Bureau of Land Management

Swiftwater Resource Area – Roseburg District

Calapooya Creek Harvest Plan Environmental Analysis

Bureau of Land Management
Roseburg District Office
Swiftwater Field Office

DOI-BLM-OR-R040-2013-0009-EA

U.S. Department of the Interior, Bureau of Land Management
Roseburg District Office
777 NW Garden Valley Boulevard
Roseburg, Oregon 97471

This environmental assessment analyzes proposed timber harvest designed in conformance with management direction provided in the 1995 Roseburg Record of Decision and Resource Management Plan (ROD/RMP), as amended prior to December 30, 2008.

The BLM is providing a 30-day period for public review and comment on the documents, and will accept comments until the close of business (4:30 PM, PDT) on May 4, 2015.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment be advised that your entire comment, including your personal identifying information, may be made publicly available at any time. While you can ask us in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so. If you choose to submit any written comments, they should be directed to Max Yager, Swiftwater Field Manager, at the above address.

In keeping with Bureau of Land Management policy, the Roseburg District posts Environmental Assessments, Environmental Impact Statements, Findings of No Significant Impact, and Decision Records/Documentations on the district web page under Plans & Projects, at http://www.blm.gov/or/districts/roseburg. Electronic notice of availability will be transmitted to the individuals and organizations on the District NEPA mailing list on the same day the documents are published on our website. Individuals desiring a paper copy of such documents will be provided one upon request. Copies will also be available for review in the Roseburg District Office and at the Douglas County Library at 1409 NE Diamond Lake Boulevard in Roseburg, Oregon. Individuals with the ability to access these documents on-line are encouraged to do so as this reduces paper consumption and administrative costs associated with copying and mailing.

Executive Summary

The Calapooya Creek Harvest Plan project area occurs within the General Forest Management Area (GFMA), Connectivity/Diversity Block (C/D), and Riparian Reserve (RR) land use allocations administered by the Swiftwater Field Office, Roseburg District Office BLM. This Environmental Assessment (EA) considers two alternative treatments (including No Action) on approximately 1,245 acres of forest stands, 40-62 years old, in the proposed Green Gas and Good Boyd timber sales and the effects of those treatments.

See *Table i. (Comparison of the Key Findings and Effects of the Calapooya Creek Harvest Plan Alternatives).* This table highlights specific examples of the differences between the alternatives. For a complete discussion of the alternatives, see *Chapters 2* and *3*.

The Roseburg District initiated planning and design for this project on May 3, 2013. The project conforms to and is consistent with the Roseburg District's 1995 Record of Decision/Resource Management Plan (ROD/RMP 1995). Analysis of the effects of the proposed actions tiers to the analytical assumptions and conclusions of the 1994 *Final - Roseburg District Proposed Resource Management Plan/Environmental Impact Statement* ((PRMP/EIS) USDI/BLM 1994). Analysis of effects and information from the 2008 *Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management* is incorporated by reference.

Timely scoping comments gathered during the early stages in the planning process helped to refine alternatives and project design for Calapooya Creek. However the scoping comments did not provide additional information specific to the project to prompt the Swiftwater Field Office to alter or include additional analyses beyond that which the interdisciplinary team had already considered as pertinent.

Table i. Comparison of the Key Findings and Effects of the Alternatives of the Calapooya Creek Harvest Plan

Key Finding/Effect		No Action Alternative	Proposed Action Alternative
Proposed Harvest	**Project Size**	0 acres	1,245 acres
	Thinning Prescription **VRH Prescription**	0 acres	1,182 unit acres 63 unit acres
	Thinning Prescription **VRH Prescription**	None	Basal Area: 85-141 sq. ft. / acre Basal Area: 73-81 sq. ft. / acre
	Volume Harvested	0 MMBF	8.0 MMBF
	Proposed Road Maintenance or Renovation	0 miles	55 miles
	Proposed Road Construction	0 miles	1.8 miles
	Proposed Road Decommissioning	0 miles	2.7 miles
Fuels Treatment	**Machine-pile and burn**	0 acres	184 acres
Forest Vegetation	**Post-Harvest Canopy Cover - VDT**	No harvest 39-99%	37-76%
	Post-Harvest Canopy Cover - VRH		39-45%
Northern Spotted Owls	**Harvest within Nest Patch** (300 meter radius)	0 acres	0 acres
	Thinning within Core Area **VRH within Core Area** (0.5 mile radius)	0 acres	90 acres 0 acres
	Thinning within Home Range **VRH within Home Range** (1.2 mile radius)	0 acres	635 acres modified 0 acres
	Suitable Habitat	0 acres	0 acres
	Dispersal Habitat	0 acres	1,245 acres
	Critical Habitat	0 acres	122 acres modified 84 acres removed
	Seasonal Restrictions	Known sites are located outside of threshold distances for disturbance; seasonal restrictions (March 1-July 15) necessary for 10 units until spot checks completed.	
Soils	**Detrimental Compaction** (3-9% of the ground-based yarding area; 2-3% of the cable yarding area)	0 acres	56 acres
	Roads or spurs mulched with logging slash to aid soil recovery	0 miles	0 miles
Hydrology, Aquatic Habitat & Fisheries	**No-harvest Stream Buffer Widths**	None	35 feet intermittent streams 60 feet perennial streams 100 feet fish-bearing streams
	Net Roaded Area (peak flow response when > 12%)	3.6%	3.6%
	Stream Temperature	Stream temperature regimes would remain unchanged under either alternative	
	Sediment Regime	Sources of sediment from roads would not be fully repaired with road maintenance alone	Sources of sediment from roads would be reduced due to improved drainage
	Fish Populations	No impacts to fish populations would be anticipated under either alternative	

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Chapter 1. Purpose and Need for Action

This chapter provides a description of the purpose and need for the action, a brief description of the proposed action, the scope of the analysis, the decisions to be made, issues expressed, and conformance with management direction and applicable laws and regulations.

A. Introduction

The analysis area encompasses lands managed by the Roseburg District, Bureau of Land Management (BLM) in the Calapooya Creek, Elk Creek and Lower North Umpqua fifth-field watersheds. Eighty-eight percent of the project area is within the Calapooya Creek watershed which covers approximately 157,194 acres, of which 11,661acres (7.4 percent) are administered by the Swiftwater Field Office of the Roseburg District. The remainder of the project area is evenly divided between the Elk Creek and Lower North Umpqua River watersheds.

The project area includes lands within the General Forest Management Area (GFMA), Connectivity/Diversity Blocks (C/D) and Riparian Reserve land use allocations. Project actions would include timber harvest and road construction, maintenance and decommissioning, in two proposed timber sales, Green Gas and Good Boyd. Collectively, these proposed sales are referred to as the Calapooya Creek Harvest Plan (Appendix H, Figures 1-3).

B. Purpose and Need

The action proposes to treat 1,245 acres of mid-seral forest stands, thinning approximately 1,182 acres in the Matrix land use allocations (GFMA and C/D) and Riparian Reserves, and implementing a variable retention harvest prescription on 63 acres within GFMA.

Management of BLM-administered lands and resources in the project area are governed by statues that include the Oregon and California Revested Lands Sustained Yield Management Act (O&C Lands Act), Federal Land Policy and Management Act, Endangered Species Act, and Clean Water Act as discussed in the Roseburg District *Record of Decision and Resource Management Plan* (1995 ROD/RMP; p. 15). The O&C Lands Act requires the Secretary of the Interior to manage suitable O&C timber lands for permanent forest production in accordance with the principles of sustained yield (1995 ROD/RMP, p. 15).

The following are purposes (objectives) for the proposed action:

1. Produce a sustained yield of forest products (1995 ROD/RMP; p. 60) to support local and regional economic activity (1995 ROD/RMP; p. 55). The 1995 ROD/RMP (p. 60) directs that timber resources on Matrix lands, consisting of GFMA and C/D Block land use allocations, be managed to provide timber sale volume toward the Roseburg District's annual allowable sale quantity (ASQ) of 45 million board feet.

2. Manage Matrix lands to promote tree survival and growth, and to achieve a balance between wood volume production, quality of wood, and timber value at harvest (1995 ROD/RMP; p. 60). Silvicultural systems would be applied to forest stands to produce desired species composition, structural characteristics and age class distributions (1995 ROD/RMP; p. 61).
   Specifically in GFMA:
   - Thinning would be programmed in stands under 80 years of age to manage stand densities within desired ranges and to assure high levels of volume productivity (1995 ROD/RMP; p. 151).

- Regeneration harvest may be scheduled in stands as young as 60 years in order to develop a desired the age-class distribution across the landscape (1995 ROD/RMP; p. 61).

3. Riparian Reserves allocated within the Matrix are intended to aid in attainment of objectives of the Aquatic Conservation Strategy, which was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands (ROD/RMP, p. 19). Silvicultural practices are to be applied where deemed necessary to control stocking, reestablish and manage stands, and acquire desired vegetative characteristics (ROD/RMP, pp. 25 and 153-154).

The need for action was determined by analysis of existing conditions in the stands that identified opportunities for treatment to move the stands toward the desired conditions described below. Forest Operations Inventory (FOI) was used to determine the stands that are of an appropriate age for management across the Calapooya watershed. Stand examinations and field review provided current data on stocking levels, stand health and species composition in units proposed for management.

The following are needs for the proposed action.

1. There is a need to produce a sustainable yield of forest products. The Roseburg District's declared annual allowable sale quantity (ASQ) of 45 million board feet reflects the O&C Act requirements to manage suitable timber lands in the analysis area for sustainable timber production. Timber volume generated through harvest would contribute toward the socio-economic benefits envisioned in the *Roseburg District Proposed Resource Management Plan/Environmental Impact Statement* (USDI BLM 1994, PRMP/EIS Vol. 1, p. xii).

2. There is a need to manage Matrix lands to promote tree survival and growth, and to achieve a balance between wood volume production, quality of wood, and timber value at harvest. The majority of stands proposed for treatment in the Calapooya Creek Harvest Plan project area are densely stocked, uniformly structured stands currently at or beyond the appropriate relative density for thinning, resulting in reduced tree growth and vigor. Thinning would target the removal of suppressed and intermediate trees in densely stocked stands, which would reduce competition for sunlight, nutrients, and water. Reduction in competition would result in increased growth and vigor of the remaining trees.

3. There is a need for a balanced distribution of age classes in Matrix lands in the Calapooya Creek watershed. The ROD/RMP (p. 61) specifies application of silvicultural systems that are planned to produce, over time, forests which have desired species composition, structural characteristics, and distribution of seral or age classes, as set forth in Appendix E of the ROD/RMP. Stand management objectives in GFMA include managing for a balance of seral stages at the watershed and stand level (Appendix E, ROD/RMP, p. 150). The VRH prescription would adjust the distribution of seral (age) classes in the watershed while protecting structural characteristics and developing species and habitat diversity at the stand level.

4. There is a need to apply silvicultural practices in Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics. Thinning in Riparian Reserves would reduce canopy cover in densely stocked young stands resulting in increased tree growth and the release of minor conifers, hardwoods and shrubs. This would aid in the attainment of ACS objectives to maintain and restore species composition, structural diversity, and coarse woody debris for future instream recruitment in the Riparian Reserves.

C. Decision to be Made

Factors to be considered in alternative development and selection would include:

- The degree to which the objectives previously described would be achieved, including: the retention of existing habitat features and potential for creating future habitat components for listed species, the manner in which timber harvest would be conducted with respect to cost, and the feasibility of project implementation;
- The manner in which the described objectives would be achieved, including yarding methods, seasons of operation, access, activity fuels reduction, and reforestation.
- The nature and intensity of environmental impacts that would result from implementation of the proposed timber harvest and the nature and effectiveness of measures to mitigate impacts to resources including, but not limited to, wildlife and wildlife habitat, soil productivity, water quality, and the spread of noxious weeds;
- Compliance with management direction from the 1995 ROD/RMP and the Bureau Special Status Species program.
- Compliance with applicable laws including, but not limited to, the Clean Water Act, O&C Act, Federal Land Policy and Management Act, National Historic Preservation Act, Endangered Species Act, including terms of consultation on species listed as threatened or endangered and their designated critical habitats; and the Magnuson-Stevens Fishery Conservation and Management Act (Federal Register 2002);
- The degree to which the proposed project would provide revenue to Federal and County governments from the sale of timber resources in support of local industry while managing the lands in a cost efficient manner.

D. Scoping

1. Internal Scoping

An interdisciplinary team was assembled at initiation of the project analysis process. Issues identified for analysis were determined based on ROD/RMP management direction for utilization and protection of natural resources; circumstances and concerns identified through field reconnaissance; comments from external groups, and requirements set forth in laws, regulations, policy and court rulings.

2. External Scoping

A notice of project initiation was published in the Roseburg District Quarterly Planning Update (Spring 2013), informing the general public of the nature of the proposed action. Letters were sent to landowners with property adjacent to BLM-administered lands where timber harvest is proposed, those whose property lies along identified haul routes, and those with registered surface water rights for domestic use located within one mile downstream of any proposed units. Recipients were encouraged to share any concerns or special knowledge of the project area that they may have.

Letters were also sent to the Confederated Tribes of Grand Ronde, Confederated Tribes of Siletz, and Cow Creek Band of Umpqua Tribe of Indians requesting identification of any special interest they might have in the lands in question.

Timely scoping comments were received from American Forest Resource Council (AFRC). Additional scoping comments were received in May 2014 from Oregon Wild after alternatives and project design were complete. Many comments were of a generic or philosophical nature that would not guide the development of alternatives. Numerous comments identified issues for consideration and analysis that are routinely addressed in environmental assessments for timber management activities. Other comments suggested analyses that cannot be addressed within the scope of this EA.

A small subset of comments was identified that might refine alternatives and project design. These are summarized in italics and addressed below.

"The difficulty that the BLM has had implementing any treatment that successfully regenerates a stand of mature timber has resulted in an unbalanced age-class distribution across the Forest, particularly on the Matrix allocation, and has left a void in stands in the 0-20 year age class. This void concerns AFRC and raises the question of where future timber products off the BLM will come from." Also, *"we would like the BLM to include in their analysis an age-class breakdown of the Matrix lands in this Resource Area.*

The BLM recognized the imbalance in age-class distribution within the Calapooya 5th Field Watershed and addressed this issue in the development of the project alternatives and design. Analysis in the EA includes effects of the proposed project on the age class distribution at the watershed scale. However, the Calapooya project is within stands that are 40 to 62 years of age and not within mature timber stands.

". . . much of the project area is in the newly designated NSO critical habitat (CHU), including the unit proposed for regeneration harvest. The Fish & Wildlife Service released a final rule on this new habitat designation which recommends "a hands on approach to forest management within critical habitat."

The BLM included the U.S. Fish and Wildlife Service in all phases of project development for Calapooya, in part because of its location within critical habitat. This collaboration allowed for development of treatment alternatives in the proposed stands to protect current and provide future elements of critical habitat.

"We note that this project is in the same general area as the Back in Black Project. Maybe there are significant cumulative effects or connected actions that would require an EIS."

The Back in Black project is located within the same 5th field watershed as most of the Calapooya Creek Harvest Plan. Cumulative effects in this EA address the proposed Back in Black project as a reasonably foreseeable action. The Calapooya Creek and Back in Black projects are similar actions, not connected actions, and are independent of each other for their implementation. The cumulative effects of the BLM timber management program on the Roseburg District have been described and analyzed in the PRMP/EIS (Chapter Four), incorporated herein by reference. This EA considers the environmental consequences of the no action and the proposed action to determine if there would be impacts exceeding those analyzed in the PRMP/EIS, precluding a Finding of No Significant Impact and requiring preparation of a Supplemental Environmental Impact Statement.

E. Issues for Analysis

Through internal and external scoping, the interdisciplinary team identified the following issues for analysis. For some resources there may be no specific concerns because their protection is covered under program policy and no detailed discussion is necessary.

1. Timber Resources

- How would the alternatives meet requirements of the O&C Act for sustainable timber production from lands in the General Forest Management Area and Connectivity/Diversity Block allocations?
- How would the alternatives affect logging costs and timber yield?

- How would the alternatives meet the objective of maintaining the health and vigor of individual trees and forest stands?
- How would the alternatives meet the objective of a desired age-class distribution?

