surface shape (e.g. crowning, in sloping, and out sloping) that meets planned use and resource protection needs would be used.
- Haul on native (dirt) surfaced roads would be prohibited under wet road surface conditions, generally November through April, and would receive seasonal preventative maintenance prior to the onset of winter rains. These could include the installation of water bars or drain dips, sediment control mates or devices, removing ruts, mulching or barricades.
- Culvert inlets and outlets, drainage structures and ditches would be inspected and maintained before and during the wet season to diminish the likelihood of plugged culverts and the possibility of washouts.

Fuels

- There would be no pile burning allowed in the special yarding or landing areas above streams 23-40, 23-18, 23-15 or 23-17.
- Construct fire lines by hand on all slopes greater than 35 percent.
- Fire lines would not be placed in areas where water could be directed into water bodies, floodplains, wetlands, headwalls, or areas of instability.
- Erosion control techniques such as tilling, water-barring, or debris placement would be used on fire lines where soil erosion or movement of surface water is likely.
- Prescribed burning ignition would not occur within Riparian Reserve (1 and 2 site tree distance (220 feet / 440 feet slope distances) under alternative 3. No broadcast burn ignition would occur under alternative 4. Broadcast burn ignition would also not occur within Riparian Reserve under alternative 2 except for a very small area (estimated at about one acre) in the outer reserve of stream 23-40. This area is located on the opposite side of the ridgeline in a different catchment area than stream 23-40.
- Post-harvest treatment monitoring would be implemented with results used to reevaluate the fuels strategy and adapt future treatments.
- Prescribed burning would only be permitted with an approved burn plan and smoke management plan. The prescription for prescribed burning would be based on treatment objectives with the timing parameters developed in the burn plan to meet the objectives. Prescribed fire may also be used to remove cut and piled vegetation (pile burning).
- Alternatives 2/3 broadcast burning will be used to remove/decrease vegetative cover and woody debris by greater than 90 percent of 10 hour fuels and smaller.

- Control lines would be created and utilized on both alternatives 2/3 on those units with broadcast burning.

Cultural and historic sites

If any cultural and/or paleontological resource (historic or prehistoric site or object) is discovered during project activities all operations in the immediate area of such discovery shall be suspended until an evaluation of the discovery can be made by a professional archaeologist to determine appropriate actions to prevent the loss of significant cultural or scientific values.

Special Status Wildlife Species

Species	Presence in the Eugene District — Habitat Associations	Presence in Project Area and potential effects
Federally-listed Threatened, Endangered and Proposed Species		
Fenders' blue butterfly *Plebejus icarioides fenderi*	**Documented** – Inhabits moist grasslands and sub-irrigated meadows with Kincaid's lupine in the Willamette Valley; occurs in native prairie habitats; most typically found in native upland prairies, dominated by red fescue and/or Idaho fescue; uses lupine species as larval food plants	No; proposed activities are not near occupied or potential habitat
Northern spotted owl *Strix occidentalis caurina*	**Documented** – Occupies young, mature, or structurally-complex conifer forest stands with snags and/or downed wood; occupied stands generally have a mean tree diameter of ≥ 11in. and a canopy cover ≥ 40 percent; lives in forests characterized by dense canopy closure of mature and old-growth trees, abundant logs, standing snags and live trees with broken tops; although known to nest, roost and feed in a wide variety of habitat types, prefers older forest stands with variety: multi-layered canopies of several tree species of varying size and age, both standing and fallen dead trees, and open space among the lower branches to allow flight under the canopy; typically, forests do not attain these characteristics until they are at least 150 to 200 years old	Present; some activities may affect but are not likely to adversely affect (NLAA), and other activities may have adverse effects (LAA) to the northern spotted owl. See narrative in project wildlife report for details.
Marbled murrelet *Brachyramphus marmoratus*	**Documented** – Nests primarily in structurally-complex conifer forest stands, but occasionally nests in simple stands with nesting structure. Nesting structure occurs within 50 miles of the coast (U.S. Fish & Wildlife Service 1997:32), in a conifer tree (U.S. Fish & Wildlife Service 1997:18) ≥ 19.1 in. (49 cm) (dbh) in diameter, > 107 ft. (33 m) in height, has at least one **platform** ≥ 4 in. (10 cm) in diameter, nesting substrate (e.g., moss, epiphytes, duff) on that platform and an access route through the canopy that a murrelet could use to approach and land on the platform (Burger 2002, Nelson & Wilson 2002:24, 27, 42, 97, 100). It has a nest platform ≥ 32.5 ft. (9.9 m) above the ground (Nelson & Wilson 2002, 28) And it has a tree branch or foliage, either on the tree with nesting structure or on an adjacent tree, that provides protective cover over the platform (Nelson & Wilson 2002:98 & 99);	Present; some activities may affect but are not likely to adversely affect (NLAA), and other activities may have adverse effects (LAA) to the northern spotted owl. See narrative in project wildlife report for details.
Survey and Manage Species		
Red Tree Vole *Arborimus longicaudus*	**Documented** – Arboreal inhabitant of mid to late seral coniferous or mixed deciduous/coniferous forests. Nests in Douglas firs containing substrates that provides platforms (large limbs, epicormic branches, mistletoe growths, broken tops etc.) for nest construction. Feeds on conifer needles. Seldom leaves canopy. A distinct population of the red tree vole, the dusky red tree vole, may occur in the project area because the range of this species on Siuslaw Resource Area is north of the Siuslaw River (USDI-FWS, 2011). Population persistence depends on late successional forest habitats (Huff, et al., 2012). Surveys are not required for this project because very small patches of potential habitat for the red tree vole are in thinning areas that are less than 80 years of age, and these are exempted from survey and manage requirements by court orders (Peckman: Northwest Ecosystem Alliance, et al., Plaintiffs, v. Mark E. Rey, et. al., Defendants, 2006) (Settlement Agreement: Conservation Northwest v. Sherman, 2011). Although some stands contain a few individual trees that are older than 80 years, the stands proposed for thinning were classified as less than 80 years of age by commonly used methods of forest management professionals.	This project may impact individuals and habitat for the dusky red tree vole, but is not likely to cause a trend toward listing. Red tree voles are present in the project area; adverse effects would occur from regeneration harvest that removes young stands. However, young stand habitat is not needed for population persistence (Huff, et al., 2012). Thinning effects would be adverse short-term from habitat modification (canopy cover/continuity reduction) and disturbance, and beneficial long-term effects from hastening restoration of old growth forest and cavities (dead wood creation in live trees).
Sensitive Species		
Evening fieldslug *Deroceras hesperium*	**Suspected** – Associated with low to mid elevations in the western Cascade Range to the Pacific Ocean and from northwestern Oregon through western Washington and onto Vancouver Island, B.C.; no currently extant sites are known; habitat is largely unknown but, based on limited information, includes varied low vegetation, litter, and debris; rocks may also be used; the last report of living *Deroceras hesperium* was in 1969; it has been known from a few scattered sites within a fairly broad range; based on what is currently known, its status is not at all secure; while it may logically be expected to still occur in the Columbia Gorge east of Portland, on the north slope of the Olympic Peninsula, and at other sites in western Washington and Oregon, that is merely speculation, since there are no recent records	Unlikely to occur in project areas because not observed anywhere since 1969. Possibly extinct.
Cascade axetail slug	**Suspected** - Associated with conifer needle duff and vine maple (*Acer*	Does not occur in the

Species	Presence in the Eugene District — Habitat Associations	Presence in Project Area and potential effects
*Carinacauda stormi**	*circinatum*) leaf litter in Douglas-fir (*Psuedotsuga menziesii*) and western hemlock (*Tsuga heterophylla*) forest habitat above 2.800 ft.	Coast Range.
Crater Lake Tightcoil *Pristiloma arcticum crateris**	**Documented** - Usually found in non-acid fens or sedge habitats at elevations from 2750 to 6400 feet above sea level. This species has been found in mature conifer forests and among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 meters of open water in wetlands, springs, seeps and riparian areas which experience perennially moist conditions and long winters.	Does not occur in the Coast Range.
Roth's blind ground beetle *Pterostichus rothi*	**Suspected**– Restricted to cool, moist, closed-canopy conifer forests with well-drained, deep, coarse-crumb structure soils; not found on alluvial soils on floodplains; prefers ground covered by duff; found throughout year under embedded rocks and logs; not found in disturbed sites, meadows, or ecotones associated with grassy areas	May occur in project area because appropriate forest conditions do exist in the project area and appropriate soil conditions may exist. Short-term adverse effects could occur after thinning for about 5-10 years, and longer term adverse effects for 15-30 years from regeneration harvest due to drier microclimate.
Oregon plant bug *Lygus oregonae*	**Suspected** – Confined to sand dunes near the beach, usually just back of the foremost dune where host plant grows	Unlikely to occur in project areas
California Shield-backed bug *Vanduzeeina borealis californica*	**Suspected** - A tall grass prairie specialist, this subspecies inhabits high elevation (e.g. 3,000 feet) natural balds and meadows.	Unlikely to occur in project area because no tall grass prairies are present.
Western Bumblebee *Bombus occidentalis*	**Suspected** This ground-nesting species utilizes an array of habitat where flowering plants provide nectar sources.	Possible disturbance or destruction of nest sites and beneficial effects to abundance of nectar plants from increase of early seral habitat abundance.
Hoary elfin (butterfly) *Incisalia polia maritima*	**Suspected** – Coastal; kinn kinnick associate (host plant); known from Lincoln and Curry Counties in Oregon and Del Norte County in California; there are no known populations on Forest Service or BLM lands; the site farthest north is near Waldport; colonies are on the interface of "public beach lands" and private lands, in addition to the State Park land of Driftwood State Wayside where the elfin has been found in the past	Unlikely to occur in project areas
Taylor's checkerspot (butterfly) *Euphydryas editha taylori*	**Suspected** – Inhabits coastal bluffs and chaparral, grassland and native prairie on valley floor; once found throughout grasslands in the lowlands west of the Cascade Range from Oregon's Willamette Valley; extirpated from British Columbia and restricted to twelve sites in Washington and two in Oregon; open grasslands and grass/oak woodland sites where food plants for larvae and nectar sources for adults are available; these sites include coastal and inland prairies on post-glacial, gravelly outwash and balds	Unlikely to occur in project areas, but potential beneficial effects from habitat modification that increases amount of grasses or forbs.
Mardon skipper (butterfly) *Polites mardon*	**Suspected** – Alpine, grassland/herbaceous, conifer woodlands; grass openings in Idaho fescue and serpentine; occurrence in Eugene District not considered "reasonable possibility" (Applegarth 1995:88)	Unlikely to occur in project areas
Johnson's Hairstreak (butterfly) *Callophrys johnsoni*	**Documented –** Eggs laid on conifer mistletoes preferably in mature to old-growth conifer stands. Depends heavily on mature or old-growth conifer or mixed conifer/deciduous forests.	May occur in project area. However, mistletoe has not been observed in units. Adverse effects could occur due to habitat degradation; i.e., removal of mistletoe infected trees; esp. in Matrix. Beneficial effects from increase of nectar plants.
Insular Blue (butterfly) *Plebejus saepiolus littoralis*	**Suspected** – Associated with coastal and near coastal conditions. Typically along stream edges, bogs, or wet meadows but also along drier sites that have blooming clovers such as roadsides and open meadows.	Unlikely to occur in project areas because project is not near coast. If species occurs in project then potential beneficial effects from increase of early seral habitats.
Haddock's rhyacophilan caddisfly	**Suspected** – Known habitat does not exist in Lane County (Applegarth 1995:90)	Unlikely to occur in project areas