2. Wildlife

- What would be the direct and indirect effects of the alternatives to the Federally-threatened northern spotted owl in terms of disturbance and modification of habitat?
- To what degree would the alternatives be consistent with Recovery Actions from the Northern Spotted Owl Recovery Plan and assist in recovery of the northern spotted owl?
- What would the direct and indirect effects of the alternatives be to Bureau Sensitive species?
- What would the direct and indirect effects of the alternatives be to Survey and Manage wildlife species?
- What would the direct and indirect effects of the alternatives be on landbirds and to the habitat provided by BLM-managed lands in the project area?

3. Botany

- What would the direct effects of the alternatives be to Federally-listed vascular plants, and Bureau Sensitive and Survey and Manage vascular plants, lichens, bryophytes and fungi that may be present in the forested stands proposed for timber harvest?

4. Fish, Aquatic Habitat and Water Resources

- What would the direct and indirect effects of the alternatives be to the Federally-threatened Oregon Coast coho salmon and other fish species that inhabit streams in proximity to proposed harvest units?
- What effects would the alternatives have on the condition of aquatic habitat, including critical habitat designated for the Oregon Coast coho salmon and Essential Fish Habitat designated for Oregon Coast coho salmon and Oregon Coast Chinook salmon?
- What effects would the alternatives have on water quality, particularly temperature and shade, and sediment and turbidity in streams in the project area?
- What effects would the alternatives have on the timing and quantity of stream flows in the project area?

5. Soils

- What would the direct effects of the alternatives be in terms of soil displacement and compaction?
- What would the indirect effects of the alternatives be in terms of increased potential for erosion and reductions in site productivity caused by soil displacement and compaction?
- What would the direct and indirect effects of the alternatives be on slope stability and risk of slope failures and landslides?

6. Fuels Management and Air Quality

- What direct and indirect effects would the alternatives have on present and future risk of fire within the proposed harvest units?
- What would be the effects on air quality from fuels reduction implemented as part of the proposed action?

7. Carbon Storage and Release

- What effects would the alternatives have on the release of carbon in the form of carbon dioxide (CO_2) at the project scale and in comparison to annual national and global CO_2 emissions?
- What would be the effects of the alternatives on future carbon sequestration in the forested stands that are proposed for harvest?

8. Cultural/Historical Resources

- What would the effects of the alternatives be on cultural or historical resources that may be present within proposed harvest units or road rights-of-way?

9. Recreation

- How would the alternatives affect recreational use, including off-highway vehicle use, within the project area?

10. Cumulative Effects

- What are the cumulative effects of proposed projects in context of the watershed as a whole relating to current and planned BLM management actions?

F. Conformance

1. Applicable Planning Documents

The Roseburg District initiated project planning and design to be consistent with, and project implementation would conform to management direction from, the Roseburg District's 1995 Record of Decision/Resource Management Plan (1995 ROD/RMP) as amended by the following:

- *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA and USDI 1994b); and
- *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA and USDI 2001).

Analysis of the effects of the proposed actions tiers to the analytical assumptions and conclusions of the 1994 *Roseburg District Proposed Resource Management Plan/Environmental Impact Statement* ((PRMP/EIS) USDI/BLM 1994). This environmental assessment (EA) analyzes the environmental consequences of the *No Action Alternative* and the *Proposed Action Alternative* to explain the environmental effects of each for the decision-making process. Additional information and analysis provided by the following documents is incorporated by reference.

- *Final Supplemental Environmental Impact Statement* (FSEIS) *on Management of Habitat for Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl* (USDA and USDI 1994a),
- FSEIS *for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA and USDI 2000),
- FSEIS *to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines* (USDA and USDI 2004b);

- *Final Supplement to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines* (USDA and USDI 2007), and
- *Final Environmental Impact Statement for the Revision of the Resource Management Plans for the Western Oregon Bureau of Land Management* (USDI BLM 2008 (2008 FEIS)).

2. Survey & Manage

On February 18, 2014, the District Court for the Western District of Washington issued a remedy order in the case of *Conservation Northwest et al. v. Bonnie et al.*, No. 08-1067- JCC (W.D. Wash.)/No.11-35729 (9th Cir.). This was the latest step in the ongoing litigation challenging the 2007 Record of Decision (ROD) to modify the Survey and Manage (S&M) Standards and Guidelines.

The remedy order contained two components. The order:
(1) Vacates the 2007 ROD to Remove or Modify the Survey and Manage S&M Mitigation Measure Standards and Guidelines, and
(2) Allows for continued project planning and implementation for projects that relied on the 2011 Consent Decree and were being developed or implemented on or before April 25, 2013 (date of the Ninth Circuit Court ruling invalidating the 2011 Consent Decree).

In summary, the current status of Survey and Manage is:
(1) Follow the 2001 S&M ROD and Standards and Guidelines (S&G);
(2) Apply the "Pechman exemptions;" and
(3) Implement the 2001, 2002, and 2003 ASR modifications to the S&M species list, except for the changes made for the red tree vole.

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 project is consistent with the 2001 ROD and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines, as incorporated into the District Resource Management Plan.

This project utilizes the December 2003 species list. This list incorporates species changes and removals made as a result of the 2001, 2002, and 2003 Annual Species Reviews (ASR) with the exception of the red tree vole. For the red tree vole, the Ninth Circuit Court of Appeals in KSWC et al. v. Boody et al., 468 F3d 549 (9th Cir. 2006) vacated the category change and removal of the red

tree vole in the mesic zone, and returned the red tree vole to its status as existed in the 2001 ROD Standards and Guidelines, which makes the species Category C throughout its range. Details of the project surveys are described in Chapter 3 of the EA (pp. 82-85; pp. 109-110).

The Pechman Exemption "a" applies to 1,147 acres of the Calapooya project because these stands are less than 80 years old and would be treated with thinning only. Activities associated with the proposed thinning include road construction, maintenance/renovation, and decommissioning as described in *Chapter 2: Description of the Alternatives* (pp. 20-24). Road maintenance/renovation and decommissioning activities would occur on existing road facilities where habitat for Survey and Manage species is absent and, therefore, would not be considered habitat disturbing. The right-of-way width for road construction located entirely within proposed unit boundaries would typically be less than the tree spacing following harvest. Roads proposed for construction outside of unit boundaries would occur within stands that are less than 80 years old and habitat is not present.

3. Applicable Laws and Regulations

Design and implementation of the proposed action would conform to applicable laws, regulations and Executive Orders that include but are not limited to:

- **The Oregon and California Act of 1937:** Section 1 of the Act stipulates that suitable commercial forest lands revested by the government from the Oregon and California Railroad are to be managed for the sustained production of timber.
- **The Federal Land Policy and Management Act (FLPMA):** Section 302 at 43 U.S.C. 1732(a), directs that "The Secretary shall manage the public lands . . .in accordance with the land use plans developed by him under section 202 of this Act when they are available . . ."
- **National Historic Preservation Act, 2012 National Programmatic Agreement and 2015 Oregon State Historic Preservation Office Protocol:** Protection of resources of historic or cultural value.
- **Clean Water Act:** Section 313 and Executive Order 12088 require federal agencies with all programs and requirements for controlling water pollution from nonpoint sources.
- **Clean Air Act:** Directs federal agencies to maintain and enhance air quality.
- **The Endangered Species Act:** Section 7(a) (2) directs that each Federal agency shall, in accordance with and with the assistance of the Secretary, insure that any action authorized, funded, ort carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary to be critical.
- **Migratory Bird Treaty Act and Executive Order 13186:** Protection of migratory birds.
- **Lacey Act, Federal Noxious Weed Act and Executive Order 13112:** Minimize the risk of establishment or spread of noxious weeds and invasive non-native plants.

Chapter 2. Description of the Alternatives

This chapter describes the features of the *No Action Alternative* and the *Proposed Action Alternative* being analyzed in this EA. The *Proposed Action Alternative* analyzed in detail in this EA is summarized in Tables 1- 4 in this chapter.

A. Terminology and Definitions

There are several terms whose definitions and meanings are integral to a clear understanding of the Calapooya Creek Harvest Plan (Calapooya) Environmental Assessment. These definitions are presented below, prior to the description of the *No Action* and *Proposed Action Alternative*s. In addition, throughout this assessment, acres (or percentages of the proposed units by treatment type) are presented and discussed. These numbers are approximations based on office planning and subsequent field review. These acres and percentages may change as additional information and further field review refines the approximations.

Silvicultural Terminology

Average Stand / Modeled Stand – A forest stand that displays the simple average of trees per acre, basal area, volume, and relative density. A stand that met this average was chosen to model each prescription method, and for snag and coarse woody debris analysis. Refer to Appendix E for more information.

Minor conifer – A conifer tree species other than Douglas-fir *(Pseudotsuga menziesii).*

Prescription methods:
Two prescription methods are proposed and modeled for the Calapooya project. Six prescription types, as defined below, are incorporated into the methods in various amounts and locations. The two methods proposed for Calapooya are:

Variable Density Thinning (VDT) – A thinning method where at least two densities of trees are retained to promote stand heterogeneity. In addition, VDT includes unharvested areas or skips (e.g. no-harvest stream buffers) and may include openings (e.g. gaps). An objective of VDT is to provide conditions conducive to the initiation and growth of tree regeneration thereby encouraging the development of two-storied or multi-layered stands through development of the understory.

Variable Retention Harvest (VRH) – A form of regeneration timber harvest with the goal of establishing a complexity of future forest conditions within the treated stand through the establishment of a new cohort of trees and other vegetation while retaining legacy structures, organisms, and conditions from the pre-harvest forest stand. This harvest method includes both dispersed and aggregate retention. Dispersed retention would be applied outside of Riparian Reserves in the Calapooya project.

Prescription types:

Light Thinning – Tree density is reduced to a residual square foot of basal area of 120 with relative tree density ranging from 29 to 37. Trees per acre would range from 57 to 201 with post-harvest canopy cover generally over 60 percent.

Moderate Thinning – Tree density is reduced to a residual square foot of basal area of 80 with relative tree density ranging from 18 to 25. Trees per acre would range from 42 to134 with post-harvest canopy cover generally over 50 percent.

Heavy Thinning – Tree density is reduced to a residual square foot of basal area of 60 with relative tree density of 10 and 11. Trees per acre would range from 28 to 39 with post-harvest canopy cover over 20 percent.

Gaps – Areas where all or nearly all overstory trees are harvested. Gaps for this project range from approximately one-half to two acres in size. Gaps may contain one or more "character" trees (e.g. wolf-trees, larger than average trees, etc.), but there is no minimum number of trees required to be retained in gaps.

Skips or *Aggregate Retention* – Areas designated as reserved from harvest, i.e. "no treatment" areas. Skips and aggregate retention include various designated stream and wildlife habitat buffers and are generally more than 0.5 acres in size. Depending on harvest operability, yarding corridors may be established through designated aggregates with cut trees retained in place.

Dispersed Retention – Individual or small groups of live trees covering less than 0.25 acres, that are designated for long-term post-harvest retention to provide for living and dead structures. On average, nine green trees per acre would be retained to meet the post-harvest 6-8 green conifer tree retention requirement plus one additional green tree to provide for future snag recruitment (ROD/RMP, pp. 64, 150-151).

Relative Density (RD) – A means of describing the level of competition among trees or the site occupancy in a stand relative to some theoretical maximum based on tree size and species composition. For this project "RD" refers to Curtis relative density (Curtis 1982).

Seral Stages – The series of relatively transitory plant communities which develop during ecological succession from bare ground to the climax stage. Five stages are defined with associated age classes (ROD/RMP, p. 112).

Snag Recruitment:

Passive Recruitment – Natural mortality processes are relied upon to produce snags and down wood.

Active Recruitment – Natural mortality processes are relied upon to produce snags and down wood, plus the artificial creation of snags and down wood via girdling and falling of live trees at or soon after the time of harvest.

Two-storied or layered stands – A forest stand would be considered two-storied or layered when at least 30 percent of that stand is comprised of layered areas. Areas are considered layered when 60 percent of the vertical space from the top of the main tree canopy to the forest floor is filled with live tree crowns from *both* overstory and understory trees (i.e. a two-storied condition).

Uplands – Areas outside of the Riparian Reserve land use allocation.

Road Terminology

Road Maintenance/Renovation

Road maintenance/renovation includes road work to maintain the original design and/or bring an existing road back to its original design. Road maintenance/renovation includes work on any existing designed road that is on the land scape - not just numbered roads currently in the BLM transportation system. Indicators of a designed road include a defined cut and fill, compacted surface, rock surfacing, and/or drainage structures. In some instances, trees and other plant species may have re-vegetated the road but it would still be considered road maintenance/renovation if the planned road work would bring the road back to its original design.

The amount of effort to bring the road back to its original design can vary dramatically from road to road. Typical activities that would be associated with road maintenance/renovation include:

- cutting/removal of vegetation,
- ditch cleaning,
- surface grading,
- replacing drainage structures, and/or
- rock placement where needed, in locations where rock was included in the original design.

Typically, road maintenance/renovation that is performed by BLM personnel is referred to as "maintenance" while road maintenance/renovation performed by a timber sale purchaser or other contractor is termed "renovation".

Road Construction

Road construction includes work to build a road where a ***designed road did not exist previously***. Typical activities that would be associated with road construction include:

- cutting/removal of vegetation,
- building cut/fill slopes,
- compacting the driving surface,
- surfacing with rock (in some instances but not all) and/or
- installing drainage structures (e.g. culverts, cross-drains).

Road Decommissioning

Roads and spurs that are not needed for long-term resource management or require resource protection would be closed to vehicle traffic. Prior to closure, roads would be left in an erosion-resistant condition by applying one or more of the following:

- removal of temporary culverts and/or existing culverts where barriers would prevent culvert maintenance;
- installation of waterbars to effectively drain a rock or native road surface;
- mulching the road surface with logging slash to control erosion and deter use by off-highway vehicles;
- mulching the road surface with seed and straw mulch to control erosion where logging slash is unavailable or where future access would be necessary for noxious weed control or power line maintenance;
- blocking the road with a barrier, such as logs, a gate or a trench to prevent access.

B. No Action Alternative

The *No Action Alternative* provides a baseline for comparison with the *Proposed Action Alternative*. This alternative describes the existing condition and continuing trends anticipated in the absence of the proposal but with the implementation of other reasonably foreseeable federal and private projects.

If the *No Action Alternative* were selected there would be no harvesting of timber or treatment of the stands within the 1,245 acres of the project area at this time and there would be no revenue generated from the sale of the timber. There would be no road construction to provide access for yarding and timber hauling. Road renovation designed to reduce erosion, correct drainage deficiencies, improve water quality, and provide for user safety would not be undertaken. Decommissioning of roads surplus to long-term transportation and management needs would not occur. Road maintenance would be conducted as needed and as constrained by budgets to provide resource protection, accommodate reciprocal users, and protect the federal investment.

Selection of this alternative would not constitute a decision to re-allocate these lands to non-commodity uses. Future harvesting in this area would not be precluded and could be considered under subsequent NEPA documents.

C. Proposed Action Alternative

The Calapooya project occurs on Revested Oregon and California Railroad Lands (O&C Lands) within the GFMA, C/D, and Riparian Reserve land use allocations. The project is primarily within the Calapooya Creek Watershed where the Riparian Reserve width for fish-bearing streams would be 360 feet (two-site potential tree heights on both sides of the stream) and 180 feet for non-fish bearing streams (one-site potential tree height on both sides of the stream). Approximately 80 acres falls within the Lower North Umpqua River Watershed where the Riparian Reserve widths are the same as in Calapooya Creek. Another 80 acres falls within the Elk Creek Watershed where the Riparian Reserve width for fish-bearing streams would be 400 feet and 200 feet for non-fish bearing streams.

The *Action Alternative* proposes treatment of approximately 1,245 acres of mid-seral stands with Variable Density Thinning and Variable Retention Harvest. Thinning would occur on approximately 421 acres within GFMA, 274 acres within C/D, and 487 acres within Riparian Reserve. Variable Retention Harvest would be implemented on approximately 63 upland acres within GFMA. Approximately nine acres would be cleared for spur roads to access the treatment units, including approximately 0.8 acres outside of unit boundaries. Twenty-six harvest units in two proposed timber sales, Green Gas and Good Boyd, would provide approximately eight million board feet of timber (Appendix H, Figures 1-3).

This section describes the project design features (PDF) of the *Proposed Action Alternative*. Activities included in the *Proposed Action Alternative* are summarized in Table 1. Unit details and proposed yarding methods are shown in Table 2.

Table 1. Calapooya Proposed Action Alternative Summary.