Species	Presence in the Eugene District — Habitat Associations	Presence in Project Area and potential effects
Rhyacophila haddock		
Foothill yellow-legged frog *Rana boylii*	**Documented** – Perennial, low-gradient, medium-sized streams (4th – 6th order) or side channels of larger creeks or rivers with rock, gravel or sand substrate	Possibly; design features for water quality and fish will prevent unacceptable adverse effects.
Northwestern pond turtle *Clemmys marmorata marmorata*	**Documented** – Associated with both terrestrial and aquatic habitats from sea level to 5000 ft.; lentic water (ponds, slow reaches of rivers); nests in open areas within 150 m of water; overwinter within 500 m of live/open water.	Unlikely; too steep.
Painted turtle *Chrysemys picta*	**Suspected** – Inhabit freshwater that is quiet, shallow, and has a thick layer of mud; slow-moving shallow waters of ponds, marshes, creeks and lakes with soft, muddy bottoms, with suitable basking sites and ample aquatic vegetation. There are no known sightings of this species in the Eugene District and this species has no known historical population here. The District is at the southern edge of this species' range and it is unlikely that there are any populations of these turtles on the Eugene District. Given the habitat associated with this species, any populations of this species on the District would likely be found within the West Eugene Wetlands area.	Unlikely to occur in project areas because there are no known sightings of this species in the Eugene District and this species has no known historical population here.
California brown pelican *Pelecanus occidentalis californicus*	**Suspected** – Coastal; inhabits coastal salt water, beaches, bays, marshes and the open ocean, most numerously within a few kilometers of the ocean throughout the year, also occupies large inland water bodies with fish; a warm-weather species that thrives near coasts and on islands; generally uses the rocky islands along the California coast for its group or "colonial" nest sites; roosting and resting, or "loafing," sites where pelicans can dry their feathers and rest without disturbance are also important	No; unlikely to occur in project area.
Dusky Canada goose *Branta canadensis occidentalis*	**Documented** – Winter resident only; associated with open grasslands, wet meadows; nest is usually located in an elevated area near water such as streams, lakes, ponds and sometimes on a beaver lodge	Unlikely to occur in project areas because no open grasslands are present.
Aleutian Canada goose (winter) *Branta canadensis leucopareia*	**Suspected** – Winter resident only; in Oregon inhabit coastal grasslands	Unlikely to occur in project areas because no open grasslands are present.
Harlequin duck *Histrionicus histrionicus*	**Documented** – In the District known to breed only in the Cascades: McKenzie River and Middle Fork of the Willamette River; not know to occur on the valley floor or in the Coast Range; inhabits forests generally within 50 m of 1st- 5thorder streams from March to August; winters in the ocean	Unlikely to occur in project areas because project is in Coast Range.
American peregrine falcon *Falco peregrinus anatum*	**Documented** – Nest on cliffs; forages along river corridors and over wetlands where bird prey reside and feed; only a single eyrie know in the Eugene District but others are likely; nests unlikely to be directly affected by proposed activities	Unlikely to occur in project areas due to lack of nesting habitat
Bald eagle *Haliaeetus leucocephalus*	**Documented** – Nest and roost in large trees, late-seral forest stands within 1 mile of lakes, rivers and large streams; nest site selection varies widely from deciduous, coniferous and mixed-forest stands; nest trees are usually large diameter trees characterized by open branching and stout limbs; nests are in dominant or co-dominant trees often located near a break in the forest such as a burn, clearcut, field edge (including agricultural fields), or water; the majority of nest sites are within 1/2 mile of a body of water such as coastal shorelines, bays, rivers, lakes, farm ponds, dammed up rivers (i.e., beaver dams, log jams, etc.) and have an unobstructed view of the water; habitation occurs primarily in undeveloped areas with little human activity; winter foraging areas are usually located near open water on rivers, lakes, reservoirs, and bays where fish and waterfowl are abundant, or in areas with little or no water (i.e., rangelands, barren land, tundra, suburban areas, etc.) where other prey species (e.g., rabbit, rodents, deer, carrion) are abundant; communal roost sites contain large trees (standing snags and utility poles have also been used) with stout lower horizontal branches for perching and may be used at night by three to greater than one hundred bald eagles, as well as during the day, especially during inclement weather; perch trees used during the day possess the same characteristics as roost trees but are located closer to foraging areas; conspicuous birds and most use areas in the Eugene District are known	Unlikely to occur in the project area because units are not near large bodies of water. If bald eagles are discovered, then appropriate protection measures would be applied.
White-tailed kite *Elanus leucurus*	**Documented** – Associated with grasslands, typically with deciduous trees for nesting and perching; also frequent agricultural lands; typically occur on valley floor	Likely; beneficial effects from habitat modification that increases amount of deciduous trees near grasslands or agricultural lands.
Lewis'woodpecker *Melanerpes lewis*	**Documented** – Associated with open woodlands including Oregon white oak woodlands, Ponderosa pine woodlands and mixed oak/pine woodlands; more common in woodlands near grassland-shrub communities; winter resident in	Likely; snag creation treatments would be beneficial.

Species	Presence in the Eugene District — Habitat Associations	Presence in Project Area and potential effects
	West Eugene Wetlands	
Purple martin *Progne subis*	**Documented** – Snags in early-seral stands, openings and burns; commonly associated with rivers, marshes and open water, especially when snags are present, both for nesting and foraging	Likely; beneficial effects from snag creation in early-seral habitat areas.
Streaked horned lark *Eremophila alpestris strigata*	**Documented** – Associated with grasslands, pastures and agricultural fields; prefer short vegetation; documented in prairie portions of Fern Ridge Reservoir; probably occur in West Eugene Wetlands; nesting in Willamette Valley associated with large expanses of herbaceous dominated habitat (cultivated grass fields, moderate to heavily grazed pasture, fallow fields, roadside shoulders), Christmas tree farms and wetland mudflats; dominated by short grasses (0-6 inches), relatively high percent of bare ground (17%) for territories, a higher percent cover of bare ground (31%) for nest sites; wintering habitat Willamette Valley associated with high percent of bare ground (sites with flocks > 20 birds averaged greater than 85% bare ground) and large expanse of treeless area; most birds use agricultural fields, particularly rye grass fields with sparse ground cover	Unlikely to occur in project areas, but potential beneficial effects from habitat modification that increases amount of grasses or forbs.
Grasshopper sparrow *Ammodramus savannarum*	**Documented** – Associated with grasslands, hayfields and prairies; verified in West Eugene Wetlands; occupy open grasslands and prairies with patches of bare ground; prairie and cultivated grasslands, weedy fallow fields and alfalfa fields; avoid significant shrub cover; occupy intermediate grassland habitat, preferring drier sparse sites in tallgrass prairies with open or bare ground for feeding; with few exceptions, nests are built on the ground, near a clump of grass or base of a shrub, "domed" with overhanging vegetation	Unlikely to occur in project areas, but may have beneficial effects from habitat modification that increases amount of grasses or forbs.
Oregon vesper sparrow *Pooecetes gramineus affinis*	**Documented** – Associated with grasslands, fields, prairies and roadsides; not associated with forests	Likely; treatments that increase grasses or forbs would be beneficial, especially on roadsides.
Pallid bat *Antrozous pallidus*	**Suspected** – Associated with desert areas in Oregon; west of Cascades restricted to drier interior valleys of southern portion of state, including Lane County, where it occurs at low elevations and along the valley floor; usually found in brushy and rocky terrain but has been observed along edges of coniferous and deciduous woods and open farmlands; crevice dweller associated with rock crevices, snags, large hollow trees and human structures used for day roosting	Likely; beneficial effects from increasing snags (roosting) and deciduous vegetation (prey increased) (Hagar, 2007) (Wilson, 2010).
Townsend's big-eared bat *Corynorhinus townsendii*	**Suspected** – Cave obligate; day roosts in mines, caves, tree cavities and attics of buildings	Likely; beneficial effects from increasing snags (roosting) and deciduous vegetation (prey increased).
Fisher *Martes pennanti*	**Documented** – Forest stands, both conifer and conifer-hardwood mix, with large down logs, live trees and snags for denning; in Oregon fishers occurred historically throughout the Coastal and Cascade mountains; currently the range is severely reduced; despite extensive surveys conducted in forested regions of Oregon, records dating from 1954 to 2001 show that the remaining populations of fishers are in two separate and genetically isolated populations in southwestern Oregon; one in the northern Siskiyou Mountains and one in the southern Cascade Range. Both populations appear to be slowly increasing.	Possible; beneficial effects from increasing quality of forest habitat by increasing the amount of deciduous vegetation and dead wood, which could increase amount of prey and resting sites.
Fringed myotis *Myotis thysanodes*	**Suspected** – Crevice dweller associated with large snags and live trees, abandoned buildings, mines and caves, some bridges; forage in openings, and late- and mid-seral forests	Likely; beneficial effects from increasing snags and deciduous vegetation (prey increased).
Birds of Conservation Concern (not already listed above)		
Western Grebe *Aechmophorus occidentalis*	This species breeds in inland lakes and marshes (locally common at Fern Ridge Reservoir). Some winter along the coast	No; unlikely to occur in project area.
Black swift *Cypseloides niger*	**Possible** – Breeding swifts are restricted to two main habitat features – sea caves or cliffs along the Pacific coast, and adjacent to or near wet cliffs in montane canyons; inland nests are usually located near dripping water sources, waterfalls, or turbulent water sprays; foraging habitat is poorly known; during warm, clear weather, foraging is presumed to occur at high altitudes where blooms of aerial insects are available, from 1000 to 2000 feet above ground during the day to within 100 feet of the ground during the late afternoon	Possible; beneficial effects from increasing deciduous vegetation (prey increased). Nesting habitat, if present, would be protected by design features for water and fish.
Rufous hummingbird *Selasphorus rufus*	**Present**– Inhabits forest edges near riparian thickets, meadows and other openings; found in forests, on seed-tree harvest units, riparian shrub, and spruce-fir habitats; during the winter it lives wherever flowers are present	Likely; beneficial effects from increasing deciduous shrubs (see IM OR-2009-018)