Activity		Total Acres
Variable Density Thinning[1]	General Forest Management Area (GFMA) Connectivity/Diversity Block (C/D) Riparian Reserve (RR)	421 acres 274 acres 487 acres
Variable Retention Harvest[1]	General Forest Management Area (GFMA)	63 acres
Yarding	Cable Yarding Only Ground-based Yarding Only Combination of Cable and Ground-based Yarding	238 acres 25 acres 982 acres
Hauling	Wet or Dry Season Haul	56.39 miles
Road Activities	Road Construction Maintenance/Renovation of Existing Roads Clearing Associated with Roads Decommissioning (i.e. water bar and block)	1.79 miles 54.60 miles 9 acres 2.73 miles
Fuels Treatment	Machine Pile and Burn at Landings Hand Pile along Designated Roadways	184 acres 44.5 acres

[1]Acres – Does not include the acreage of existing roads within the unit boundaries. Acreage of proposed spurs is included

Table 2. Calapooya Unit Legal Description, Land Use Allocations, Proposed Prescriptions, and Harvest Methods.

Unit	Township-Range-Section	Unit Acres[1]	Land Use Allocation	Prescription[2]	Yarding Method(s)
7H	T25S-R03W-Sec. 7	39	Riparian Reserves; C/D	VDT	Cable
17B	T25S-R03W-Sec 17	40	Riparian Reserves; GFMA	VDT	Cable; Ground-based
17D	T25S-R03W-Sec. 17	35	Riparian Reserves; GFMA	VDT	Cable; Ground-based
19B	T25S-R03W-Sec. 19	6	Riparian Reserves; GFMA	VDT	Cable; Ground-based
29G	T25S-R03W-Sec. 29	84	Riparian Reserves (28 acres) GFMA (56 acres)	Skip VRH	Cable; Ground-based
29H	T25S-R03W-Sec. 29	10	Riparian Reserves; GFMA	VDT	Cable
33A	T25S-R03W-Sec. 33	64	Riparian Reserves; GFMA	VDT	Cable; Ground-based
23A	T25S-R04W-Sec. 23	223	Riparian Reserves; GFMA	VDT	Cable; Ground-based
25A	T25S-R04W-Sec. 25	4	C/D	VDT	Cable
Green Gas Total		**505**			
1A	T24S-R04W-Sec. 1	64	Riparian Reserves; GFMA	VDT	Cable; Ground-based
1B	T24S-R04W-Sec. 1	20	Riparian Reserves; GFMA	VDT	Cable
9C	T24S-R04W-Sec. 9	149	Riparian Reserves; C/D	VDT	Cable; Ground-based
13A	T24S-R04W-Sec. 13	23	Riparian Reserves; GFMA	VDT	Cable; Ground-based
13B	T24S-R04W-Sec. 13	7	Riparian Reserves; GFMA	VDT	Cable; Ground-based
13C	T24S-R04W-Sec. 13	43	Riparian Reserves; GFMA	VDT	Cable; Ground-based
15A	T24S-R04W-Sec. 15	25	Riparian Reserves; GFMA	VDT	Ground-based
5A	T24S-R03W-Sec. 5	11	Riparian Reserves; GFMA	VDT	Cable; Ground-based
5B	T24S-R03W-Sec. 5	42	Riparian Reserves; GFMA	VDT	Cable
7B	T24S-R03W-Sec. 7	27	Riparian Reserves; GFMA	VDT	Cable; Ground-based

Unit	Township-Range-Section	Unit Acres[1]	Land Use Allocation	Prescription[2]	Yarding Method(s)
7C	T24S-R03W-Sec. 7	57	Riparian Reserves; GFMA	VDT	Cable; Ground-based
9C	T24S-R03W-Sec. 9	63	Riparian Reserves; GFMA	VDT	Cable; Ground-based
9D	T24S-R03W-Sec. 9	25	Riparian Reserves; GFMA	VDT	Cable; Ground-based
11A	T24-R04W-Sec 11	88	Riparian Reserves (28 acres); C/D (60 acres)	Skips VDT	Cable
11B	T24-R04W-Sec 11	35	Riparian Reserve, C/D (32 acres) C/D (3 acres)	Skips Gaps Only	Cable
11C	T24-R04W-Sec 11	47	Riparian Reserve, C/D (44 acres) C/D (3 acres)	Skips Gaps Only	Cable Ground-based
17C	T24S-R03W-Sec. 17	14	Riparian Reserves (7acres) GFMA (7 acres)	VDT VRH	Cable; Ground-based
Good Boyd Total		**740**			
Calapooya Total Treatment Acres		**1,245**			

[1]Unit Acres – Does not include the acreage of existing roads within the unit boundaries. Acreage of proposed spurs is included.
[2] The prescription applies to all unit acres unless indicated otherwise by land use allocations.

1. Project Design Features

a) *Timber Harvest*

Treatment Prescription Methods and Types

The proposed project area is to be treated primarily through a VDT prescription method. Two units in the project area are proposed for treatment using the VRH prescription method. The prescription methods and types proposed for each land use allocation are shown in Table 3.

Table 3a. Prescription Methods and Types Proposed for each Land Use Allocation

Land Use Allocation	Unit Prescription Method	Prescription Types Applied
GFMA	Variable Density Thinning	Skips, light thinning and moderate thinning
	Variable Retention Harvest	Skips (aggregates) and dispersed retention
C/D	Variable Density Thinning	Skips, light thinning, moderate thinning, heavy thinning and/or gaps
Riparian Reserve	Variable Density Thinning	Skips, light and moderate thinning

The proposed Calapooya units would be treated with combinations of the six prescription types that include light, moderate and heavy thinning, dispersed retention, gaps, and skips. In GFMA units where VDT is proposed, the light prescription would be located in the uplands, the moderate prescription in the Riparian Reserves and skips along the steam channels (i.e. no-harvest buffers). In C/D units where VDT is proposed, the three thinning prescriptions would be implemented in a mosaic pattern and may include the gap prescription. Riparian Reserves that have not been previously treated would be thinned. The heavy thinning and gaps would be located in the uplands.

In GFMA where VRH is proposed, 50 percent and 56 percent of the unit acres of Units 17C and 29G, respectively, would be treated with dispersed retention located in the uplands. Unit 17C would have no aggregates located in the uplands. Approximately 11 percent of Unit 29G would be designated as aggregates in the uplands to protect soils, existing legacy features (i.e. large down wood and snags), hardwoods and minor species within northern spotted owl critical habitat.

Exceptions to these prescriptions include:

1) Unit 25A: This four acre unit in the C/D has average crown ratios of approximately 33 percent and would be treated with light thinning to maintain a higher tree density to reduce wind throw potential.
2) Units 11A, 11B, and 11C: These units are in the C/D land use allocation and have been previously thinned including the Riparian Reserves. Unit 11A would be treated using light and moderate thinning, skips and gap prescriptions in the uplands but would not incorporate heavy thinning. Units 11B and 11C would be treated with a gap prescription only, located in the uplands.

The approximate percentage of each prescription type implemented within each prescription method is shown in Table 4 along with the total of each prescription-type proposed for the Calapooya project units.

Table 3b. *Proposed Action Alternative* – Allocation of Prescription Types by LUA

Prescription Method by LUA	Percent of Unit Acres Treated by Prescription Type						
	Skip or Aggregate Retention		Light Thinning	Moderate Thinning	Heavy Thinning	Dispersed Retention	Gap
	Within RR	Outside RR					
VDT - GFMA	7%	0	63%	30%	0	0	0
VDT – C/D	20%	16%	24%	25%	10%	0	5%
Unit 17C (14 acres) **VRH – GFMA VDT – RR**	21%	0%	0%	29%	0%	50%	0%
Unit 29G (84 acres) **VRH – GFMA**	33%	11%	0%	0%	0%	56%	0%
Total Project Area	18%		46%	27%	3%	5%	1%

Variable Density Thinning

Merchantable trees in the suppressed and intermediate crown classes would be the primary targets for removal in the thinning areas, although some co-dominant and dominant trees would be removed where necessary to meet the residual relative density objective. Older remnant trees may be present, but are not the numerically predominant stand components and would generally be marked for retention. Thinning would focus on removal of intermediate and suppressed canopy layers however it is possible that some suppressed trees that are marked for cutting may be older than the prevailing stand age. Minor conifer and hardwood species would be retained to maintain stand diversity.

Approximately 18 percent of the project area is within no-harvest stream buffers and other identified skips that would not be treated. The skip prescription type would be implemented in all units in this project except Unit 25A where there is no stream buffer or other designated habitat area.

Candidate features for skips would include:

- Adjacent no-harvest stream buffers;
- Areas with low tree stocking;
- Downed wood pockets;
- Snag concentrations;
- Rock outcrops;
- Wetland/spring habitat features;
- Trees exhibiting habitat structures.

Recruitment of Snags & Coarse Woody Debris

In all land use allocations, snags would be reserved from cutting unless they are a safety concern. It is assumed that additional snags would be created by yarding damage to retention trees, and wind breakage. Where post-harvest assessments indicate a deficit in the desired numbers of snags, additional snags could be created by mechanical treatment. Snags felled for safety reasons would be retained on site as coarse woody debris.

Existing coarse woody debris in Decay Classes 3, 4, and 5 would be retained in GFMA and C/D lands, and all coarse woody debris would be retained in the Riparian Reserve.

Variable Retention Harvest

Aggregated and Dispersed Retention

Variable Retention Harvest units would be designed to retain a combination of aggregates and dispersed retention trees. The majority of the retention would be in the form of aggregates that are one-quarter acre or larger in area, while the remainder would be in the form of dispersed retention represented by scattered individual trees, or groups and clumps of trees less than one-quarter acre in size. However, the dispersed retention covers a greater percentage (56 percent) of the unit acreage than the aggregate areas (44 percent).

Aggregate retention includes various designated long-term riparian and wildlife habitat areas. Aggregates can vary in size and shape. They may be distributed throughout the stands proposed for treatment, or be located solely on key features such as streams, i.e. Riparian Reserves. Yarding corridors may be established through designated aggregates when necessary for logging operability.

Candidate areas for aggregate retention outside of Riparian Reserves would include:

- Concentrations of trees that are older and larger than the prevailing stand conditions;
- Trees with unique characteristics (e.g., deformed boles, cavities, etc.);
- Concentrations of large down wood;
- Concentrations of snags;
- Unique habitats such as seeps, rocky outcrops, and areas of unique species diversity;
- Patches dominated by hardwood trees.

Dispersed retention would focus on predominant, dominant and co-dominant trees, some of which would be expected to provide future snags and large down wood within the harvest area. Operational considerations would affect selection of dispersed retention. Candidates for dispersed retention would include but are not limited to the following:

- Legacy hardwood and conifer trees;
- Trees with unique structure;
- Trees with defect that would provide wildlife habitat or be expected to become snags in a relatively short period;
- Minor species;
- Green trees protecting snags or groups of snags;
- Trees that are expected to be long lived that would provide long-term legacy components. These trees would have high crown ratios and low height to diameter ratios.

Six to eight green conifer trees per acre would be reserved in the dispersed retention areas, averaged over the GFMA acres proposed for VRH treatment. Selection of retention trees would reflect the existing conifer species composition of the stands and full range of diameter classes greater than 20 inches diameter breast height (ROD/RMP, p. 64) if available or the largest six to eight trees per acre (ROD/RMP, p. 151). One additional green tree would be retained for snag recruitment in harvest units where there is an identified near-term snag deficit (ROD/RMP, p. 64).

Recruitment of Snags & Coarse Woody Debris

Snags within proposed VRH units would be reserved from cutting unless they are a safety concern. One additional green tree per acre would be retained in VRH units to provide for future snag recruitment. Retaining snags would contribute toward achieving the analytical assumption of providing an average of at least 1.2 snags per acre (PRMP/EIS, Chapter 4-43) to support cavity nesting birds at 40 percent of potential population levels (ROD/RMP, pp. 34-35). Protection would include establishing aggregate retention around concentrations of snags and clumping trees around individual scattered snags. It is assumed that additional snags would be created by yarding damage to retention trees, and wind breakage. Where post-harvest assessments indicate a deficit in the desired numbers of snags, additional snags would be created by mechanical treatment. Snags felled for safety reasons would be retained on site as coarse woody debris.

Existing coarse woody debris in Decay Classes 3, 4, and 5 would be retained in GFMA. At a minimum, an average of 120 linear feet per acre of large down wood in Decay Classes 1 and 2 would be provided, initially described in the ROD/RMP (p. 65) as pieces greater than or equal to 16 inches in diameter and 16 feet long. Plan maintenance in the 1997 Roseburg District Annual Program Summary (USDI, BLM 1998, p. 26) describes a range of scenarios by which this requirement may be met.

Reforestation and Stand Maintenance

Reforestation would utilize both artificial (planting) and natural regeneration. Planting would use a mixture of species planted at a rate per acre to meet BLM reforestation goals for future timber harvest. Douglas-fir would be the primary species planted, using genetically improved nursery stock where available. Minor species would be planted and could range up to 20 percent depending on natural occurrence on-site and when the planting stock is available (ROD/RMP, pp. 63, 152). The composition of natural regeneration would depend on tree species adjacent to harvested areas, species mix of retention trees, seed bed conditions, timing and abundance of seed crops, seed predation, and weather conditions.

Treatments to maintain the survival and long-term dominance of tree species would include mulching to reduce competition from grasses primarily on drier south and west aspects, protection from herbivory (browsing), and conifer release from competing shrubs and hardwoods. The necessary treatments and their timing would be determined through evaluation exams conducted over the first 15 years following harvest.

b) ***Riparian Reserves***

Riparian Reserves would be established based on a site-potential tree height calculated from the average site index of inventory plots located on lands capable of supporting commercial timber stands throughout each watershed. The calculated site-potential tree height for the Calapooya Creek and Lower North Umpqua River watersheds is 180 feet and for the Elk Creek watershed is 200 feet.

On intermittent and perennial non-fish-bearing streams, Riparian Reserves would be one site-potential tree height in width, slope distance, measured from the top of the stream bank. On all fish-bearing streams, perennial or intermittent, Riparian Reserves would be two site-potential tree heights in width, slope distance, measured from the top of the stream bank. On wetlands greater than one-acre in size, Riparian Reserves would be one site-potential tree height in width; measured from the outer edge of riparian vegetation, or the extent of seasonally saturated soils. For natural ponds, Riparian Reserves would be two site potential trees (ROD/RMP; p. 24).

c) ***Stream Buffers***

Fish-bearing streams

A "no-harvest"buffer extending 100 feet (slope distance) on either side of the edge of the stream channel, as measured from the ordinary high water line for fish-bearing streams, would exclude thinning immediately adjacent to streams.

Perennial Streams

A "no-harvest" buffer extending 60 feet (slope distance) on either side from the edge of the stream channel, as measured from the ordinary high water line for perennial streams, would exclude thinning immediately adjacent to streams.

Intermittent Streams

A "no-harvest" buffer extending 35 feet (slope distance) on either side from the edge of the stream channel, as measured from the ordinary high water line for intermittent streams, would exclude thinning immediately adjacent to streams.

d) ***Timber Cruising***

Timber in the proposed units would be cruised using one or more approved BLM cruise methods. Sale volumes are calculated in 16-foot log lengths (East Side Scribner).

Additional timber would potentially be included as a modification to this project. These additions would be limited to the removal of individual trees or small groups of trees that are blown down, a safety hazard, or needed to facilitate the proposed action. Historically, this addition has been less than ten percent of the estimated sale quantity.

e) ***Timber Yarding***

Skyline cable and ground-based yarding would be used to remove timber from the proposed units. In the areas designated for cable-yarding, up to 10 acres of incidental ground-based yarding may occur to access small isolated portions of cable units near roads where cable yarding is not practical.

Cable Yarding

Cable logging systems that limit ground disturbance would be used to obtain partial or full log suspension (ROD/RMP; p. 130). Intermediate supports would be used as necessary to obtain partial suspension at slope breaks. Where excessive soil furrowing occurs, it would be hand waterbarred and filled with limbs or other organic debris to control surface soil erosion in disturbed areas. Cable yarding would require full suspension over streams to the greatest extent practicable. At least 75 feet of lateral yarding capability would be required of cable equipment, with average spacing of 150 feet between cable corridors, whenever practicable, to reduce the number of yarding corridors and landings, and the amount of soil disturbance.