Species	Presence in the Eugene District — Habitat Associations	Presence in Project Area and potential effects
Olive-sided flycatcher *Contopus borealis*	**Present**– Inhabits mixed conifer and hardwood-conifer forests; abundant in landscapes containing fragmented late-seral forests with pronounced ecotones; frequent coniferous forests, especially with tall standing dead trees. They prefer spruce, fir, balsam, pine, or mixed woodlands near edges and clearings, wooded streams, swamps, bogs, edges of lakes or rivers	Likely; beneficial effects from increasing deciduous vegetation. (see IM OR-2009-018)
Willow Flycatcher *Empidonax traillii*	**Present** - This is a species of edge, nesting and roosting in willow thickets along streams and brush thickets between grasslands or forested areas. Feeds mostly in open areas.	Likely; potential short-term impacts due to disturbance to, or modification of nesting habitat. Potential long-term beneficial effects from increase of deciduous shrub habitats, especially in regeneration harvest areas.
Purple finch *Carpodacus purpureus*	**Present** – Inhabits coniferous and mixed forests, as well as park-l ke areas, breeding throughout western Oregon; nests are most often found far out on horizontal branches in conifers and are made of concealing material; food consists mostly of seeds, buds, blossoms, and fruit, usually taken from the outer branches of trees and occasionally from the ground; purple finches display strong site fidelity to breeding areas, but in winter, flocks may range widely depending on local food supplies and a wider variety of habitats are used	Likely; beneficial effects from increasing deciduous vegetation and vigor of conifer trees that produce seeds (see IM OR-2009-018)

Steam Donkey Echo
Summary

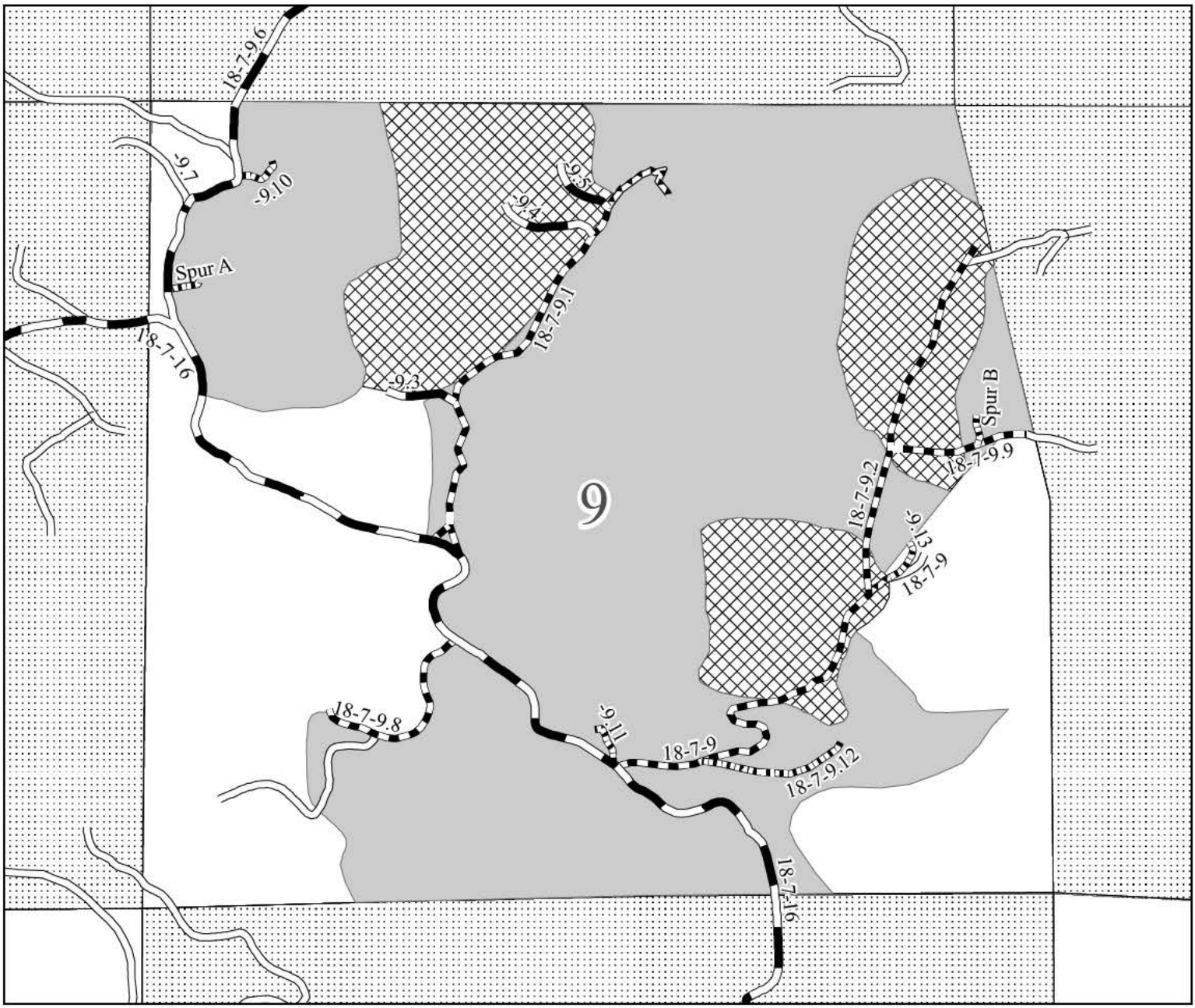
Alternative	Unit	Treated Acres*						Untreated Acres*		Total Acres*
		LSR	Matrix		Riparian Reserve		Subtotal Acres*	Riparian Reserve	Other	
		Thin	Regen	Thin	Thin LSR	Thin Matrix				
2	1A		4.3				4.3	1.8		6.1
	1B	5.7	5.0				10.7		0.2	10.9
	1C	14.9	8.2				23.0	1.7		24.8
	1D	3.4			0.7		4.1			4.1
	1E	40.7			2.2		42.9			42.9
	1F	44.5	2.6		8.1		55.2			55.2
	1G		5.0				5.0			5.0
	2A		26.6				26.6	5.5		32.2
	2B		8.5				8.5			8.5
	2C		1.2				1.2			1.2
	2D		8.1	2.5			10.6	0.5	2.5	13.6
	2E		1.1				1.1	0.9		2.1
	RR†							362.9		362.9
	Drop								763.7	763.7
	Alt 2 Totals:	109.1	70.5	2.5	11.0		193.2	373.5	766.4	1,333.0
3	1A		4.3			1.8	6.1			6.1
	1B	5.7	5.0				10.7		0.2	10.9
	1C	14.9	8.2			1.7	24.8			24.8
	1D	3.4			0.7		4.1			4.1
	1E	40.7			2.2		42.9			42.9
	1F	44.5	2.6		8.1		55.2			55.2
	1G		5.0				5.0			5.0
	2A		16.7	7.3		4.7	28.8	0.8	2.6	32.2
	2B		8.5				8.5			8.5
	2C		1.2				1.2			1.2
	2D		8.1	2.5		0.5	11.1		2.5	13.6
	2E		1.1			0.7	1.8	0.2		2.1
	RR†							362.9		362.9
	Drop								763.7	763.7
	Alt 3 Totals:	109.1	60.6	9.9	11.0	9.5	200.2	363.9	768.9	1,333.0
4	1A			4.3		1.8	6.1			6.1
	1B	5.7		5.2			10.9			10.9
	1C	14.9		8.2		1.7	24.8			24.8
	1D	3.4			0.7		4.1			4.1
	1E	22.0			2.2		24.2		18.7	42.9
	1F	44.5		2.6	8.1		55.2			55.2
	1G			5.0			5.0			5.0
	2A			24.1		5.5	29.6		2.6	32.2
	2B			8.5			8.5			8.5
	2C			1.2			1.2			1.2
	2D			13.1		0.5	13.6			13.6
	2E			1.1		0.7	1.8	0.2		2.1
	RR†							362.9		362.9
	Drop								763.7	763.7
	Alt 4 Totals:	90.4		73.2	11.0	10.3	184.9	363.1	784.9	1,333.0

* Acres on this table have **not** been adjusted for Small Diversity Patches (gaps, skips, etc.)