Occasionally, trees selected for use as tailholds or guyline anchors may be located outside of proposed thinning units. To the extent possible, trees with northern spotted owl suitable nesting structure would be avoided when selecting anchor trees. Contract provisions require written approval before attaching logging equipment to a tailhold tree in the timber reserve area and precautions would be taken to protect the tree from damage. Protective measures could include tree plates, straps, or synthetic rope, where possible, and minimal notching (less than half the tree diameter) where necessary. Guyline trees are generally cut because they are located in the vicinity of cable yarding equipment and subject to state safety regulations. Anchor trees that are felled for safety reasons may be harvested or left as coarse woody debris at the discretion of the government's contract administrator.

Ground-Based Yarding

Ground-based yarding would not be allowed during the wet season (i.e. typically October 15 to July 15, depending on weather conditions), unless waived by the authorized officer. If soil moisture levels would cause the amount of compaction and soil displacement to exceed ten percent or more of the ground-based area (including landings, log decks, and trails), operations would be suspended during unseasonably wet weather in the dry season. The soil scientist and the authorized officer would monitor soil moisture, compaction and displacement to determine when operations may need to be suspended. No ground-based yarding would occur in or through the no-harvest buffers.

Ground-based yarding equipment would generally be limited to slopes less than 35 percent (2001 Plan Maintenance; 2010 APS, pp. 52-54). Operations on steeper pitches between benches could be authorized where appropriate. Landings (including log deck areas and equipment areas), skid trails, and large slash piles would be located so that less than approximately ten percent of the ground-based harvest area would be affected.

Ground-based equipment would be confined to designated skid trails and would re-use existing skid trails as much as practical. Skid trails would be spaced, on average, at least 150 feet apart. In addition, machines used for ground-based logging would be limited to a track width no greater than 12 feet. Harvester-forwarder and shovel systems would be required to walk over as much slash as can safely be negotiated. Forwarder trails would be designated. Shovel systems would avoid making more than one pass in swinging logs and piling slash to roads or designated trails.

All compacted skid trails would be subsoiled in dispersed retention areas which would be considered a final harvest entry (ROD/RMP 1995, p. 62). Main skid trails and landings would be subsoiled if deemed necessary in thinning units. A main skid trail is defined as a trail in which duff and slash are displaced such that 50 percent or more of the trail surface area is exposed to mineral soil. Logging slash would be placed over subsoiled areas, to replace some of the displaced duff and surface soil organic matter. Any main skid trails that are not subsoiled in Calapooya thinning units would be mapped for later evaluation of subsoiling needs.

f) ***Timber Hauling***

The proposed project would include dry and wet season timber hauling. Sediment reducing measures (e.g., placement of straw bales, silt fences, or sediment filters) would be implemented near stream crossings, if necessary, to prevent sediment from reaching the streams prior to wet season (generally, mid-October through mid-May) haul on surfaced roads. Timber hauling would be suspended during wet weather if road run-off would deliver sediment at higher concentrations than existing conditions to the receiving stream or to prevent damage to the road.

Dust abatement measures would be used on roads, when needed, during BLM timber harvest operations or other BLM commodity hauling activity (ROD/RMP; p. 35).

g) ***Road Activities***

The Calapooya project is within GFMA and it is anticipated that roads constructed for this project would be used for future harvest operations. The project would include dry and wet season logging activities and use existing roads to the greatest extent practical. Road construction is intended to move landings off of roads that are heavily traveled to avoid user conflict, or to access landing locations that provide for environmentally responsible yarding. Roads and landings would be located on geologically stable locations; e.g., ridge tops, stable benches or flats, and gentle-to-moderate side-slopes (ROD/RMP; p. 132). Roads and spurs would be designed no wider than needed for the specific use to minimize soil disturbance (ROD/RMP; p. 132), generally, with a 14 foot-wide road surface and an average road clearing width of 40 feet. However, road shoulders, landings, vehicle turnouts, and curve widening could result in road clearing as wide as 60 feet.

Road construction, renovation, overwintering, and decommissioning would be restricted to the dry season (normally May 15 to October 15). The operating season would be adjusted if unseasonable dry or wet conditions occur outside of this seasonal restriction (e.g. an extended dry season beyond October 15 or wet season beyond May 15). In-stream work and culvert installation would be limited to periods of low or no flow, generally between July 1 and September 15. New cut and fill slopes would be mulched with weed-free straw, or equivalent, and seeded with a native or sterile hybrid mix.

There would be approximately 55 miles of road maintenance/renovation, including 1.44 miles of existing spur roads, and 1.79 miles of new road construction (Tables 4a and 4b). Construction of Spur GGc is proposed in order to reconnect Units 17B and 17D to the existing road network within Section 17, T. 25 S. R. 3 W. (Appendix H, Figure 2). The previous access route, the 25-4-12.0 road, is located adjacent to a fish-bearing stream and has become naturally decommissioned in Section 18, T. 25 S. R. 3 W. Renovation of this road was deemed economically and environmentally unviable due to the need to reestablish several crossings over a major fish-bearing stream. Another route into these units that was proposed during project initiation was also determined to be unviable due to steep slopes and soil impacts.

Approximately 2.7 miles of new and existing spurs would be decommissioned after harvest operations are completed (Tables 4a and 4b). Road decommissioning would include one or more of the following activities: installing water bars, mulching with logging slash where available (or with straw if logging slash is not available), and blocking with trench barriers or logging slash. The proposed decommissioning for specific roads is presented in Tables 4a and 4b. Actual decommissioning may be subject to agreement by holders of reciprocal rights-of-way, easements, or other legal interests.

Table 4a. Green Gas Roads and Spurs

Road No.	Construction		Maintenance/ Renovation (miles)	Surfacing		Season of Haul	Decommissioning	
	Length (miles)	Within Riparian Reserve (feet)		Existing	Proposed		Length (miles)	Method
25-3-17.0[1]			0.30	Rock	Rock	Wet/Dry		
25-3-18.0[1]			2.14	Rock	Rock	Wet/Dry		
25-3-20.0[1]			0.38	Rock	Rock	Wet/Dry		
25-3-29.1			0.52	Rock	Rock	Wet/Dry		
25-3-29.14			0.12	Native	Rock	Wet/Dry		
25-3-29.17			0.14	Rock	Rock	Wet/Dry		
25-3-29.2			0.21	Rock	Rock	Wet/Dry		
25-3-29.2			0.08	Native	Rock	Wet/Dry		
25-3-29.4			0.28	Rock	Rock	Wet/Dry		
25-3-29.4			0.20	Native	Rock	Wet/Dry		
25-3-29.6			0.09	Native	Rock	Wet/Dry		
25-3-29.9			0.54	Native	Rock	Wet/Dry		
25-3-33.1			0.74	Rock	Rock	Wet/Dry		
25-3-7.0			0.80	Rock	Rock	Wet/Dry		
25-3-7.1			0.95	Rock	Rock	Wet/Dry		
25-3-8.2			0.14	Rock	Rock	Wet/Dry		
25-4-12.0			0.78	Rock	Rock	Wet/Dry		
25-4-12.0[1]			0.60	Native	Rock	Wet/Dry		
25-4-12.1			7.97	Rock	Rock	Wet/Dry		
25-4-13.0			3.00	Rock	Rock	Wet/Dry		
25-4-14.0			1.00	Native	Rock	Wet/Dry		
25-4-14.0			0.72	Rock	Rock	Wet/Dry		
24-4-2.0[1]			2.61	Rock	Rock	Wet/Dry		
25-4-23.1			0.29	Native	Rock	Wet/Dry		
Spur GG a	0.15		0	None	Rock	Wet/Dry	0.15	Block, Water bar
Spur GG b	0.05		0	None	Rock	Wet/Dry	0.05	Block, Water bar
Spur GG c[1]	0.50	1200	0	None	Rock	Wet/Dry		
Spur GG d	0	0	0.16	Native	Rock	Wet/Dry	0.16	Block, Water bar
Spur GG e	0	0	0.05	Native	Rock	Wet/Dry	0.05	Block, Water bar
Spur GG f	0.07	0	0	None	Rock	Wet/Dry	0.07	Block, Water bar
Spur GG g	0.07	0	0	None	Rock	Wet/Dry	0.07	Block, Water bar
Spur GG h	0.05	0	0	None	Rock	Wet/Dry	0.05	Block, Water bar
Total	**0.89**	**1200**	**24.81**				**0.60**	

[1] Gated Road- No public access

Table 4b. Good Boyd Roads and Spurs

Road No.	Construction		Maintenance/ Renovation (miles)	Surfacing		Season of Haul	Decommissioning	
	Length (miles)	Within Riparian Reserve (feet)		Existing	Proposed		Length (miles)	Method
23-4-36.0			0.20	Rock	Rock	Wet/Dry		
24-3-5.1[1]			0.83	Native	Rock	Wet/Dry		
24-3-5.3[1]			2.30	Rock	Rock	Wet/Dry		
24-3-7.0			3.44	Rock	Rock	Wet/Dry		
24-3-7.1			0.30	Rock	Rock	Wet/Dry		
24-3-7.2			0.23	Native	Rock	Wet/Dry		
24-3-8.0[1]			0.64	Native	Rock	Wet/Dry		
24-3-8.1[1]			0.31	Native	Rock	Wet/Dry		
24-3-16.0[1]			0.50	Rock	Rock	Wet/Dry		
24-3-20.0[1]			0.20	Rock	Rock	Wet/Dry		
24-3-20.3			1.30	Rock	Rock	Wet/Dry		
24-3-21.0[1]			2.65	Rock	Rock	Wet/Dry		
24-4-1.6			0.12	Rock	Rock	Wet/Dry		
24-4-9.1			0.31	Rock	Rock	Wet/Dry		
24-4-9.2			0.19	Rock	Rock	Wet/Dry		
24-4-9.5			0.15	Rock	Rock	Wet/Dry		
24-4-9.6			0.30	Rock	Rock	Wet/Dry		
24-4-11.0			0.31	Rock	Rock	Wet/Dry		
24-4-11.0			0.09	Native	Rock	Wet/Dry		
24-4-11.2			0.40	Rock	Rock	Wet/Dry		
24-4-11.4			0.19	Rock	Rock	Wet/Dry		
24-4-11.7			0.14	Rock	Rock	Wet/Dry		
24-4-13.0			1.59	Rock	Rock	Wet/Dry		
24-4-13.0			0.22	Native	Rock	Wet/Dry		
24-4-13.1			0.40	Rock	Rock	Wet/Dry		
24-4-13.2			0.10	Rock	Rock	Wet/Dry		
24-4-13.3			0.10	Rock	Rock	Wet/Dry		
24-4-14.1			1.77	Rock	Rock	Wet/Dry		
24-4-15.0			0.96	Native	Rock	Wet/Dry		
24-4-22.0[1]			4.62	Rock	Rock	Wet/Dry		
24-4-23.0			3.60	Rock	Rock	Wet/Dry		
24-4-23.0			0.10	Native	Rock	Wet/Dry		
Spur GB a	0.11		0.12	Native	Rock	Wet/Dry	0.23	Block, Water bar
Spur GB b	0.19		0	None	Rock	Wet/Dry	0.19	Block, Water bar
Spur GB c	0.10		0	None	Rock	Wet/Dry	0.10	Block, Water bar
Spur GB d	0.10	30	0	None	Rock	Wet/Dry	0.10	Block, Water bar

Road No.	Construction		Maintenance/ Renovation (miles)	Surfacing		Season of Haul	Decommissioning	
	Length (miles)	Within Riparian Reserve (feet)		Existing	Proposed		Length (miles)	Method
Spur GB e	0	0	0.20	Rock	Rock	Wet/Dry	0.20	Block, Water bar
Spur GB f	0	0	0.30	Rock	Rock	Wet/Dry	0.30	Block, Water bar
Spur GB g	0	0	0.05	Native	Rock	Wet/Dry	0.05	Block, Water bar
Spur GB h	0.05	0	0	None	Rock	Wet/Dry	0.05	Block, Water bar
Spur GB i	0.05	0	0	None	Rock	Wet/Dry	0.05	Block, Water bar
Spur GB j	0	0	0.23	Native	Rock	Wet/Dry	0.23	Block, Water bar
Spur GB k	0	0	0.10	Native	Rock	Wet/Dry	0.10	Block, Water bar
Spur GB l	0	0	0.18	Rock	Rock	Wet/Dry	0.18	Block, Water bar
Spur GB m[1]	0.10	50	0	None	Rock	Wet/Dry	0.10	Block, Water bar
Spur GB n[1]	0.10	0	0	None	Rock	Wet/Dry	0.10	Block, Water bar
Spur GB o[1]	0	0	0.05	Native	Rock	Wet/Dry	0.05	Block, Water bar
Spur GB p[1]	0.05	0	0	None	Rock	Wet/Dry	0.05	Block, Water bar
Spur GB q[1]	0.05	0	0	None	Rock	Wet/Dry	0.05	Block, Water bar
Total	**0.9**	**80**	**29.79**				**2.13**	

[1] Gated Road- No public access

h) ***Winterization***

Natural surfaced roads, not decommissioned prior to the wet season, would be winterized. Winterization would include: installation of waterbars, mulching the running surface within 100 feet of streams with weed-free straw, and blocking to prevent access.

i) ***Sediment Control Plan***

Best Management Practices (BMPs) would be applied during road construction, renovation, and decommissioning. "Best Management Practices are the primary mechanism to prevent and control to the 'maximum extent practicable' nonpoint source pollution and achieve Oregon water quality standards" (1995 ROD/RMP, p. 129).

The Bureau of Land Management fulfills the requirement for Federal agencies to comply with all State requirements and programs to control water pollution from nonpoint sources (per Clean Water Act Section 313 and Executive Order 12088) by implementing Best Management Practices (1995 ROD/RMP, p. 129).

To minimize or prevent sediment delivery to streams and comply with the Clean Water Act of 1972 and its revisions, the following BMPs would be incorporated in to project design. Implementing these BMPs, and others found in the 2011 Roseburg District Annual Program Summary (pp 71-88) would disconnect road surfaces from drainage ditches to minimize or reduce the conveyance and delivery of sediment to the waters of the United States.

In the 2011 Roseburg District Annual Program Summary, updated BMPs that would disconnect road surfaces from drainage ditches were incorporated as plan maintenance. It is not intended that all of the BMPs listed would be selected for any specific management action. Each activity is unique, based on site-specific conditions and the selection of an individual BMP or a combination of BMPs and measures to become the BMP design. Some of the more common BMPs for disconnecting road related sediment delivery are listed below:

- Disconnect road runoff to the stream channel by outsloping the road approach. If outsloping is not possible, use runoff control, erosion control and sediment containment measures. These may include using additional cross drain culverts, ditch lining, and catchment basins. Minimize ditch flow conveyance to streams by placing cross drains above stream crossings.
- Locate cross drains to prevent or minimize runoff and sediment delivery to wetlands, riparian management areas, floodplains, and waters of the state. Implement sediment reduction techniques, such as settling basins, brush filters, sediment fences, or check dams to prevent or minimize sediment delivery.
- Space cross drain culverts at intervals sufficient to prevent water volume concentration and accelerated ditch erosion.
- Install underdrain structures when roads cross or expose springs, seeps, or wet areas rather than allowing intercepted water to flow in ditchlines.
- Effectively drain the road surface by using crowning, insloping, outsloping, grade reversals (rolling dips), waterbars, or a combination of these methods. Avoid concentrated discharge onto fill slopes unless the fill slopes are stable and non-erodible.
- Locate surface water drainage measures (e.g. cross drain culverts, rolling dips, or water bars) where water flow would be released on convex slopes or other stable and non-erodible areas that would absorb road drainage and prevent sediment flows from reaching wetlands, floodplains, and waters of the state. Where possible, locate surface water drainage structures above road segments with steeper downhill grades.
- Discharge cross drain culverts at ground level on non-erodible material. Install downspout structures or energy dissipaters at cross drain outlets or drivable dips where water is discharged onto loose material, erodible soils, fills, or steep slopes.
- Use slotted risers or over-sized culverts, or build catch basins where floatable debris or sediment may plug cross drain culverts.
- Prior to the wet season, provide effective road surface drainage by machine cleaning ditches, blading surfaces including berm removal, constructing sediment barriers, and cleaning inlets and outlets.
- Avoid undercutting cut-slopes when cleaning ditchlines. Retain ground cover in ditchlines, except where sediment deposition or other obstructions require maintenance.
- Avoid fragile and unstable areas or plan appropriate mitigation measures.
- Manage road construction so that any construction can be completed and bare soil protected and stabilized prior to fall rains. Apply native seed and certified weed free mulch to cut and fill slopes, ditchlines, and waste disposal sites with the potential for sediment delivery to wetlands, riparian management areas, floodplains, and waters of the state. Apply upon completion of construction or as early as possible to increase germination and growth. Reseed if necessary to accomplish erosion control. Select seed species that are fast growing, have adequate germination, and provide ample ground cover and soil-binding properties. Apply mulch that would stay in place and at site specific rates to prevent erosion.
- Inspect and maintain culvert inlets and outlets, drainage structures, and ditches before and during the wet season to diminish the possibility of plugged culverts and washouts.
- On roads being hauled on during the wet season, use durable rock surfacing with sufficient surface depth to resist rutting or the development of sediment on roads that drain directly to wetlands, floodplains, or waters of the state.

- Suspend commercial use when the road surface is rutted, covered by a layer of mud, or runoff from the road surface is causing a visible increase in stream turbidity.
- Do not allow wet season haul on natural surface roads or sediment producing surfaced roads without practicable and effective mitigation.

j) ***Noxious Weeds***

Manual, mechanical, or chemical treatments would be used to manage invasive plant infestations. Existing infestations of Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), and English hawthorn (*Crataegus monogyna)* would be treated prior to road renovation or construction and harvest operations. Spur roads would remain open following completion of harvest operations if it is determined that access is necessary for ongoing treatment of noxious weeds. Roads would be closed as shown in Tables 4a and 4b when control of the noxious weeds is completed.

Logging and road construction equipment would be cleaned, with a pressure washer, and free of weed seed prior to entering BLM lands (BLM Manual 9015-Integrated Weed Management). If equipment is removed from the contract area, re-cleaning and inspection would be required prior to re-entry on to BLM lands.

k) ***Cultural Resources***

If any cultural resources (e.g. historic or prehistoric objects, features, or structures) are found during the implementation of the proposed action, operations would be suspended until the site has been evaluated to determine its significance and the appropriate mitigation action that would be applied.

l) ***Fuels Treatment***

Logging slash at landings would be machine-piled and burned, where necessary, to reduce the risk of potential future fire damage to the thinned stands. In addition, slash between 3-6 inches in diameter would be hand piled, covered, and burned along select roadways. Estimates of these treatment acres by harvest unit are presented in Table 5.

Table 5. Hand-piling and Machine-piling of Activity Fuels in Calapooya.

Sale	Unit	Township-Range-Section	Acres	Hand-Pile[1] (acres)	Machine-Pile[2] (acres)
Green Gas	17B	T25S-R03W-Sec. 17	40	0	5
	17D	T25S-R03W-Sec. 17	35	0.5	4
	19B	T25S-R03W-Sec. 19	6	2	2
	29G	T25S-R03W-Sec. 29	84	7	7
	29H	T25S-R03W-Sec. 29	10	0	0
	33A	T25S-R03W-Sec. 33	64	2	2
	7H	T25S-R03W-Sec. 7	39	1	4
	23A	T25S-R04W-Sec. 23	223	32	29
	25A	T25S-R04W-Sec. 25	4	0	1
	SUB-TOTAL		**505**	**44.5**	**54**

Sale	Unit	Township-Range-Section	Acres	Hand-Pile[1] (acres)	Machine-Pile[2] (acres)
Good Boyd	17C	T24S-R03W-Sec. 17	14	0	2
	5A	T24S-R03W-Sec. 5	11	0	2
	5B	T24S-R03W-Sec. 5	42	0	3
	7B	T24S-R03W-Sec. 7	27	0	2
	7C	T24S-R03W-Sec. 7	57	0	7
	9C	T24S-R03W-Sec. 9	63	0	10
	9D	T24S-R03W-Sec. 9	25	0	4
	11A	T24S-R04W-Sec. 11	88	0	10
	11B	T24S-R04W-Sec. 11	35	0	3
	11C	T24S-R04W-Sec. 11	47	0	3
	13A	T24S-R04W-Sec. 13	23	0	4
	13B	T24S-R04W-Sec. 13	7	0	1
	13C	T24S-R04W-Sec. 13	43	0	8
	15A	T24S-R04W-Sec. 15	25	0	5
	1A	T24S-R04W-Sec. 1	64	0	14
	1B	T24S-R04W-Sec. 1	20	0	5
	9C	T24S-R04W-Sec. 9	149	0	29
	SUB-TOTAL		740	**0**	**112**
	CALAPOOYA TOTAL		**1,245**	**44.5**	**166**

[1]Hand-Piling: acreage was calculated by multiplying the length of road segment (in feet) by the width of treatment (50 feet) = square feet which was then converted to acres.
[2]Machine-Piling: acreage was calculated by assuming piles would be created along roads approximately 100 feet apart and measure approximately 0.1 acres each.

m) ***Air Quality***

All prescribed burning would have an approved "Burn Plan" and be conducted under the requirements of the Oregon Smoke Management Plan in a manner consistent with the requirements of the Clean Air Act (Oregon Department of Environmental Quality and Oregon Department of Forestry 1992). Slash would be burned during the late-fall to mid-spring season when the soil, duff layer (soil surface layer consisting of fine organic material), and large down log moisture levels are high and atmospheric conditions are conducive to smoke dispersion and particulate removal.

n) ***Special Status Plants and Animals***

Federally listed (Threatened or Endangered), or proposed, plants and animals and their habitats would be managed to achieve their recovery in compliance with the Endangered Species Act, approved recovery plans, and Bureau Special Status Species policies (1995 ROD/RMP, p. 41). Bureau Sensitive species and their habitats would be managed so as not to contribute to the need to list, and to recover the species (1995 ROD/RMP, p. 41). If during implementation of the proposed action, any Special Status Species are found that were not discovered during pre-disturbance surveys; operations would be suspended as necessary and appropriate protective measures would be implemented before operations would be resumed.

Northern Spotted Owl

Suitable northern spotted owl *(Strix occidentalis caurina)* habitat is adjacent to seven of the nine Green Gas units and 11 of the 17 Good Boyd units (Appendix H, Figure 8). To minimize disturbance impacts to nesting spotted owls and alleviate the need for seasonal restrictions in areas where owls are not present during implementation of timber harvest activities, at least two-years of spotted owl protocol surveys have been completed; surveys are expected to continue as funding allows.

Based on current (2014) protocol survey data (USDI/USFWS), there are five spotted owl sites located in contiguous suitable habitat adjacent to harvest units. However as of 2014, there are no active northern spotted owl activity centers within the 65 yard disruption threshold for harvest activities. Although activity centers are located outside of the disruption distance thresholds (e.g. 65 yards for chainsaws, 35 yards for heavy equipment), *seasonal restrictions would apply for harvest operations occurring within the disruption distances of occupied stands adjacent to units (by either a pair or resident single spotted owl) during the northern spotted owl critical breeding season (March 1-July 15),* until protocol surveys or "spot check" surveys have been completed to determine the current location of nesting owls. If pre-project clearance surveys detected barred owls, but did not detect spotted owls, spot checks would be required and may occur concurrently with harvest activities occurring in units adjacent to stands of suitable habitat being surveyed (USDI/USFWS 2012).

Prescribed burning in Calapooya Units would be subject to seasonal restrictions during the critical breeding period (March 1- July 15) if surveys determine that suitable habitat adjacent to units is occupied by northern spotted owls. There is currently one known northern spotted owl site (Field Creek, IDNO 2202B) located within 440 yards (0.25 mile) of Units 7H and 17B that would require restrictions for prescribed burning. In subsequent years, the outcome of protocol surveys or spot checks would determine where seasonal restrictions would be required during the critical breeding period.

Seasonal restrictions may be waived until March 1 of the following year if current calendar year surveys indicate: 1) spotted owls not detected, 2) spotted owls present, but not attempting to nest, or 3) spotted owls present, but nesting attempt has failed. Based on current survey results, the proposed units that would be affected by seasonal restrictions are shown in Table 6. Units requiring seasonal restrictions are subject to change based on future survey results.

Table 6. Northern Spotted Owl Seasonal Restrictions for Proposed Calapooya Units[1].

Green Gas Units																	
ACTIVITY	**7H**	**17B**	**17D**	**19B**	**29G**	**29H**	**33A**	**23A**	**25A**								
Harvest Operations	Yes[1]	Yes[1]	Yes[1]	No	No	No	Yes[1]	Yes[1]	No								
Prescribed Burning	Yes[1]	Yes[1]	Yes[1]	No	No	No	Yes[1]	Yes[1]	No								
Good Boyd Units																	
ACTIVITY	**1A**	**1B**	**9C**	**13A**	**13B**	**13C**	**15A**	**5A**	**5B**	**7B**	**7C**	**9C**	**9D**	**11A**	**11B**	**11C**	**17C**
Harvest Operations	Yes[1]	No	No	No	No	Yes[1]	No	No	No	No	Yes[1]	No	No	Yes[1]	No	Yes[1]	No
Prescribed Burning	Yes[1]	No	No	Yes[1]	No	No	No	No	No	No	Yes[1]	No	No	Yes[1]	No	No	No

1. "Yes" indicates that these units would require seasonal restrictions in subsequent years, and the outcome of protocol surveys or spot check surveys would determine where seasonal restrictions would be required during the critical breeding period.

Bald Eagle

There is a known bald eagle *(Halieaeetus leucocephalus)* nest site approximately 0.4 miles south of Unit 25A. To avoid disturbance to the known bald eagle nesting territory during the breeding season, seasonal restrictions would typically be implemented within 0.5 miles line-of-sight of the nest site from January 1 through August 31, both days inclusive. However, based on GIS analysis and the location of the known nest trees, the topography provides a visual barrier between nest trees and harvest units such that seasonal restrictions would not be required for this proposed project.

Based on numerous observations of bald eagles during the 2014 bald eagle breeding season and the presence of suitable nesting habitat along the major streams (i.e. Coon Creek, Calapooya Creek and Gassy Creek) and near reservoirs in the area, it is suspected that there may be additional bald eagle nest sites within the vicinity of the Calapooya project. Surveys are planned for 2015 to determine if there are other nest sites within the project area. Seasonal restrictions would be implemented for any new nest site located within 0.25 miles or 0.5 miles line-of-sight of a proposed timber sale unit.

o) *Survey & Manage Terrestrial Wildlife*

Great Gray Owl

A large owl species, originally suspected to be a great gray owl *(Strix nebulosa),* was observed within Unit 17C. First year pre-disturbance surveys have been completed and a great horned owl was detected in 2014. Another year of surveys is planned to be completed in 2015 to verify species and determine nesting status. Identified great gray owl nest sites would be protected by providing a no-harvest buffer of 300 feet around meadows and natural openings and establishing a quarter-mile protection zone around the nest site (ROD/RMP, p. 44).

If surveys verify a nesting pair of great horned owls, the nest tree would be buffered with a minimum of five acres. Either owl species would require a disturbance restriction during the breeding season, February 1 through September 30, both days inclusive. Seasonal restrictions may be waived until February 1st of the following year if current calendar year surveys indicate: 1) owls not detected; 2) owls present, but not attempting to nest; or 3) owls present, but nesting attempt has failed.

Mollusks

Surveys for the **Oregon Shoulderband** *(Helminthoglypta hertleini)* snail are being conducted in stands where surveys are required under Survey and Manage Program guidance (Duncan *et al.* 2003). Known sites of this species would be protected by retaining habitat features and environmental conditions by following existing Conservation Assessment guidelines (Duncan 2004a; Duncan 2004b, Duncan 2005).

D. Alternatives Considered but Not Analyzed in Detail

Additional Calapooya Acres

An alternative was considered that included approximately 139 additional acres of forest stands and 0.7 miles of haul route roads that were part of the original Calapooya project area but were deferred from further analysis for the following reasons:

- Proposed VRH Units 17A (19 acres), 17B (12 acres) and 15B (51 acres) were determined to be RA-32 habitat by BLM staff wildlife biologists and would not be treated to be consistent with recommendations of Recovery Action 32 of the Northern Spotted Owl Recovery Plan (USFWS 2012).
- Proposed VDT Unit 29C (17 acres) was dropped due to soil stability concerns.
- Approximately 40 acres of proposed Unit 23A were determined to be northern spotted owl suitable habitat and would not be treated at this time.
- Approximately 0.7 miles of proposed haul route in Units 9C and 7B were dropped from the project due to soil and hydrology concerns. The haul route and logging systems were modified to reduce impacts to resources.

Helicopter Yarding

Comments on other environmental assessments for timber harvest have suggested that the BLM should consider helicopter yarding as an alternative to any road construction or renovation. This is not considered a reasonable alternative and was not analyzed for the following reasons:

- Primary road access to the units already exists. Proposed road construction would be principally located within unit boundaries allowing landings to be moved off of through-roads and/or placed in areas that provide adequate reach and deflection for environmentally responsible yarding;
- Using representative appraisal criteria, helicopter yarding would be three to four times more expensive than traditional cable yarding or ground-based harvest methods, and would make harvest economically unviable;

E. Resources Considered but Not Analyzed in Detail

1. Resources Not in Project Area

The following resources or concerns are not present and would not be affected by either of the alternatives: Areas of Critical Environmental Concern (ACECs), Research Natural Areas (RNAs), prime or unique farm lands, floodplains/wetlands, solid or hazardous waste, developed recreation sites, Wild and Scenic Rivers, Wilderness, and Lands with Wilderness Characteristics.

The proposed action is consistent with Executive Order 12898, which addresses Environmental Justice in minority and low-income populations. The BLM has not identified any potential impacts to low-income or minority populations, either internally or through the public involvement process. No Native American religious concerns were identified by the interdisciplinary team or through correspondence with local tribal governments.

There are currently no energy transmission, transport facilities, utility rights-of-way, and/or energy resources with commercial potential in proximity to any of the proposed units.

2. Cultural Resources

Cultural resource inventories within proposed harvest units and locations of proposed road construction are complete. These efforts are documented in CRS# 18809, 18810, 18908, 19212, 19216, MS9409, SW0010, SW0203, SW0204, SW0905, SW1403, SW1404, SW9803, and SW9911. The most recent surveys identified two previously undocumented sites including OR-10-326 and OR-10-327. Site OR-10-326 is located outside of the project area and would not be impacted by proposed actions. Site OR-10-327 is a historic trail, in use in modern times, with no historic integrity. This site, which runs through the proposed project area, is not eligible for listing on the National Register of Historic Places and would not be managed for conservation. Ultimately, the proposed Calapooya project would have no impact on documented historic properties.

Any cultural resources that are located in future surveys or during project implementation would be appropriately managed either through avoidance or mitigation. In this way, no cultural resources would be affected by this project. Consequently, the BLM is in compliance with Section 106 of the National Historic Preservation Act under the guidance of the 2012 National Programmatic Agreement and the 2015 Oregon Protocol. In accordance with BLM policy and legal requirements, the locations of these sites are not disclosed in public documents in order to diminish the potential for violations of the Archaeological Resources Protection Act.

3. Visual Resource Management

The objective of Visual Resource Management (VRM) is to manage public lands in a manner which would protect the quality of the scenic (visual) values of these lands (USDI/BLM 1984). Visual Resource Management includes an inventory of all District lands and their corresponding management level classes, which are ranked I through IV. The objective of VRM Class IV is to "provide for management activities which require major modifications to the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention." (USDI/BLM 1986a; p. 7). All of the proposed units in the Calapooya Creek project are within VRM Class IV and the proposed timber harvest would result in a high level of visual modification as allowed for on these lands (ROD/RMP 1995, p. 53).

4. Recreation

Recreational use of the area includes hunting, forest product gathering, target shooting, back country driving, and off highway vehicle (OHV) use. While timber harvest may temporarily impact the public's ability to recreate in the area, there would be no long term impacts to the availability of existing recreational opportunities in the project area. The use of OHVs is limited to existing roads and trails (ROD/RMP 1995, p. 58) and this project does not authorize any additional OHV use. Proposed timber management activities would not measurably impair or interfere with recreation opportunities in the analysis area because this EA does not propose changes to the recreation objectives or opportunities detailed in the 1995 ROD/RMP (pp.55-58). Although some areas may be temporarily unavailable, no long-term changes would occur.

Chapter 3. Affected Environment & Environmental Consequences

This chapter discusses the current condition of the specific resources potentially affected by the alternatives and the direct, indirect and cumulative environmental effects of the proposed action over time. This discussion is organized by individual resource and provides the basis for comparison of the effects between alternatives.