† These Riparian Reserve acres are not being thinned in any action alternatives

Steam Donkey Echo Project Area Strata

T. 18 S., R. 7 W., Sec. 9



Stratum 1

Stratum 2

Owner, BLM

Owner, Other

Road, Rock Surface

Road, Other Surface

Road, To Renovate

Road, To Improve

Road, To Construct

N

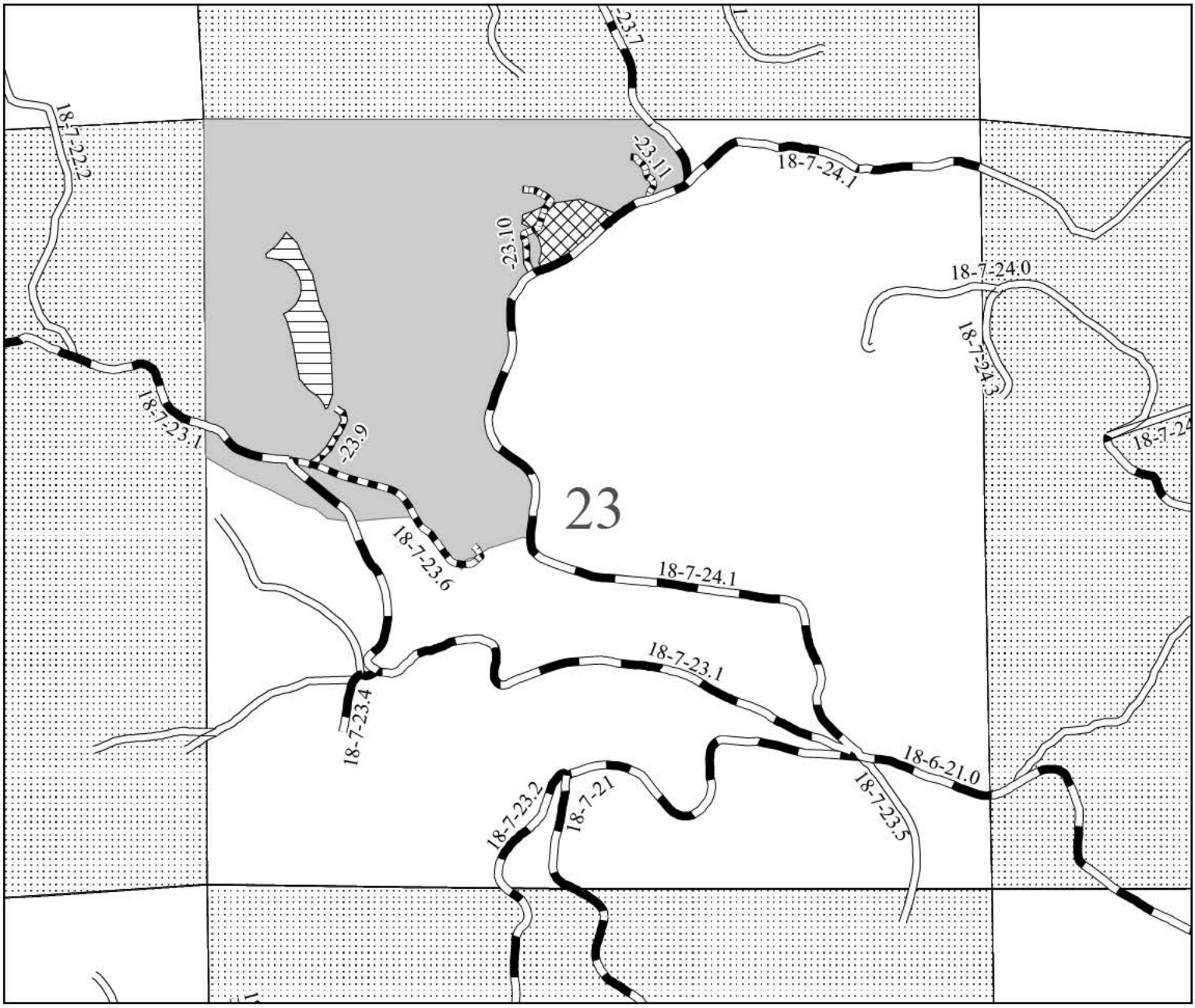
Metres

0 200 400 600 800

P:\eug\SI\EAs\SteamDonkeyEcho\Team\GIS\Strata_Grey.mxd - Jul 16, 2015 - 7:34:22 AM

Steam Donkey Echo Project Area Strata

T. 18 S., R. 7 W., Sec. 23



Stratum 1

Stratum 1, Unit 2a

Stratum 2

Owner, BLM

Owner, Other

Road, Rock Surface

Road, Other Surface

Road, To Renovate

Road, To Improve

Road, To Construct

N

Metres

0 200 400 600 800

P:\eug\SI\EAs\SteamDonkeyEcho\Team\GIS\Strata_Grey.mxd - Jul 16, 2015 - 7:34:26 AM

Alternative 2

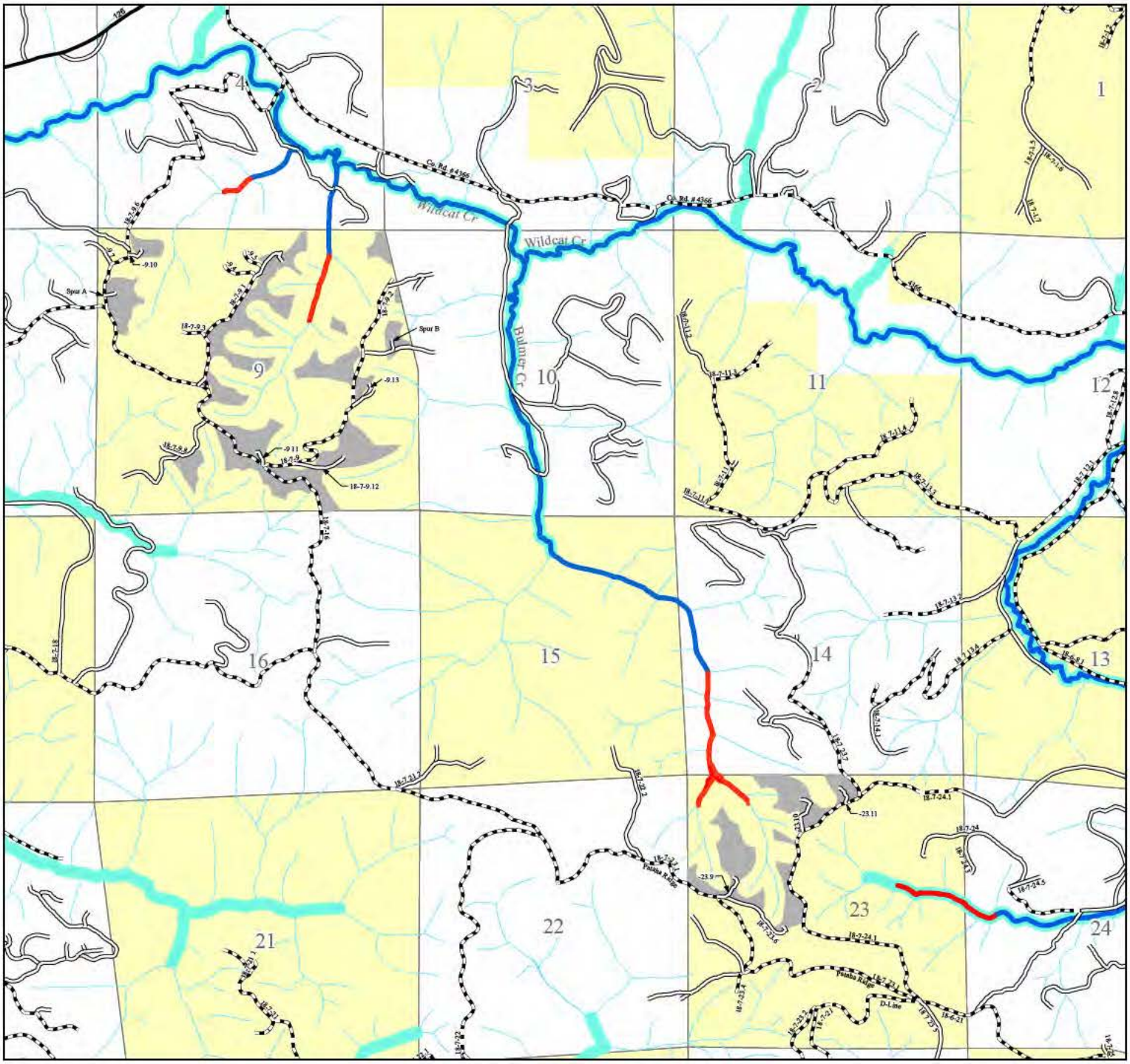
Alternative 3

Alternative 4

Steam Donkey Echo - Map 1

T.18 S. R.7 W.