The Council on Environmental Quality (CEQ) provided guidance on June 24, 2005, as to the extent to which agencies of the Federal government are required to analyze the environmental effects of past actions when describing the cumulative environmental effect of a proposed action in accordance with Section 102 of the National Environmental Policy Act (NEPA). CEQ noted the "[e]nvironmental analysis required under NEPA is forward-looking," and "[r]eview of past actions is only required to the extent that this review informs agency decisionmaking regarding the proposed action." This is because a description of the current state of the environment inherently includes effects of past actions. Guidance further states that "[g]enerally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historic details of individual past actions."

The cumulative effects of the BLM timber management program in western Oregon have been described and analyzed in the 1994 *Final - Roseburg District Proposed Resources Management Plan/Environmental Impact Statement* (1994 PRMP/EIS), incorporated herein by reference.

For all analyzed resources, the No Action Alternative would have no cumulative effects because no new management actions would occur at this time.

Ongoing BLM actions in the analysis area include silvicultural maintenance of young stands, including pre-commercial thinning, special forest products gathering, road maintenance, fire suppression, and weed control.

Past actions and previous decisions have been included in the description of existing conditions. However, the 2006 decision for the Whatagas Timber Sale is not included in the Calapooya cumulative effects analysis. Whatagas is a sold and unawarded timber sale located in the vicinity of several Calapooya units. None of the actions authorized in the Whatagas Decision Document have been implemented on the ground. Due to litigation and numerous environmental and analysis issues, this sale is not expected to be implemented in its current form in the foreseeable future.

The proposed Back in Black project is considered as a reasonably foreseeable future action. Back in Black proposes regeneration harvest on approximately 600 acres of O&C forest stands in the GFMA land use allocation in the Calapooya Creek and Lower North Umpqua River watersheds and would include approximately two miles of spur road construction. Implementation is planned for 2016 and 2017.

A. Forest Vegetation

1. Affected Environment

The Calapooya Creek Watershed Analysis Unit covers approximately 157,194 acres, with 91 percent of the watershed held in private ownership. Forestry is the most common land use in the watershed at 64 percent of the land base. Agriculture is the second largest land use at 33 percent. The remaining land base is occupied by residential and commercial/industrial uses (Geyer 2003).

The Swiftwater Field Office of the BLM Roseburg District manages approximately 11,311 acres (7 percent) of the watershed. Late-Successional Reserves account for approximately eight percent of the BLM ownership with the remaining 92 percent allocated as General Forest Management Area, Connectivity/Diversity Blocks and Riparian Reserves. The acres of forested stands managed by the BLM in the watershed are displayed by seral stage in Table FV-1.

Table FV-1. Seral Stage Classes on BLM Managed Lands in the Calapooya Creek Watershed.

SERAL STAGES[1]	AGE OF STANDS	FORESTED ACRES	PERCENT OF BLM MANAGED LAND
Early-Seral Stage	0-15	3	0.03%
Mid-Seral Stage	15-40	2,643	23%
Late-Seral Stage	40-100	4,936	44%
Mature-Seral Stage	100-200	1,889	17%
Old-Growth	200+	1,811	16%

1. Seral stages as defined in the ROD/RMP, p. 112.

The stands proposed for treatment in the Calapooya Creek project originated from timber harvest during the 1950s to the 1970s. Commercial thinning was previously implemented in 2008 in Units 11A, 11B and 11C, and in 1994 in Unit 29G. Douglas-fir *(Pseudotsuga menziesii)* is the predominant overstory tree species and stand ages range from 40 to 62 years old. Remnants of an older age class may be present in some units but are not the predominant component. Other overstory tree species in the stands include, but are not limited to western hemlock (*Tsuga heterophylla*), western redcedar (*Thuja plicata)* Pacific madrone (*Arbutus menziesii)*, and bigleaf maple (*Acer* macrophyllum). The average of minor conifer and hardwood species present within the project area is 17 percent, ranging from 0-53 percent within the proposed units.

Stand specific inventories (stand exams) identified current vegetation stand attributes for each unit. See *Appendix F* for a description of the assumptions and methodology used to analyze forest vegetation. Proposed units may contain one or more stands, as mapped in the District's forest operations inventory (FOI), and may contain a mix of tree species, form, and distribution. On average, live crown ratios are approximately 40 percent in the proposed units. A summary of current stand conditions for live trees for the Calapooya project is shown in Table FV-2.

Table FV-2. Current Stand Conditions for Live Trees[1] by Prescription Method and LUA.

Unit	Land Use Allocation[2]	Proposed Prescription	Age of Stands	Trees Per Acre	Average Diameter[3] (inches)	Basal Area (square feet/acre)	Curtis Relative Density	Canopy Cover[4] (Percent)
7H	RR; C/D	VDT	49	143	15	170	44	83
17B	RR; GFMA	VDT	62	146	15	173	45	86
17D	RR; GFMA	VDT	54	138	14	149	40	83
19B	RR; GFMA	VDT	55	202	14	201	55	89
29G	RR; GFMA	VRH	60	84	18	152	36	75
29H	RR; GFMA	VDT	45	213	15	264	68	96
33A	RR; GFMA	VDT	42	199	14	202	55	93
23A	RR; GFMA	VDT	46	169	11	152	51	75
25A	C/D	VDT	60	199	16	276	69	96
1A	RR; GFMA	VDT	40	221	12	173	50	91
1B	RR; GFMA	VDT	46	330	12	250	73	99
9C	RR; C/D	VDT	48	158	16	229	57	90
13A	RR; GFMA	VDT	52	138	16	187	47	90
13B	RR; GFMA	VDT	53	184	13	179	49	88
13C	RR; GFMA	VDT	53	184	13	179	49	88
15A	RR; GFMA	VDT	48	196	15	234	61	92
5A	RR; GFMA	VDT	42	129	16	173	44	85
5B	RR; GFMA	VDT	44	129	11	177	52	85
7B	RR; GFMA	VDT	45	154	16	202	51	89
7C	RR; GFMA	VDT	53	385	12	309	89	97
9C	RR; GFMA	VDT	44	124	15	145	38	78
9D	RR; GFMA	VDT	45	106	16	144	36	75
11A	RR; C/D	VDT	62	80	20	168	38	55
11B	RR; C/D	VDT	62	74	13	93	26	45
11C	RR; C/D	VDT	62	57	17	88	21	39
17C	RR; GFMA	VDT;VRH	61	213	13	186	52	94

[1] Live trees ≥ 6 inches diameter breast height. Numbers are reflective of the combined weighted average if multiple stands create a unit.
[2] RR = Riparian Reserve; GFMA = General Forest Management Area: C/D = Connectivity Density Blocks; Units that do not list RR, have no riparian within the unit.
[3] *Average Diameter* denotes the diameter (measured at 4.5 feet above the ground) of a tree with the average basal area in the stand, i.e. the quadratic mean diameter.
[4] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

One stand, Unit 25-3-33A, was evaluated to estimate snag density and coarse woody debris in the proposed Calapooya units (Appendix F). Current stand conditions for dead trees and coarse woody debris are shown in Table FV-3. There are approximately two snags (eight inches or greater DBH) per acre and three percent coarse woody debris ground cover (four inches or greater large end diameter) in the modeled stand.

Table FV-3. Current Stand Conditions: Dead Trees in Calapooya[1].

Snag Density (Trees Per Acre)		**Coarse Woody Debris** Large end Diameter			
8-19" DBH	**≥20" DBH**	**Cubic Feet Per Acre**		**Percent Ground Cover**	
		4" – 19"	20" – 35"	4" – 19"	20" – 35"
1.6	0.4	714	922	2	1

[1] One stand (25-3-33A) was evaluated to determine snag density and coarse woody debris.

2. Environmental Consequences

a) ***No Action Alternative***

In the absence of treatment of the proposed units that have not previously been commercially thinned, canopy cover would remain high, relative density would increase, and the crowns of individual trees would continue to recede (Chan *et al.* 2006), resulting in increased suppression mortality and decreasing diameter growth rates as trees compete for water, nutrients, and sunlight (Oliver and Larson 1990).

As trees increase in height, with little increase in diameter, they become unstable and more susceptible to damage (Wonn and O'Hara 2001, Oliver and Larson 1990). Within a few decades it is expected that trees would exceed height to diameter ratio thresholds (≥ 80) and become less resistant to stem bending, windsnap, and windthrow.

Inter-tree suppression or *regular* mortality would occur primarily in the smaller size classes of trees and would be the main source for passive snag and coarse woody debris recruitment. However, non-suppression *irregular* mortality from insects, disease, windthrow, and stem breakage can occur across all crown classes at any age. As the stand ages, regular mortality from inter-tree competition would become less abundant and irregular mortality factors would become more important (Oliver and Larson 1990). Mortality is the source of snags and down wood. Since trees would not be removed under the *No Action Alternative*, this alternative would produce a high amount of dead wood through passive recruitment.

Shrub density and cover would remain stable in the short term (Chan *et al.* 2006). In the absence of a substantial disturbance, the stand structure would remain single-storied over the next 100 years. Over time, site conditions would become more conducive to the establishment and growth of shade-tolerant shrubs and tree species (e.g. hemlock) as understory light increases due to receding overstory tree crowns and tree mortality (Oliver and Larson 1990). This process would be slow and it is unlikely that understory tree and shrub development would be sufficient to cause a shift from single-storied to a two-storied or layered structure within 100 years (Oliver and Larson 1990; Munger 1940).

In the absence of treatment, the units that have been thinned in the past (11A, 11B, 11C, and 29 G), would be expected to continue to produce a high rate of diameter growth. The stands would not be expected to remain open enough, without additional thinning, to maintain light levels providing for the long-term survival and growth of understory vegetation that would produce a layered structure (Chan *et al.* 2006, Cole and Newton 2009).

Projected future stand conditions under the *No Action Alternative* are shown in Table FV-4 for live trees in 100 years and Table FV-5 for dead trees in 20 and 100 years.

Table FV-4. Predicted Stand Conditions for Live Trees in 100 years. No Action Alternative.

LUA and Unit	Trees Per Acre	Average Diameter[1] inches	Basal Area All Species (feet^2/acre)	Basal Area Minor Spp. (feet^2/acre)	Trees Per Acre ≥ 30" DBH	Canopy Cover[2] (Percent)
GFMA Unit 17B	162	21	390	110	19	73
GFMA Unit 17C	130	23	370	140	11	75
GFMA Unit 29G	79	30	380	11	40	64
C/D Unit 9C	92	30	445	13	37	68

[1] *Average Diameter* denotes the diameter (measured at 4.5 feet above the ground) of a tree with the average basal area in the stand, i.e. the quadratic mean diameter.
[2] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

Table FV-5. Predicted Stand Conditions[1] for Dead Trees in 20 and 100 years. No Action Alternative.

LUA and Unit	Snag Density in 20 years (Trees Per Acre)		Snag Density in 100 years (Trees Per Acre)		Coarse Woody Debris	
	10"-20" DBH	≥ 20" DBH	10"-20" DBH	≥ 20" DBH	Cumulative Mortality[2] in 20 years (ft^3)	Cumulative Mortality[2] in 100 years (ft^3)
GFMA Unit 17B	24.5	1.5	27.9	5.3	329	3,228
GFMA Unit 17C	10	<1	52	4	629	3,700
GFMA Unit 29G	1	<1	5	4	156	1,620
C/D Unit 9C	18	1	26	21	946	7,152

[1] Live trees ≥ 6 inches diameter breast height.
[2] Cumulative Mortality includes snags and future coarse woody debris

b) ***Proposed Action Alternative***

It is common, following the application of different treatments to a stand, to view each treatment area as a separate entity, based on the classical definition of a stand as a group of trees relatively homogenous in structure and composition. Ecologically, it is more useful to view an entire treatment area, including both harvested and unharvested areas, as a functional stand consisting of a mosaic of structural units (Franklin *et al.* 2002). The effects analyses that are unique to each analysis incorporate that concept of a synergism between treatments, although common effects are described separately for each treatment type.

Variable density thinning would be used to reduce the density of trees in the proposed units and provide intermediate timber volume and revenue (Daniel *et al.* 1979). The changes in relative stand density and canopy closure would reduce competition among the remaining trees for available water, light, and nutrients and result in increased tree diameter growth compared to unthinned stands. Diameter growth increases from 33 to 56 percent have been observed on very productive sites (Marshall *et al.* 1992). A retrospective study of commercially thinned 40 to 100 year old stands found that radial growth rates at 10 to 23 years post-thinning averaged 36 percent greater in thinned stands versus unthinned stands (Bailey and Tappeiner 1998). Thinning also stabilizes or prevents height to diameter ratios from increasing above thresholds (≥ 80) that predispose the stand to stem bending, windsnap, and windthrow (Wonn and O'Hara 2001, Oliver and Larson 1990).

Thinning can increase, maintain, or reduce the rate of recession of live crown ratios (Oliver and Larson 1990, Chan *et al.* 2006, Marshall and Curtis 2002). Maintaining live crown ratios greater than 30 percent prevents a substantial reduction in vigor and diameter growth (Smith 1962). Thinning can also result in an increase in crown ratios by stimulating epicormic branching in tree species, such as Douglas-fir, true firs, and big-leaf maple (Tappeiner *et al.* 2007).

Canopy cover gradually increases over time after a thinning. Thinned overstory canopy cover closes at a rate of about one percent a year based on stand simulation outputs. Canopy closure measured as skylight through the canopy decreases by two percent per year (Chan *et al.* 2006). Initially, shrubs and herbaceous vegetation cover would be reduced by the harvest operations however, cover and plant diversity would increase to levels beyond pre-treatment conditions with increased light and nutrient availability (Chan *et al.* 2006, Bailey *et al.* 1998). Natural regeneration of tree species is common after thinning, depending on availability of seed and other factors. Seedling distribution and density are highly variable (Chan *et al.* 2006) but generally increase with increasing intensity of thinning (Bailey and Tappeiner 1998, Nabel 2008).

The VRH prescription would change stands from a uniform closed canopy to stands that provide a greater complexity of habitat components. Early-successional habitat, consisting of conifer regeneration and shrub cover, would be intermixed with: 1) older forest components retained in the form of legacy trees and large down wood, 2) dispersed retention trees, and 3) patches of closed canopy forest within aggregate retention areas, untreated riparian reserves and no-harvest stream buffers.

Proposed VDT Treatments in GFMA

Variable density thinning, utilizing three prescription types would be implemented on 421 acres in stands located in General Forest Management Areas. The effects of the individual prescription types and of the overall stand treatment would be as follows:

Effects from the Light Thinning Prescription

Stands that are lightly thinned to a relative density of 29-37 would produce moderately-high volume growth rates at the expense of individual tree diameter growth rates A single light thinning offers minimal opportunity to create diverse, multi-storied (i.e. layered structure) stands before the canopy closes and light becomes unavailable to the forest floor. Understory conifer and hardwood species vigor and survival would diminish as the overstory canopy closes (Chan *et al.* 2006, Cole and Newton 2009).

Effects from the Moderate Thinning Prescription

Stands that are moderately thinned to a relative density of 18-25 would produce high rates of diameter growth at the expense of volume production. It is uncertain if a moderately thinned stand would remain open enough, without additional thinning treatment, to maintain light levels providing for the long-term survival and growth of understory vegetation that would produce a layered structure (Chan *et al.* 2006; Cole and Newton 2009).

Effects from Skips

Portions of stands where skips are located would develop in the same manner as described previously for stands under the *No Action Alternative.* Stands would remain single-storied with high canopy cover and a stable shrub density. Suppression mortality would result in increased coarse woody debris and snags.

Effects of Variable Density Thinning in GFMA

The combination of prescription types and their spatial distribution in these units would result in an increase in the stand level development of a layered structure in portions of the stands. The entire stands may not be sufficiently variable to be classified as 'layered' however the spatial distribution of the treatment types and vegetative responses in the stands would increase the overall variability within the stands while producing high rates of stand volume.