Comparison of Alterna i es 2 3 and



Steam Donkey Echo 2015

Fish Habitat & Presence - Map 2

T.18 S., R.7 W. Sec. 9 & 23

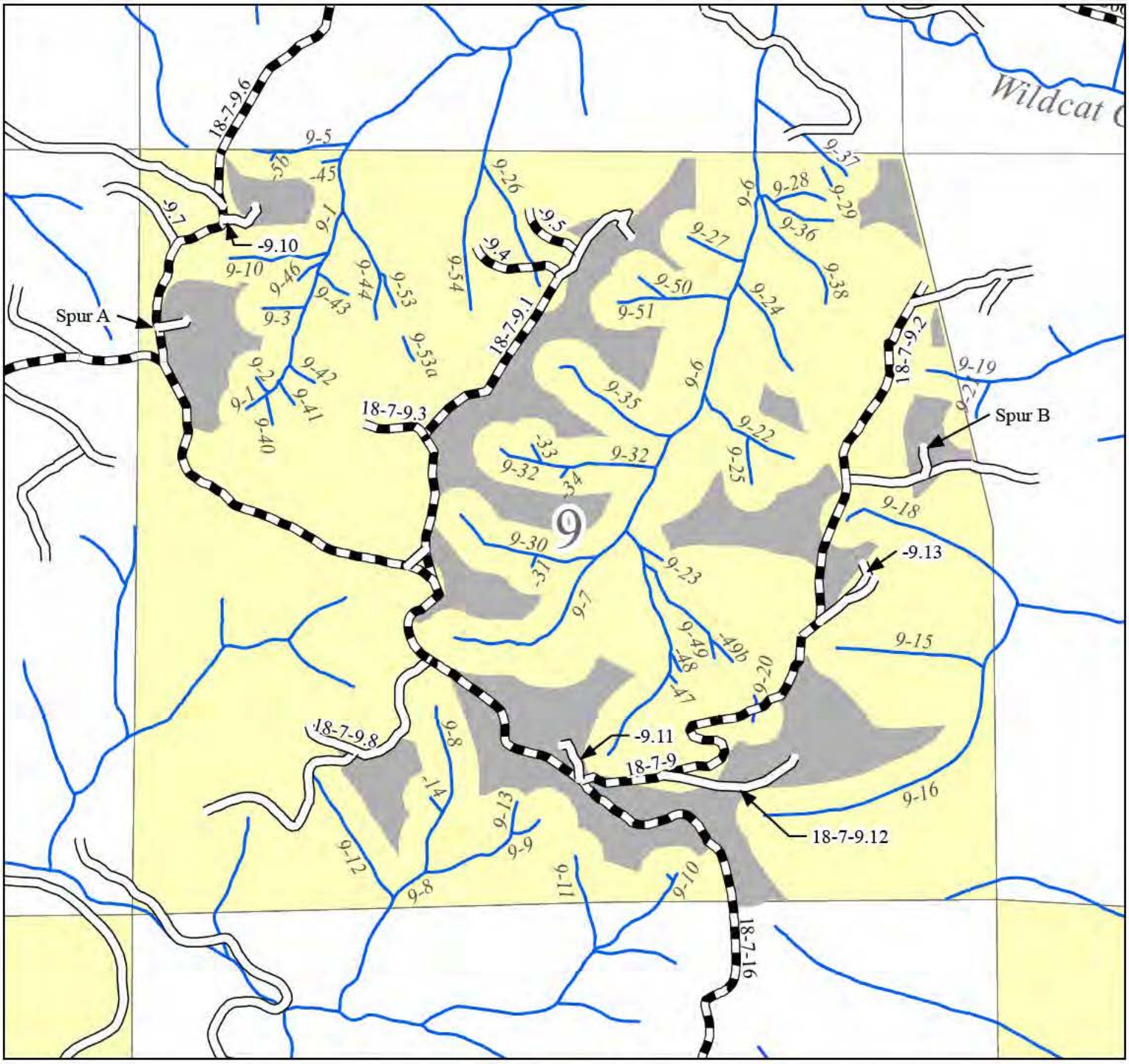
- BLM Ownership
- Treatment Area
- Coho Critical Habitat (NMFS)
- Coho & Cutthroat Present
- Cutthroat Present
- Non-Fish-Bearing Stream

Meters

0 1,000 2,000

Eugene District

P:\eug\SI\TimberSale\2015\SteamDonkeyEcho\Team\GIS\FishHabPresence.mxd - Sep 2, 2015 2:27:41 PM



Steam Donkey Echo 2015

Streams - Map 3

T.18 S., R.7 W., Sec. 9

BLM Ownership

Treatment Area

Stream

Road, Rock Surface

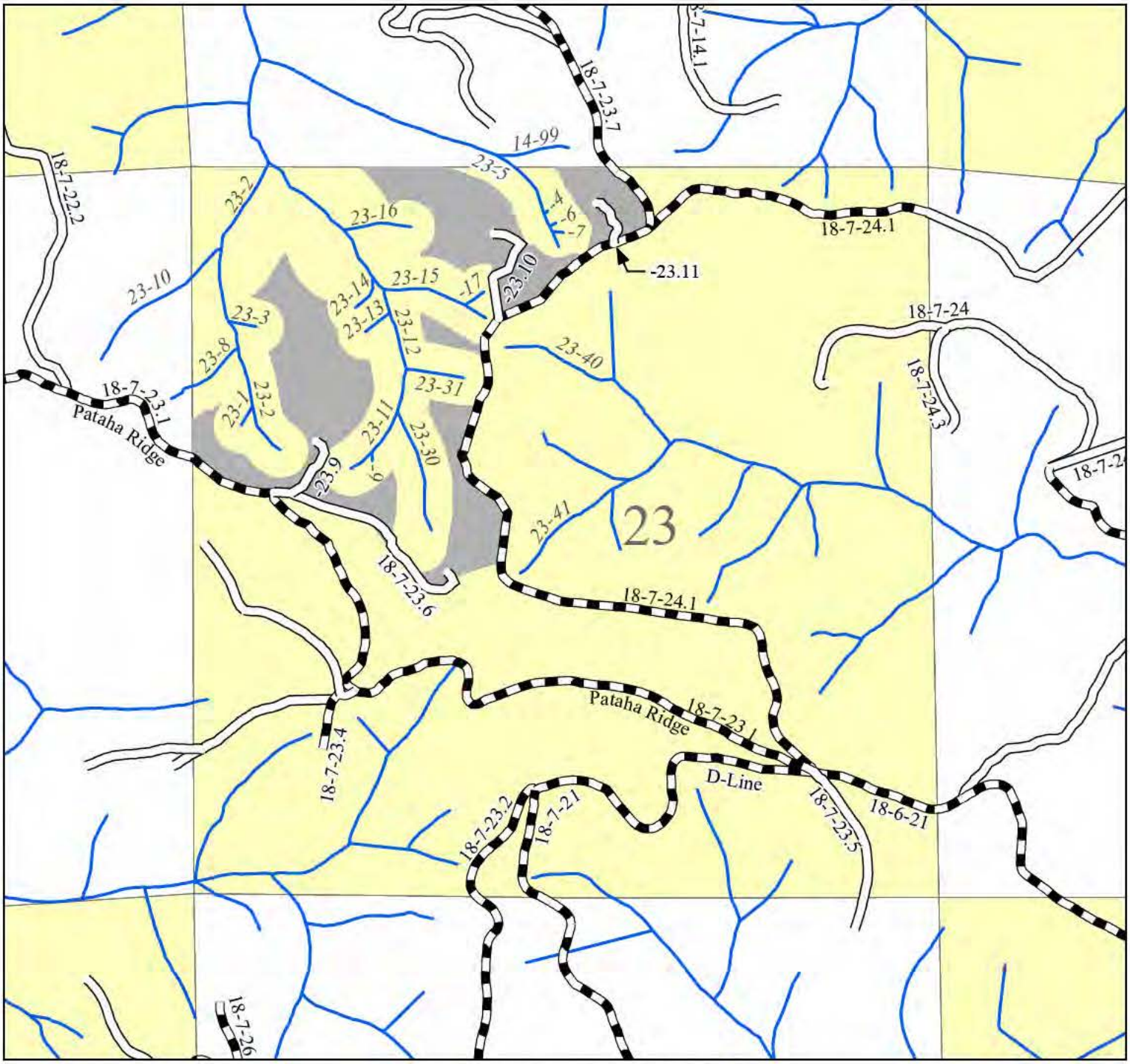
Road, Other Surface

Meters

0 1,000

Eugene District

P:\eug\SI\EAs\SteamDonkeyEcho\Team\GIS\SDE_Streams mxd - Jul 31, 2015 8:17:26 AM



Steam Donkey Echo 2015

Streams - Map 4

T.18 S., R.7 W., Sec. 23

BLM Ownership

Treatment Area

Stream

Road, Rock Surface

Road, Other Surface

Meters

0 1,000

Eugene District

P:\eug\SI\EAs\SteamDonkeyEcho\Team\GIS\SDE_Streams mxd - Jul 31, 2015 8:17:28 AM

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
EUGENE DISTRICT OFFICE

PRELIMINARY FINDING OF NO SIGNIFICANT IMPACT

DOI-BLM-OR-E050-2013-0006-EA
Steam Donkey Echo

The Bureau of Land Management (BLM) has prepared an Environmental Assessment (EA) (DOI-BLM-OR-E050-2013-0006-EA) for Steam Donkey Echo Project, which analyzes the effects of the Preferred Alternative and two other action alternatives. On the basis of the information contained in the EA, it is my determination that: (1) the implementation of the Preferred Alternative or other action alternatives will not have significant environmental impacts beyond those already addressed in the August 1992 draft Environmental Impact Statement (DEIS) and the November 1994 Final EIS. It is also supported by and consistent with Interagency Record of Decision Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl, (April 1994) and the Eugene District Final EIS and Proposed Resource Management Plan (RMP), (November, 1994) and the 2001 Survey and Manage EIS; (2) the Preferred Alternative and other action alternatives do not constitute a major federal action having a significant effect on the human environment. Therefore, an environmental impact statement or a supplement to the existing environmental impact statement is not necessary and will not be prepared.

This finding is based on my consideration of the Council on Environmental Quality's (CEQ) criteria for significance (40 CFR 1508.27), with regard to the context and to the intensity of the impacts described in the EA.

CONTEXT

The action alternatives would occur in the Matrix (General Forest Management Area (GFMA), Late Successional Reserve (LSR) and Riparian Reserve (RR) Land Use Allocations (LUA) as designated by the 1995 Eugene District RMP *as amended*. The RMP anticipated that forest management activities would occur in these LUAs as follows:

Matrix (RMP p. 34). The objectives of Matrix lands are to: produce a sustainable supply of timber and other forest commodities to provide jobs and to contribute to community stability; provide connectivity (along with other allocations such as Riparian Reserves) between Late Successional Reserves; provide habitat for a variety of organisms associated with both late-successional and younger forests; provide important ecological functions, such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components, such as down logs, snags, and large trees; and provide early-successional habitat.

Late Successional Reserve (RMP p. 28). The objectives of LSR lands are to: protect and enhance conditions of late successional and old growth forest ecosystems, which serve as habitat for late successional and old growth forest related species including the northern spotted owl and marbled murrelet; maintain a functional, interacting, late successional and old growth forest ecosystem.

Riparian Reserve (RMP p. 23). The objectives of RR lands are: to meet the objectives of the Aquatic Conservation Strategy (RMP p. 18); and to provide habitat for Special Status Species, and other terrestrial species.

All action alternatives meet the purpose and need for the project. In the Matrix land use allocation, this includes the enhancement of complex early seral habitat through regeneration harvest and improve growing conditions by commercial thinning and making provisions for a sustainable supply of timber and other forest products. In the LSR land use allocation this includes thinning treatments to improve stand structure which would benefit late successional species such as spotted owls and marbled murrelets. Riparian reserve thinning has been considered when appropriate to meet the objectives of the ACS by improving the heterogeneity and complexity of forest stands adjacent to streams where needed.

The stands where treatments would occur are approximately 76 to 78 years of age based on Forest Operations Inventory (FOI) data. The stands are structurally homogenous with dense canopy cover and low understory diversity. The stands in which regeneration harvest has been proposed have reached Culmination of Mean Annual Increment (CMAI). Management direction in the 1995 Eugene District RMP (page 85) recommends regeneration harvest in younger stands that may not have achieved CMAI, within the first decade of the RMP. After the first decade, as is the case currently, the RMP management direction recommends regeneration harvest in stands that have reached CMAI.

INTENSITY

I have considered the potential intensity/severity of impacts anticipated from the Steam Donkey Echo project relative to each of the ten areas suggested for consideration by the CEQ. With regard to each:

1. **Impacts that may be both beneficial and adverse.** The EA considers both beneficial and adverse effects, the long term effects from creating complex early seral habitat through regeneration harvest and spotted owl and marbled murrelet habitat improvements from thinning would be beneficial even though short term reductions in existing habitat would occur. Issues were identified during the internal and external scoping process, six issues were analyzed as those being necessary to make a reasoned choice between alternatives. For each issue considered, the BLM analyzed the direct, indirect and cumulative impacts to the resource. None of the effects are beyond the range of effects analyzed in the Eugene District "Final Proposed Resource Management Plan/Environmental Impact Statement" (November 1994), and the FEIS for Amendment to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (November, 2000) to which the EA is tiered.

   Although there would be a reduction in the amount of low quality spotted owl foraging habitat due to regeneration harvest and road construction in the project area, there is a large amount of similar type of habitat in the project area, at least 75% of section 09 and at least 84% of section 23 would continue to provide foraging or nesting/roosting habitats after harvest (EA p. 56). There would be no regeneration harvest or thinning that would occur within nest patches or core areas of active spotted owl sites. Approximately 176 acres (less than 4%) of the Pataha site home range lie in the southern portion of section 9 (LSR LUA) and about 35 acres of this home range is being proposed for thinning, which is about 1% of the home range (EA p. 55). Although 53% of the sub-watersheds (SWS) is considered foraging habitat, only about 16% of the sub watersheds is higher quality habitat with multi layered multi species canopies and hardwoods, and is likely to continue to be used for foraging (EA p. 57). There are beneficial long term effects of converting low quality foraging habitat to complex high quality early seral habitat which promotes habitat for the spotted owl prey base. After 25 to 40 years the treated areas would begin to function as high quality foraging habitat (EA p. 55).

   Regeneration harvest would occur within 100 yards of four unoccupied potential marbled murrelet nest trees. Removal of supporting vegetation around the unoccupied trees is a minor and a short term adverse effect to the use of those trees by murrelets for nesting. However in the long term the four trees would benefit from open growing conditions and the remaining potential nest trees (approximately 250 were verified in the field) would continue to provide potential nesting structure. The lack of competition from adjacent conifers would enhance growing conditions because of more space, light and nutrients which would encourage the development of large limbs that would be more suitable for marbled murrelet nesting platforms (EA p. 51-52). Road construction would remove one unoccupied marbled murrelet potential nest tree, however approximately 250 potential nest trees were verified in the field for this project therefore the removal of one such tree does not limit the availability of potential nest trees in this area. The benefits of road construction are to improve access for thinning LSR stands resulting in long term benefits for both spotted owl and marbled murrelet habitats (EA p. 56).

2. **The degree to which the proposed action affects public health and safety.** No aspect of the Proposed Action would have an effect on public health and safety. Steam Donkey Echo is not located in an area that would impact public health and safety, the project area may be subject to closures during operations in order to maintain safe conditions for the public, and there is no public access to the project area. Adherence to the Oregon Smoke Management Plan would greatly limit smoke dispersal. Due to the combination of burning only on days with stable atmospheric conditions and limited smoke dispersal, there would be no significant impacts on air quality associated with burning, and hence no significant impacts on public health or safety from burning.

   No herbicides would be used in conjunction with this project. The Eugene District does not have clearances to use herbicides within the project area, and no herbicide application is included in the proposed action. Thus, there would be no public health or safety issue presented by the use of herbicides associated with this project.

3. **Unique characteristics of the geographic area such as proximity of historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.** There are no known historic or cultural resource sites that would be affected by the Proposed Action. A historic site located in the project area would remain outside the treatment areas and would not be affected by this project. Past pre-project cultural resource surveys conducted in conjunction with surface-disturbing actions in the Oregon Coast Range physiographic province have not identified or discovered any significant cultural properties. Post-disturbance surveys, when conducted would follow standards based on slope as defined in Appendix D of the *Protocol for Managing Cultural Resource on Lands Administered by the Bureau of Land Management in Oregon*. These standards only mandate post-disturbance survey on slopes of 10% or less, or if professional judgment prompts such efforts due to topographic features or existence of nearby cultural resources. Ground disturbing work must be suspended if cultural material is discovered during project work until an archaeologist can assess the significance of the discovery.

   There are no parks, prime farmlands, or wild and scenic rivers in the planning area. A few, small streamside wetlands have been identified and protected. All streams/wetlands would be buffered by wide, untreated riparian vegetation.

There would be no water diversions, well drilling, or other activities associated with lowering water tables. Field surveys did not identify any ecologically critical areas within the planning area.

4. **The degree to which the effects on the quality of the human environment are likely to be highly controversial.** The effects on the quality of the human environment are not likely to be highly controversial ((40 CFR 1508.27(b)(4)). CEQ guidelines relating to controversy refer not to the amount of public opposition or support for a project, but to a substantial dispute as to the size, nature, or effect of the action. The effects of actions planned under the modified proposed action are similar to many other forest management projects implemented within the scope of the 1995 Eugene RMP (FEIS, pp. 4-106 to 4-119). Controversy over regeneration harvest on matrix lands was addressed in the NWFP and a policy balance struck through the signing of the Record of Decision for the Eugene District RMP, and thus, the implementation of those decisions through project-specific regeneration harvest does not require the BLM to revisit the question of alleged significance associated with any remnants of that controversy every time the agency proposes a timber sale. The EISs for the NWFP and 1995 Eugene RMP projected effects over the lifetime of that plan to date for 10,260 acres of regeneration harvest. In actuality, the Eugene District has offered only about 35% of the projected amount of regeneration harvest. The approximately 61 acres of regeneration harvest in the preferred alternative of the Steam Donkey Echo Project would equate to an additional <1% of this projection. Given the very large discrepancy between the acreage of regeneration harvest assumed within the collective effects analysis of the NWFP and RMP EISs and what the Eugene District has actually offered for sale, it is abundantly clear that the incremental effect of the harvest proposed in the Steam Donkey Echo Project is well within the effects of the total regeneration harvest projected within the Eugene District by the NWFP and RMP EISs. The Eugene District BLM acknowledges that there may be some in the local community who are opposed to or have serious differences of opinion regarding the proposed action, however, no unique or appreciable scientific controversy has been identified regarding the effects of the modified proposed action, and, therefore, no known scientific controversy exists over the impacts of the project.

   Environmental effects of the project are within the scope of those considered in the NWFP EIS and RMP EISs, which addressed the issues and differences of opinion surrounding social and scientific controversy over matrix harvest, including regeneration harvest in matrix. The 1994 FEIS projected that the Eugene District would harvest 570 acres (p. xix) annually through regeneration harvest methods. As of May 2014, the District has harvested approximately 35% of the total 10,260 acres projected under the 1995 RMP. Regeneration harvesting approximately 61 acres (preferred alternative) would constitute another <1% of this projection. To the extent there is any remnant of that controversy, these figures show that Eugene's performance is far, far below the expected level of harvest, and therefore well within the effects analysis related to any social or scientific controversy that those EISs addressed.