Proposed VDT Treatments in Connectivity/Diversity Blocks

Variable density thinning, utilizing five prescription types would be implemented on 274 acres in stands located in Connectivity/Diversity Blocks. The effects from the light and moderate thinning prescriptions and skips would be the same as described above when implemented on GFMA areas. In addition, heavy thinning and gaps would be incorporated into the treatment of five of the six C/D units. The effects of these additional prescription types and of the overall stand treatment would be as follows:

Effects from the Heavy Thinning Prescription

Stands that are heavily thinned to a relative density of 10 and 11 would produce the highest rates of diameter growth of the proposed thinning intensities at the expense of volume production (Curtis and Marshall 1986). It is anticipated that the overstory canopy would remain open enough to maintain light levels conducive to the long-term survival and growth of understory vegetation that would produce a layered structured stand (Chan *et al.* 2006; Newton and Cole 2009).

Effects from the Gap Prescription

Canopy gaps with or without retention trees would encourage understory vegetation development, including shrubs, forbs and natural tree regeneration, and contribute to horizontal and vertical structural diversity. The size and shape of gaps and the height growth of the adjacent stand affect the development of vegetation in gaps (Malcolm *et al.* 2001). In stands dominated by Douglas-fir, trees adjacent to gaps have shown an increased basal area growth of 11 percent (Roberts and Harrington 2008).

Units 11A, 11B, and 11C have previously been commercially thinned. This project proposes treatment with only gap creation in Units 11B and 11C, and gap creation plus additional moderate thinning in Unit 11A, to increase the structural diversity in these stands located in C/D (Appendix H; Figure 5). Gap size would be less than two acres as defined previously in Terminology and Definitions (p. 10).

Effects of Variable Density Thinning in C/D Blocks

The combination of prescription types and their spatial distribution in these units would result, in the long-term (i.e. next 100 years), in the development of a layered structure in portions of the stands. A more complex structure is expected with the increase in treatment types across the stands. Entire stands may not be sufficiently variable to be classified as 'layered' however the spatial distribution of the treatment types and vegetative responses in the stands would increase the overall variability within the stands.

Example stands in each land use allocation were modeled to predict immediate post-treatment stand conditions following VDT treatment. Table FV-6 displays the predicted range of stand conditions immediately after harvest for the stands proposed for thinning. Predicted stand conditions for live trees 100 years post-treatment are shown in Table FV-7. For comparison purposes, the predicted values for the No Action Alternative (q.v. Table FV-4) are included in Table FV-7.

Table FV-6. Immediate Post-treatment Stand Conditions after VDT: Live Trees[1]

Prescription Method by LUA	Trees Per Acre	Basal Area (square feet/acre)	Average Diameter[2] (inches)	Canopy Cover[3] (percent)
GFMA – VDT (Unit 17B)	73-159	98-141	11-16	56-76
C/D – VDT (Unit 9C)	54-86	85-125	12-16	37-65

[1] Live trees ≥ 6 inches diameter breast height. Numbers are reflective of the combined weighted average by prescription. Numbers are listed for the range of conditions for the various stands treated with VDT.
[2] *Average Diameter* denotes the diameter (measured at 4.5 feet above the ground) of a tree with the average basal area in the stand, i.e. the quadratic mean diameter.
[3] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

Table FV-7. Predicted Stand Conditions[1] in 100 years after VDT: Live Trees.

Treatment Method	No Action or Treatment Proposed	Trees Per Acre	Average Diameter[2] inches	Basal Area All Species (feet^2/acre)	Basal Area Minor Spp. (feet^2/acre)	Trees Per Acre ≥ 30" DBH	Canopy Cover[3] (Percent)
GFMA – VDT (Unit 17B)	No Action	162	21	390	110	19	73
	Treatment Proposed	103	23	300	72	16	67
C/D –VDT (Unit 9C)	No Action	92	30	445	13	37	68
	Treatment Proposed	50	32	280	8	26	51

[1] One stand from each treatment method and land use allocations was selected to model conditions in 100 years.
[2] *Average Diameter* denotes the diameter (measured at 4.5 feet above the ground) of a tree with the average basal area in the stand, i.e. the quadratic mean diameter.
[3] *Canopy Cover* is the proportion of the forest floor covered by the vertical projection of tree crowns adjusted for crown overlap.

Proposed VRH Treatments in GFMA
Variable retention harvest would be implemented in two units on approximately 63 acres in GFMA. The effects of the individual prescription types and overall stand treatment would be as follows:

Effects of Aggregate Retention Areas
Within areas of aggregated retention, trees would be subject to the same processes of growth and development, including regular and irregular mortality, as under the *No Action Alternative*. Since trees would not be removed, aggregates would produce the greatest amount of dead wood through passive recruitment, compared to the treated areas. Aggregates with low edge to area ratios ≥ 2.5 acres in extent would be expected to support core areas with micro-climates indistinguishable from interior forest, and also ameliorate microclimate in adjacent harvested areas (Heithecker and Halpern 2007). Weather-induced mortality from wind and snow would be expected to occur along the edges of aggregates and along the edges of untreated stands bordering harvested areas (Maguire *et al.* 2006).

Figures FV-1 and FV-2 illustrate two variable retention harvests with features such as blocks, peninsulas, and aggregates of retention.


Figure FV-1. Aerial View of a Variable Retention Harvest Treatment


Figure FV-2. Ground View of a Variable Retention Harvest Treatment

Effects of Dispersed Retention Areas and Understory Development

Harvest would change current vegetation structure and composition to one resembling an early-seral stage (ROD/RMP, p. 112). The composite effects of harvest types and distribution suggest that over the next 50 to 100 years, many attributes found in unmanaged mature and old-growth forest stands would be maintained or would develop within the harvested area, trending from a condition of stand establishment with structural legacies to a mature stand condition with a multiple-canopy structure.

Dispersed retention trees would provide short and long-term live and dead structural legacies. Mortality of dispersed retention trees has been quantified by several recent studies (Buermeyer and Harrington 2002; Busby *et al.* 2006; Maguire *et al.* 2006; Garber *et al.* 2011). On an annualized basis these studies report mortality rates ranging from about 0.6 to 2.2 percent for dispersed retention trees within the range of retention levels expected for the proposed project. Causes of mortality would include windthrow, wind-topping, logging damage, and "thinning shock".

A ten percent mortality rate for dispersed retention trees would be expected per decade for the first two decades after harvest and three percent mortality per decade in subsequent years (Lewis and Pierle 1991). Approximately 70 percent of the mortality in any period would initially result in the formation of snags and 30 percent would produce down wood (Busby *et al.* 2006). Surviving trees would be expected to maintain pre-harvest basal area growth rates (Garber *et al.* 2011) or exhibit a short-term decrease (North *et al*. 1996). Increased growth rates in low density mature trees following harvest begins within the range of five to 25 years post-harvest (Latham and Tappeiner 2002).

Establishment of natural regeneration from adjacent aggregates and dispersed retention trees is likely, but not considered a reliable regeneration option for meeting reforestation goals (Ketchum and Tappeiner 2005). Natural regeneration has often proven undependable for reforestation in a prompt manner (Stein 1955). Planted commercial conifer species would enhance the potential for the development of a conifer dominated forest stand (Tappeiner *et*

al. 2007). Mortality rates of planted conifers would be expected to range between 15 to 30 percent in the first three to four years following planting, then substantially decline after that. Conifer planting would assure that adequate reforestation is accomplished following timber harvest on Matrix lands (ROD/RMP, p. 63).

Schoonmaker and McKee (1988) described a sequence of vegetation development on sites clearcut in the western Cascades. Post-harvest cover of understory species that occurred in pre-harvest stands was initially low, but rapidly increased over time. Residual species accounted for almost 40 percent of total species composition at age five and up to 97 percent at age 40. Plant cover within the harvested area on undisturbed ground tended to be dominated by residual species. Species heterogeneity and composition peaked between 15 to 20 years post-harvest, declined to the lowest values by 40 years and conifer dominance occurred within 20 to 30 years. After 40 years, absolute cover was 53 percent herbs, 57 percent shrubs, and 82 percent conifers.

Compared to Schoonmaker and McKee's vegetation development scenario, it is expected that dispersed retention harvest areas would exhibit a higher diversity and more variable species composition than that found in clearcuts (North *et al*., 1996). However, aggregate retention areas and dispersed retention trees would affect vegetative development due to shading and other retention affects (North *et al.* 1996). Growth rates of regeneration would be substantially less than those found with clearcut harvesting due to the effects of competition for light, moisture and nutrients from both aggregated and dispersed retention (Acker *et al.* 1998; Lam and Maguire 2011).

The predicted live tree conditions for the VRH treatments immediately post-treatment are shown in Table FV-8 and at 100 years following treatment are displayed in Table FV-9.

Table FV-8. Predicted Stand Conditions Immediately Post-Harvest VRH: Live Trees.

Unit	Trees/Acre		Basal Area (feet^2/ac)	Basal Area (minor spp.)	Percent Canopy Cover
	All	≥ 6"			
Thinning Area					
17C	109	93	80	38	62
Aggregate Retention Areas					
17C	247	214	185	87	100
29G	128	84	150	1	86
Dispersed Retention Areas					
17C	24	8	22	10	14
29G	41	8	26	1	11
Combined Results at the Stand Level[1]					
17C	96	76	73	35	45
29G	72	41	81	1	39

[1] *Combined results reflect weighted averages.*

Table FV-9. Predicted Stand Conditions in 100 years after VRH: Live Trees

Unit	Trees/Acre ≥ 6"	QMD (inches)	Basal Area (feet^2/ac)	Basal Area (minor spp.)	Percent Canopy Cover
Thinning Area					
17C	68	25	230	80	68
Aggregate Retention Areas					
17C	130	23	370	140	86
29G	79	30	380	10	66
Dispersed Retention Areas					
17C	195	17	320	26	80
29G	132	24	405	1	79
Combined Results at the Stand Level[1]					
17C	145	21	305	66	70
29G	109	26	400	5	68

[1] *Combined Results reflect weighted averages for trees ≥ 6 inches DBH.*

Effects on Potential Dead Wood Production

A stand representing the average conditions and each prescription method and land use allocation was modeled to estimate the amount of dead wood (tree mortality) produced over 20 and100 year simulation periods (Appendix F). Table FV-5 (q.v. p. 36) displays the number of snags per acre of the modeled Calapooya stands in 20 and 100 years in the absence of treatment as compared to the *Proposed Action Alternative*.

Thinning to reduce stand density involves a tradeoff between maintaining or improving individual tree growth rates and promoting understory growth that leads to multi-layered stand structure and reducing the accumulation of dead trees in the form of snags and down wood. Though the proposed action would capture most of the suppression mortality by harvesting, trees would continue to die due to competition and other factors. Fewer snags would develop over time when compared to the *No Action Alternative*, however the snags developed post treatment are expected to be larger with more resiliency and limb structure (Reukema and Smith 1987) than snags that develop under more competitive stand conditions (Neitro *et al.* 1985). The amount of snags would be within the range observed by Spies *et al.* (1988) in natural mature and old-growth Coast Range stands.

Predicted conditions of dead trees for all treatments for both *No Action* and the *Proposed Action Alternatives* are displayed in Table FV-10.

Table FV-10. Predicted Stand Conditions of Dead Trees in 20 and 100 years for the *No Action* and *Proposed Action*[2] Alternatives

Prescription Method, LUA, and Unit[1]	Alternative	Snag Density in 20 Years (Trees Per Acre)		Snag Density in 100 Years (Trees Per Acre)		Coarse Woody Debris (cubic feet per acre)	
		10"-20" DBH	≥ 20" DBH	10"-20" DBH	≥ 20" DBH	Cumulative Mortality[3] in 20 years	Cumulative Mortality[3] in 100 years
GFMA - VDT 17B	No Action	24.5	1.5	27.9	5.3	329	3,228
	Proposed Action	4	<1	9	3	144	1,309
C/D - VDT 9C	No Action	18	1	26	21	946	7,152
	Proposed Action	4	<1	4	6	230	1,967
GFMA - VRH 17C	No Action	10	<1	52	4	629	3,700
	Proposed Action	4	<1	24	2	229	1,751
GFMA - VRH 29G	No Action	1	<1	5	4	156	1,620
	Proposed Action	<1	<1	57	5	73	3,672

[1] Four stands were selected to model dead wood representing each land use allocations and prescription method.
[2] The *proposed action* scenario uses a weighted average by prescription type.
[3] Cumulative Mortality includes snags and future coarse woody debris.

3. Cumulative Effects

The seral stage distribution would shift slightly under the *Proposed Action Alternative*. The proposed VRH treatment on 63 acres would increase the amount of BLM-administered acres in the early seral stage to 0.6 percent of the Calapooya Creek Watershed. The change in seral stage classes on BLM-administered lands can be found in Table FV-11. With the addition of the proposed Back in Black harvest plan, the amount of early seral stage would increase to approximately 7.7 percent of the Calapooya Creek Watershed. The change in seral stage classes on BLM-administered lands that include the Back in Black harvest units can be found in Table FV-12. These shifts from late seral stage to early seral stage make a contribution toward achieving the desired balanced age class distribution within the Calapooya Creek Watershed.

Table FV-11. Seral Stage Class Distribution on BLM-Administered Lands in the Calapooya Creek Watershed following Proposed Calapooya Harvest.

SERAL STAGES	AGE OF STANDS	FORESTED ACRES	PERCENT OF BLM-ADMINISTERED LANDS
Early-Seral Stage	0-15	69	0.6%
Mid-Seral Stage	15-40	2,643	23%
Late-Seral Stage	40-100	4,873	43%
Mature-Seral Stage	100-200	1,889	17%
Old-Growth	200+	1,811	16%

Table FV-12. Seral Stage Class Distribution on BLM-Administered Lands in the Calapooya Creek Watershed following Proposed Calapooya Harvest and future project Back in Black.

SERAL STAGES	AGE OF STANDS	FORESTED ACRES	PERCENT OF BLM-ADMINISTERED LANDS
Early-Seral Stage	0-15	870	7.7%
Mid-Seral Stage	15-40	2,643	23%
Late-Seral Stage	40-100	4,072	36%
Mature-Seral Stage	100-200	1,889	17%
Old-Growth	200+	1,811	16%

Management of Private Forest Lands

Most private lands in the Calapooya Creek watershed are intensively managed to produce wood fiber on harvest rotations of between 40 and 65 years. This management includes herbicide use to exclude competing vegetation and hasten conifer canopy closure. It is assumed that most late-seral forest stands on private timber land have been converted to simple early-seral forest conditions and harvest of mid-seral stands is ongoing, a trend that is expected to continue in the foreseeable future.

B. Wildlife

Three principle categories of terrestrial wildlife species: Special Status Species, Survey and Manage, and Landbirds, receive special consideration in the planning and implementation of BLM management actions.

Special Status Species addressed in this Environmental Assessment include Federally-listed Threatened or Endangered species, Candidate species or species proposed for listing by the U.S. Fish and Wildlife Service (FWS), under the Endangered Species Act (ESA); and Special Status Species managed under BLM Manual 6840 policy which includes species eligible for Federal or State listing, species with candidate status under the ESA and Bureau Sensitive species. Three species covered by this program are also designated for management under the Survey and Manage program and are discussed in that section as they are subject to other management considerations.

Two *federally threatened* species are known to occur on the Roseburg District. The proposed project is outside of the distribution range of the marbled murrelet *(Brachyramphus marmoratus)* and therefore, the Calapooya project would have no effect to the species or its critical habitat. Thus, the northern spotted owl *(Strix occidentalis caurina)* is the only ESA-listed terrestrial species in the proposed project area.

In addition, on October 7, 2014 the Service issued a proposal to list the West Coast Distinct Population Segment (DPS) of the fisher *(Pekania pennanti)* as *federally threatened* under the ESA. The Calapooya project area is located outside of the West Coast DPS. The Endangered Species Act requires the BLM to confer with the FWS when a proposed project is likely to jeopardize the continued existence of any species proposed to be listed under the Endangered Species Act or result in the destruction or adverse modification of critical habitat proposed to be designated for such species. At this time the Service has found the designation of critical habitat as "not determinable" for the West coast DPS of the fisher. This EA evaluates the impacts of the *no action* and *proposed action* on the fisher and its habitat.