   Effects are also expected to be consistent with those of the published literature cited in the EA, and are not controversial in a scientific sense. The public has had the opportunity to comment on this project at public meetings and through formal scoping. While comments were received expressing opinions about the BLM timber management program, none established a scientific dispute of the size, nature, or effects of the proposed action.

   The BLM is aware that the Revised Recovery Plan for the Northern Spotted Owl (USFWS 2011) uses the word 'controversy' in its discussion of spotted owls and ecological forestry (RP, p. III-11). Ecological forestry projects as implemented by the BLM in the moist forest type have typically been variable retention harvest, one type of regeneration harvest. Any form of regeneration harvest on public lands within the Pacific Northwest (such as the regeneration harvest included in the Steam Donkey Echo project), continues to be opposed by certain groups.

   A thorough reading of the full discussion in the Recovery Plan, however, reveals that the controversy in question is largely the social controversy over implementing active forest restoration activities where the spotted owl and its habitat would benefit over the long term. The Recovery Plan does not assert that the effects of ecological forestry themselves are controversial in any kind of meaningful scientific or biological sense, but rather that ecological forestry, as one part of "active forest management," will help address the uncertainty of the extent to which land managers can influence the changes occurring on forests across the Pacific Northwest. The controversy, thus, is not evidence of a substantial dispute over the size, nature, or effect of ecological forestry, but instead to the ongoing societal controversy over management of the Pacific Northwest forests.
   The BLM is aware that the Revised Recovery Plan identified that [t]he majority of published studies support this general approach for Pacific Northwest forests, although there is some disagreement regarding how best to achieve it. We received widely varying recommendations for meeting this goal from knowledgeable scientists. Most of this variance in opinion is due to the scientific uncertainty in: (1) accurately describing the ecological "reference condition" or the "natural range of variability" in historical ecological processes, such as fire and insect outbreaks across the varied forest landscape within the range of the spotted owl (e.g., see Hessburg et al. 2005, and Keane et al. 2002, 2009); and (2) confidently predicting future ecological outcomes on this landscape due to rapid, climate-driven changes in these natural processes, with little precedent in the historical (or prehistoric) record (Drever et al. 2006, Millar et al. 2007, Long 2009, Littell et al. 2010). These are very real problems that should be addressed with more

research (Strittholt et al. 2006, Kennedy and Wimberly 2009). In the meantime, addressing this uncertainty in a careful but active manner is the challenge of this Revised Recovery Plan and of forest management in general.

Therefore, while the FWS in the Revised Recovery Plan (RRP) identified differences of scientific opinion regarding the informational needs for active forest management to achieve the goals of forest restoration, including owl recovery, this difference in scientific opinion does not rise to the level of a highly controversial scientific debate that requires an EIS for this single site-specific project. Nor does the scientific difference of opinion on informational needs at the broader scale of owl recovery demonstrate a scientific controversy over using active forest management to restore ecological processes. As the Revised Recovery Plan stated: "There is a scientific and social consensus emerging that land managers must restore more sustainable (resistant and resilient) ecological processes to forests at various landscape scales (Hessburg et al. 2004, Millar et al. 2007, Long 2009, Moritz et al. 2011) (See RRP at III-12)." The FWS RRP identification of the emerging "consensus" on this issue demonstrates that any scientific controversy that may have existed over the use of active forest management through projects like the proposed action to achieve long-term spotted owl recovery is largely being laid to rest. Indeed, the RRP goes on to state that:
Federal land managers should apply ecological forestry principles where long-term spotted owl recovery will benefit, even if short-term impacts to spotted owls may occur (Franklin et al. 2006) to improve the resiliency of the landscape in light of threats to spotted owl habitat from climate change and other disturbances…This includes early-successional ecosystems on some forest sites (Swanson et al. 2010, Perry et al. 2011).
***

> management designed under an ecological forestry framework should avoid existing high value habitat, if possible, while meeting long-term restoration goals. Within provincial home ranges but outside core-use areas, opportunities exist to conduct vegetation management to enhance development of late-successional characteristics or meet other restoration goals in a manner compatible with retaining resident spotted owls. Restoration activities conducted near spotted owl sites should first focus on areas of younger forest less likely to be used by spotted owls and less likely to develop late-successional forest characteristics without vegetation management. Vegetation management should be designed to include a mix of disturbed and undisturbed areas, retention of woody debris and development of understory structural diversity to maintain small mammal populations across the landscape. (See RRP at III-17)

This is precisely what the Steam Donkey Echo project does. Again, the controversy referenced in the Revised Recovery Plan reveals references to "controversy" are principally referring to the social controversy of implementing active forest management to achieve restoration goals. The RRP also identifies differences in scientific opinion over the information needs that exist in regard to implementing such actions, but not over whether such actions should be undertaken.

The BLM is also aware that the fundamental nature of science requires disagreement and vigorous debate, and that as a result some disagreement will always be present in any scientific discussion. The topic of ecological forestry is no exception. The BLM is aware of articles in peer-reviewed scientific literature, such as DellaSalla, et al (2013), which express some reservations and disagreements with ecological forestry applications. The BLM also notes that much of DellaSalla (2013) relates to the ongoing social controversy over management practices and refinement of land management goals and practices. Where the article discusses the size, nature, and effects of ecological forestry, and discusses perceived shortcomings in the framework principles, it also acknowledges the positive aspects of the framework, and notes that the details of its management are "yet to be described." (DellaSalla et al (2013), pp. 420-421). As noted previously, unanimity in science is rarely, if ever, present. That some discussion and debate in peer-reviewed scientific forums continues to occur is a sign, not of controversy as NEPA uses the term, but of a healthy discussion and questioning of hypotheses and projections that are essential to the scientific process. In the end, however, while the BLM acknowledges this debate, NEPA and the principles which underlie it do not require unanimity, nor that an EIS be prepared for every project for which it does not exist. Articles such as DellaSalla (2013) are limited in direct application, and are more focused on advocacy and social policy. Rather than present scientific debate on the effects of implementing ecological forestry on matrix lands available for regeneration harvest, the articles question or propose a different tack on whether ecological forestry is the appropriate tool to address the current and changing conditions of forests in the Pacific Northwest. These broadly stated positions do not generate and are not evidence of a substantial dispute over the size, nature, and effects of the proposed action at issue here, however, and thus do not give rise to a "controversy" under NEPA that necessitates preparation of an EIS.

The BLM is, as noted, aware that social controversy is ongoing over the existence and practices of the BLM's timber harvest program across western Oregon. This societal debate, reflected in the scoping comments received by the BLM and addressed as applicable in the EA, is precisely the public opposition or support that the CEQ guidelines have identified as not relevant to the term 'controversy' as applied to NEPA. The BLM has considered and responded to the comments received, and found that none of them give rise to any meaningful dispute over the size, nature, or effects of the action. Because the comments received from the public do not establish such a dispute, the proposed action is not controversial for NEPA "significance" purposes in this regard, either.

5. **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.**
The proposed action would not impose highly uncertain or involve unique or unknown risks (40 CFR 1508.27(b)(5)). The analysis has not shown that there would be any unique or unknown risks to the human environment not previously considered and analyzed in 1994 FEIS, to which this decision is tiered. Timber harvest is a common practice on lands managed by the BLM in western Oregon, and the Eugene District has considerable experience with the actions to be implemented and the activities and associated design criteria incorporated with this decision are well-established land management practices. The risks are well known and understood. None of the public comments received indicated unique or unknown risks to the human environment. Based on this, and previous similar actions, the probable effects of this decision on the human environment, as described in the EA, do not involve effects that are highly uncertain or involve unique or unknown risks. The use of variable retention harvest in the proposed action is not "experimental" and does not seek to "pilot" the use of ecological forestry in older stands.

As discussed above, the Revised Recovery Plan discusses scientific uncertainty regarding the informational needs for active forest management to achieve the goals of forest restoration for achieving owl recovery, specifically (1) accurate ecological baseline information, and (2) confident predictions of outcomes of actions to restore conditions, given uncertainty in climate conditions. The RRP did not state that ecological forestry should be "tested" as a way of addressing these uncertainties, but rather that these uncertainties were part of the reason for its recommending the use of ecological forestry as an effective, research-based approach for addressing those uncertainties, and to help ensure that the best available science—which includes the recommended practice of ecological forestry--is used to benefit ecosystems and spotted owls over the long term. As discussed in more detail below, this project presents no serious question as to uncertain effects regarding the use of ecological forestry within the stands included within the proposed action, which analysis and research show is expected to benefit spotted owls in the long term.

Within the three sub-watersheds low quality early seral habitat is found on less than 4% of 22,400 acres of BLM administered lands, complex early seral habitat is lacking within the sub-watersheds. The preferred alternative would add less than 1% of complex early seral habitat within the geographic scale of the sub-watersheds. There is no highly uncertain information about baseline conditions in the action area.

Climate change and greenhouse gas emissions have been identified as an emerging resource concern by the Secretary of the Interior (Secretarial Order No. 3226; January 16, 2009), the OR/WA BLM State Director (IM-OR-2010-012, January 13, 2010), and by the general public through comments on recent project analyses. It is currently beyond the scope of existing science to identify a specific source of CO2 emissions and designate it as the cause of specific climate impacts at an exact location (EA p. 45). As an aid to decision-making, the EA analysis estimates carbon flux to the analysis area associated with the proposed action. Although the proposed action would be predicted to result in a mid-term (20 yr.) flux of additional carbon to the atmosphere, carbon stores in the reserved portions of the action area under the proposed action would be predicted to approach a steady state at or above 6,500 metric tons C, which is comparable to storage under the no action alternative (EA, p. 47). The difference in carbon storage in 20 years between alternatives would be too small to lead to a detectable change in global carbon storage, and existing climate models do not have sufficient precision to reflect the effects on climate from such a small fractional change in global carbon storage. However, estimates of the magnitude and direction in carbon response are probably accurate, and these results may be instructive for comparing the effects of the alternatives on local (watershed-scale) carbon stores (EA, p. 48). For all the reasons stated above, the effects of the proposed action are not highly uncertain and do not present unique or unknown risks with regard to carbon flux.

The analysis in the EA has not shown that there would be any unique or unknown risks to the human environment not previously considered and analyzed in the EIS to which this decision is tiered. Timber harvest is a common practice on lands managed by the BLM in western Oregon.

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.** This project neither establishes a precedent nor represents a decision in principle about future actions. The timber management program on BLM administered lands in western Oregon is well-established and this project would not establish a new precedent of management for this program. The Proposed Action is consistent with actions appropriate for Matrix, Late-Successional Reserve and Riparian Reserve land use allocations as designated by the 1995 Eugene District RMP.

7. **Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.**
There are no individual or cumulatively significant impacts identified by the analysis conducted for the Steam Donkey Echo EA. The impacts were considered in relation to other resources within the project area and the appropriate larger scale and none of the impacts were individually or cumulatively significant. All resources were given adequate

consideration. The environmental analysis did not reveal any cumulative effects beyond those already analyzed in the 1994 Eugene District FEIS. No significant cumulative effects have been identified.

8. **The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historic resources.** There are no features within the planning area that are listed or eligible for listing in the National Register of Historic Places. As such, the proposed activities would not affect districts, sites, highways, structures or objects listed in or potentially eligible for listing in the National Register of Historic Places. Nor would the activities cause a loss or destruction of significant scientific, cultural, or historical resources. There are no known historic or cultural resource sites that would be affected by the Proposed Action. A historic site located in the project area would remain outside the treatment areas and would not be affected by this project.

9. **The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.**

   ESA listed wildlife species: The project area is located within the range of the northern spotted owl and marbled murrelet, both of which are listed as threatened under the Endangered Species Act. Issues specific to the two species were identified and analyzed in the EA (p. 50-57).

   Spotted owls: Regeneration harvest in the preferred alternative would remove approximately 60 acres of low quality spotted owl foraging habitat. The analysis shows that complex high quality early seral habitat would initially grow in place of the low quality spotted foraging habitat, and would benefit prey species of the spotted owl (EA p. 54-55). After 25 to 40 years high quality foraging habitat would be restored in these areas. The cumulative analysis in the EA also indicates that complex early seral habitat is lacking in the vicinity of the project.

   Thinning treatments would convert low quality spotted owl foraging habitat to dispersal habitat in LSR thinning for a period of about 10 years, however the long term gain in improved heterogeneity and structural diversity from thinning would have a positive influence on spotted owl foraging habitat. In addition more than 50% of the project area would have suitable habitats after harvest; at least 75% of section 09 and at least 84% of section 23 would be foraging or nesting/roosting habitats after harvest (EA p. 56). Only 35 acres (less than 1%) of the outer area of the home range of one active spotted owl site (Pataha Ridge) would be thinned, no treatments would occur within the core area or nest patch of an active spotted owl site (EA p. 55).

   Nesting/roosting or high quality habitat would not be removed, no potential nest trees would be removed, and potential for disruption to nesting spotted owls would be avoided during the critical breeding period. Thinning in matrix lands and adjacent riparian reserves would retain at least 60% canopy cover. Prescribed burning would occur more than ¼ mile from active or potentially active known nest sites.

   Minor adverse effects from road work to spotted owl habitat (LAA) would occur because, although stand scale habitat functionality would not change, road construction would remove low quality spotted owl foraging habitat however, stand scale habitat functionality would not change and therefore this impact to low quality foraging habitat, even though a likely to adversely affect determination, does not rise to a level of “significance” to the species that would trigger the need for an EIS. Disruption to nesting spotted owls from road work would not occur because no active sites are near proposed road work and because operating restrictions would be applied if road work is within disruption distance of a site that could become active.

   This proposed action is consistent with Recovery Action 10 because it minimizes adverse effects to “reproductive pairs” i.e. resident (active) spotted owl sites. The EA (p. 55) describes the avoidance of core areas and nest patches of owl sites and describes how adequate habitat remains within these areas. There are no treatments proposed within nest patches, spotted owl sites would retain suitable habitat on more than 50% of core areas and 40% of home range areas for all action alternatives. About 35 acres of thinning is being proposed within the outer home range of the Pataha creek owl site which amounts to less than 1% of the home range for this owl site. After treatments, 40% of the owl home range would continue to function as foraging habitat. Harm (take) would not occur to any active or potentially active spotted owl sites because adequate amounts of habitat would remain after treatments.

   All action alternatives are consistent with Recovery Action 32 (EA page 55) because they do not include treatments in high quality spotted owl habitats (RA 32 stands).

   Treatments under all action alternatives constitute about 0.2% of the critical habitat unit ORC3 in which the project lies. This project would not adversely affect the CHU (ORC3) (EA p.75).

Marbled Murrelets: The proposed action would reduce canopy cover to less than 10% within 100 yards of about 4 unoccupied trees with nesting structure. This effect is minor and would not cause harm/take because all suitable habitat potentially affected by regeneration harvest was surveyed to protocol and no marbled murrelet detections were recorded in these specific areas. Areas where detections were made have been set aside and no treatments are being proposed within this area. Over 95% of the trees with nesting structure in the project area would NOT be affected by regeneration harvest since these trees are more than 100 yards away from regeneration harvest areas. The thinning treatments within the marbled murrelet occupied site would benefit murrelet nesting structure, and adverse effects would be minimal because all existing potential nest trees would be protected (EA p. 51-53).

Prescribed burning in regeneration harvest areas would occur within ¼ mile of breeding marbled murrelets; however, these effects are not likely to cause nest abandonment. The intensity of adverse effects from smoke would probably be minor because only two small burning areas are within ¼ mile of occupied habitat, and these burn areas are not in the same drainage as the occupied habitat. It is reasonably certain that the majority of smoke would not drift to the occupied habitat within ¼ mile because prescribed burning considers wind to be a detrimental factor while burning and therefore burning would likely be restricted to occur during low wind conditions. Also prescribed burning would occur toward the end of the marbled murrelet breeding period, thereby reducing the possibility of negative effects from drifting smoke (EA p. 52).

Minor adverse effects to murrelets (LAA) would occur because road construction would cause a need to remove an unoccupied potential nest tree. Road construction will not occur in any occupied suitable habitat, and nesting structure has been surveyed to protocol without detections. Compliance with Level 2 policy for the management of younger stands with potential murrelet nesting structure has been followed. There will be no disruption of murrelets from road work because operating restrictions would be applied (EA p. 52).

Harm (take) would not occur from the proposed action because there would be no disruption during the critical breeding period and regeneration harvest would not occur in marbled murrelet occupied habitat.

Consultation with USFWS has been completed for spotted owls and marbled murrelets. A biological opinion and letter of concurrence have been issued for Steam Donkey Echo project. Biological Opinion USDI-FWS BO-01EOFW00-2013-F-0094, 2013; Letter of Concurrence USDI-FWS LOC-01EOFW00-2012-I-0214, 2013.

Sensitive plants: No federally listed threatened or endangered plant species were located during surveys, and no effects to these species are anticipated. No mitigation measures are necessary. No sensitive plant species were located during surveys. No mitigation measures are necessary.

ESA listed fish: The project area is located within the range of the Oregon coastal coho salmon, listed as threatened under the Endangered Species Act. The project would have no effect on this species, the analysis in Issue One has adequately analyzed the Aquatic Conservation Strategy(ACS) objectives to reflect this - EA pages 27-38. All ACS objectives would maintain riparian function, the approximately 20 acres of thinning being proposed within the riparian reserves under the preferred alternative would not reduce the potential for large wood recruitment into the stream channel as described by the analysis for the ACS objectives.

Of 384 acres of riparian reserves, thinning in the preferred alternative is being proposed on approximately 20 acres, the large amount of un-thinned riparian reserves would continue to function as under the no action alternative. The thinning that is being proposed will take place in the outer riparian reserve areas (outside the 150 foot no harvest buffer). The 150 foot no harvest buffer is being implemented over the entire treatment area except for a 0.1 acre area (alternatives 3 and 4) that is about 120 feet from stream 23-17 is located in a different catchment (opposite side of the ridge) (EA page 28). Thinning would: enhance tree growth of the retained trees; promote understory vegetative development, vigor, and diversity; promote the retention of fuller crowns and larger limbs; reduce suppression mortality and slower growth; and enhance the development of emerging second story and multi-species canopies (EA page 28).

There would be no yarding across streams in any of the action alternatives and no stream crossing culverts are being replaced, removed or added, eliminating any mechanism for an increase in sediment delivery from the short or long term perspectives.

About 70 feet of new road construction would occur within RR (one site tree). This area is about 120 feet from the closest stream (in another catchment) and has no direct or indirect connection with the stream system and therefore no mechanism to negatively affect fisheries resources or water quality (EA page 31).

10. **Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.** The proposed action does not threaten to violate any Federal, State, or local laws imposed for the protection of the environment including, but not limited to, the Clean Water Act, the Clean Air Act and the Endangered Species Act. The proposed action complies with the 1995 Eugene RMP, which provides direction for the protection of the environment on public lands.

Unsigned

_____ _____

Michael J. Korn
Siuslaw Field Office Manager
Eugene District Office

Date