Twenty-two of the 25 *Bureau Sensitive* wildlife species known or suspected to occur on the Roseburg District were considered in this analysis. Fifteen (15) of the species are eliminated from detailed discussion for reasons documented in Table A-1, in *Appendix A: Wildlife*. The remaining seven species, including the northern spotted owl and fisher, are analyzed in detail in this EA, as well as summarized in Table A-1, *Appendix A: Wildlife.* Additionally, the four *Bureau Strategic* wildlife species are addressed in *Appendix A: Wildlife.*

The second category consists of wildlife species designated for protection under the Survey and Manage Standards and Guidelines established in the Northwest Forest Plan (USDA/FS-USDI/BLM 1994b). The species list from the 2001 ROD (USDA/USFS and USDI/BLM 2001) applies to the Calapooya project. Four of the six Survey and Manage Species on the Roseburg District are analyzed in detail in this EA, as well as summarized in Table B-1, in *Appendix B: Survey & Manage Wildlife Species*. The remaining two species are eliminated from detailed discussion for reasons documented in Table B-1, in *Appendix B: Survey & Manage Wildlife Species.*

The third category consists of bird species subject to protection under the Migratory Bird Treaty Act of 1918, as amended; the Bald and Golden Eagle Protection Act; focal species identified by Partners In Flight in the Conservation Strategy for Land birds in Coniferous Forests of Western Oregon and Washington; and "Birds of Conservation Concern" and "Game Birds Below Desired Condition," as defined by the FWS. Landbird species are included in *Appendix C – Landbirds*, Table C-1. Also included under "Landbirds" is the northern goshawk, a species that is not under any of the previously mentioned Landbird categories, but is a species with management direction in Roseburg District Resource Management Plan (USDI/BLM 1995).

Special Status Wildlife Species

Appendix A: Bureau Sensitive & Bureau Strategic Species summarizes general habitat requirements, status of species within the project area, and impacts of the proposed action for each of the 29 terrestrial wildlife *Special Status Species* on the Roseburg District. There are 12 *Bureau Sensitive* terrestrial species associated with conifer forest habitats that are either documented or suspected to be present within the project area.

Three *Bureau Sensitive* mollusk species, including the **Crater Lake tightcoil** *(Pristiloma arcticum crateris),* **Oregon shoulderband** *(Helminthoglypta hertleini),* and **Siskiyou ("Chace") sideband** (*Monadenia chaceana),* are also *Survey & Manage Species* and have been addressed in the *Survey & Manage Species* section below and in *Appendix B.*

The **American peregrine falcon** (*Falco peregrines anatum)* and **foothill yellow-legged frog** (*Rana boylii)* are expected to occur within the project area; however the project area does not specifically contain respective suitable breeding/rearing habitat for either species. Therefore, these species are not analyzed in detail because the proposed project is not expected to have measurable effects to the species or their respective habitats.

The remaining seven species discussed in detail below, are primarily associated with late-successional conifer forest habitat and would be expected to primarily occur within suitable habitat adjacent to the proposed units.

1. Northern Spotted Owl (Federally Threatened)

a) *Environmental Baseline*

The northern spotted owl is present throughout the Roseburg District, inhabiting forest stands more than 80 years old that provide nesting, roosting, and foraging habitat (NRF), commonly referred to as **suitable habitat**. Northern spotted owl habitat is categorized into three types: 1) suitable; 2) roosting and foraging; and 3) dispersal. Although suitable habitat also functions as dispersal habitat, these terms are used separately for this analysis.

Suitable Habitat contains the following structural components that distinguish superior suitable northern spotted owl habitat from less suitable habitat (as described by Thomas *et al*. (1990):

- a multi-layered, multi-species canopy dominated by large (>30 inches dbh) conifer overstory trees, and an understory of shade-tolerant conifers or hardwoods;
- a moderate to high (60 to 80 percent) canopy closure;
- substantial decadence in the form of large, live coniferous trees with deformities – such as cavities, broken tops, and dwarf mistletoe infections;
- numerous large snags;
- ground-cover characterized by large accumulations of logs and other woody debris; and
- a tree canopy that is open enough to allow owls to fly within and beneath it.

Roosting and foraging habitat contains (FR 73; 47347-47348):

- moderate to high canopy closure (60 to 80 percent);
- a multi-layered and multi-species canopy;
- large accumulations of logs and other woody debris on the ground;
- open space below the canopy for northern spotted owls to fly; and
- lacks nesting structure.

Dispersal Habitat is defined by Thomas *et al.* (1990) as conifer-dominated forest stands with canopy closures of 40 percent or greater and an average diameter at breast height of 11 inches or greater. Conifer-dominated forest stands approximately 40 to79-years old, such as the stands proposed for thinning in the Calapooya project area, provide dispersal habitat. Dispersal habitat may contain snags, coarse down wood, and prey sources, which are habitat components that allow northern spotted owls to move and forage between blocks of suitable habitat (USDI/FWS 2009). Dispersal habitat is essential for the movement of juvenile and non-territorial (e.g. single birds) northern spotted owls to fill territorial vacancies and provide adequate gene flow across the range of the species (USDI/FWS 2008a). A canopy cover of 60 to 80 percent provides roosting habitat conditions for thermoregulation, shelter, and cover to reduce predation risks.

Habitat use by northern spotted owls is influenced by prey availability (Ward 1990, Zabel *et al.* 1995). The composition of the northern spotted owl's diet varies geographically and by forest type, but it is primarily comprised of small mammals. Flying squirrels (*Glaucomys sabrinus*) are the most prominent prey for northern spotted owls in Douglas-fir and western hemlock (*Tsuga heterophylla*) forests (Forsman *et al*. 1984) and are the key prey species for northern spotted owls in the Calapooya project area. Flying squirrels are associated with several habitat components including high canopy cover, large trees, snags, abundant coarse woody debris, understory cover, patch-level changes in vegetation composition, and availability of fungi (Wilson 2008). Other prey species (i.e. brush rabbits and other rodents) are primarily associated with early- and mid-seral forest habitat (Maser *et al*. 1981, Sakai and Noon 1993, Carey *et al*. 1999).

Analysis Area for the northern spotted owl is the extent defined by a composite of a 1.2-mile radius polygon around proposed timber sale units and home-range diameter circles around the most recent occupied northern spotted owl activity centers that fall within the timber sale polygon. For the Calapooya project, due to the distribution of the units associated with two timber sales, there are two Analysis Areas for the northern spotted owl (Appendix H, Figure 8).

The combined Analysis Areas cover approximately 41,100 total acres with approximately 11,910 acres (29 percent) on Federal lands, including 6,927 acres (58 percent) of Matrix lands and 4,983 acres (42 percent) of Reserves, which include 619 acres designated as Known Owl Activity Centers (KOACs) and Riparian Reserves on Matrix lands. There is no Late-Successional Reserve land use allocation within the Analysis Areas (Table W-1). Approximately 3,447 acres (29 percent) of suitable habitat and 4,591 acres (39 percent) of dispersal habitat occur on Federal lands within the Analysis Areas (Appendix H, Figure 8).

Approximately 3,556 acres (30 percent) of Federal lands in the Analysis Area are in designated critical habitat for the northern spotted owl (Appendix H, Figure 9), which includes approximately 236 acres (6 percent) of KOACs associated with three northern spotted owl sites. Table W-1 summarizes the environmental baseline of habitats for the northern spotted owl within each of the Analysis Areas as shown in Figures 8 and 9 (Appendix H).

Table W-1. Environmental Baseline of Habitats within the Northern Spotted Owl Analysis Area.

ANALYSIS AREAS (41,100 TOTAL ACRES)[1]		NORTHERN SPOTTED OWL HABITATS IN THE ANALYSIS AREA (Federal Acres)				
LAND USE ALLOCATION	(Federal Acres)	NRF	DISPERSAL	CAPABLE[2]	NON-CAPABLE[3]	CRITICAL HABITAT
GREEN GAS ANALYSIS AREA						***3,556***
Matrix	*3,713*	*839*	*1,327*	*1,423*	*124*	*2,111*
Riparian Reserve	*2,331*	*813*	*696*	*769*	*53*	*1209*
Known Owl Activity Centers	*471*	*427*	*22*	*16*	*6*	*236*
LSR	*0*	*0*	*0*	*0*	*0*	*0*
GOOD BOYD ANALYSIS AREA						***0***
Matrix	*3,214*	*743*	*1,519*	*872*	*80*	*0*
Riparian Reserve	*2033*	*496*	*1021*	*477*	*39*	*0*
Known Owl Activity Centers	*148*	*129*	*6*	*11*	*2*	*0*
LSR	*0*	*0*	*0*	*0*	*0*	*0*
CALAPOOYA - ANALYSIS AREA						
Matrix	***6,927***	***1,582***	***2,846***	***2,295***	***204***	***2,111***
Reserves[4]	***4,983***	***1,865***	***1,745***	***1,273***	***100***	***1,445***
TOTAL	***11,910***	***3,447***	***4,591***	***3,568***	***304***	***3,556***

1. Analysis Area Total Acres = Federal Lands + Non Federal Lands
2. Capable = forest stands that are capable of developing into dispersal and NRF habitat but currently are not functioning as NSO habitat (FOI stand age ≤ 39 years).
3. Non-capable = lands that are not capable of developing into dispersal or NRF habitat in the foreseeable future because they are non-forested ground (e.g. rocky bluffs, cliffs, grassland, etc…) or are existing roads.
4. Reserves = LSR + Riparian Reserve+ Known Owl Activity Centers.

K**nown northern spotted owl site** (or activity center) is defined as a location with evidence of continued use. There are seven historic/known northern spotted owl sites present within the Analysis Area (Appendix H, Figure 8), which includes 14 activity centers (three of the seven sites each have one or more alternate nest sites). Two of the seven sites have never produced young (fledglings). The last year reproduction was documented within the Analysis Areas was in 2014 at the Norris Creek site (MSNO 3270A), which produced two fledglings. Of the remaining six sites, four sites have been unoccupied for at least three of the last five years and two sites have either been unoccupied or occupied by a single spotted owl since 2009, with the exception of a spotted owl pair documented in 2010 at the Field Creek (IDNO 2202O) site.

This analysis is based on the most recently occupied known northern spotted owl nest site or activity center associated with each spotted owl territory in the Analysis Area. Table W-2 summarizes the status of the northern spotted owl sites from 2009 to 2014 including occupancy and reproduction.

Table W-2. Site Status for Northern Spotted Owl within the Analysis Area for the Calapooya Proposed Project.

SITE NAME	IDNO[1]	YEAR SITE ESTABLISHED	NSO STATUS SUMMARY		
			LAST YEAR OF KNOWN PAIR STATUS[1]	LAST YEAR OF KNOWN NESTING/ REPRODUCTION[1]	SUMMARY OF SITE STATUS[2] 2009-2014
FIELD CREEK	2202B	1989	2010	2010	Pair (2009-2010) Unknown (2011-2012) Resident Single (2013) Unoccupied (2014)
FRENCH CREEK	4014O	1993	1993 (4014O)	None	Unoccupied (2009-2010, 2012) Unknown (2011)
GOSSETT CREEK	0355B	1983	1990 (0355A)	1983 (0335O)	Unoccupied (2009, 2013-2014) Unknown (2010-2012)
KELLY CREEK	1794O	1980	2000	1998	Unoccupied (2009-2010, 2012-2014) Unknown (2011)
MILL CREEK MS	3900C	1992	2004	2002	Unoccupied (2009-2010, 2013-2014) Resident Single (2011-2012)
NORRIS CREEK	3270A	1993	2014	2014	Unknown (1999-2012) Non-Nesting Pair (2013) Pair (2014)
SCOTTS TERRACE	4013O	1993	None	None	Unknown (2009, 2011) Unoccupied (2010, 2013-2014)

[1]Only includes IDNOs (activity centers) within Analysis Area. However, additional alternate activity centers that occur outside of the analysis area may be identified in the summary for pair status, nesting status, and reproduction status for the site.
[2] Unknown status = site was surveyed, but not to protocol, and no owls were detected during surveys.

Habitat at Analytical Spatial Scales are used to determine habitat condition for a known northern spotted owl site and is generally assessed by evaluating available suitable and dispersal habitat at three analytical scales: home range (1.2 mile radius), core area (0.5 mile radius), and nest patch (300 meter radius). The most recently occupied activity center and its corresponding nest patch, core area, and home range were used to determine habitat impacts for each northern spotted owl site within the proposed Calapooya project area. Table W-3 presents environmental baseline acres of suitable habitat and dispersal habitat within each analytical spatial scale for the seven known spotted owl sites located within the Analysis Areas (Appendix H, Figure 8).

Table W-3. Environmental Baseline Habitat Conditions at Analytical Spatial Scales for Northern Spotted Owl Sites within the Calapooya Analysis Area.

SITE NAME	NEST PATCH (70 ACRES)[3]			CORE-USE AREA (500 ACRES)[3]			HOME RANGE (2, 955 ACRES)[3]		
	FEDERAL ACRES	NRF ACRES (%)[2]	DISPERSAL ACRES	FEDERAL ACRES	NRF ACRES (%)[2]	DISPERSAL ACRES	FEDERAL ACRES	NRF ACRES (%)[2]	DISPERSAL ACRES
FIELD CREEK *IDNO 2202B*	41	37 (53%)	3	292	104 (21%)	85	859	326 (11%)	189
FRENCH CREEK *IDNO 4014O*	70	62 (89%)	0	400	**289 (58%)**[4]	78	1061	399 (14%)	414
GOSSETT CREEK *IDNO 0355B*	66	39 (56%)	0	306	129 (26%)	22	923	263 (9%)	333
KELLY CREEK *IDNO 1794O*	70	68 (97%)	0	351	204 (41%)	38	1220	369 (12%)	353
MILL CREEK MS *IDNO 3900C*	38	29 (41%)	0	212	130 (26%)	38	1,336	405 (14%)	505
NORRIS CREEK[1] *IDNO 3270A*	36	18 (26%)	0	198	38 (8%)	37	963	305 (11%)	326
SCOTTS TERRACE *IDNO 4013O*	35	24 (34%)	0	337	33 (7%)	184	1135	307 (11%)	433

[1]Only includes IDNOs (activity centers) within Analysis Area. However, additional alternate activity centers that occur outside of the analysis area may be identified in the summary for pair status, nesting status, and reproduction status for the site.
[2] Percent based on the total acres within the spatial scale being analyzed.
[3] Total acres within the spatial scale being analyzed within GIS: Nest patch= 700-meter radius; Core-Use Area = 0.5-mile radius; and Home Range = 1.2-mile radius.
[4] Gray shading and **bold** font indicates the amount of nesting, roosting and foraging habitat is above the viability threshold.

HOME RANGE - Home range size varies by physiographic province. The northern spotted owl home range in the West Cascades Province is a 1.2-mile radius circle centered on an activity center (i.e. nest site), encompassing approximately 2,955 acres, and is used by northern spotted owls for nesting, roosting, and foraging (USDI/FWS 2008b). The home ranges of several northern spotted owl pairs may overlap with the habitat shared by adjacent owl pairs and other non-territorial spotted owls. The home range is important for the survival and productivity of northern spotted owls because they are non-migratory birds that remain within their home range year-round (USDI/FWS 2009).

Maintenance of 40 percent of the total home range acres in suitable habitat (1,182 acres for the West Cascades Province) is the threshold considered essential to sustain northern spotted owl life functions (USDI/FWS 2008b). Studies by Bart (1995) concluded that northern spotted owl reproduction and survival decreased as suitable habitat decreased from 40 to 20 percent (USDI FWS, BLM and USFS 2008). Bart and Forsman (1992) found that areas with less than 20 percent suitable habitat had few spotted owls and less reproductive success than areas with more suitable habitat. Table W-3 shows that all seven home ranges within the Analysis Area are below the viability threshold, ranging between nine and 14 percent.

CORE AREA -The northern spotted owl core area is a 0.5-mile radius circle centered on an activity center, encompassing an area of approximately 500 acres. The core area is used to describe the area most heavily utilized during the nesting season (USDI/FWS 2008a). Core areas are defended by territorial northern spotted owls and generally do not overlap with other northern spotted owl pairs. The suitable habitat threshold considered essential to maintain northern spotted owl life functions is 50 percent (250 acres) of total core area acres (USDI/FWS 2008b). Table W-3 shows that all but one of the seven core areas within the Analysis Area is below the viability the threshold. The core area associated with the French Creek (IDNO 4014O) site is above the 50 percent threshold and currently contains 289 acres (58 percent) suitable habitat.

Two of the four sites where proposed units overlap core areas have been unoccupied since 2011 (Table W-2). One core area was last determined to have a pair of spotted owls in 2009 and 2010 and has since become unoccupied (Table W-2). The fourth site (Norris Creek; IDNO 3270A) produced two fledglings during the 2014 breeding season (Table W-2).

NEST PATCH - The 70-acre Nest Patch is centered within the core area and represented by a circle with a 300-meter radius that is centered on the nest tree (USDI/FWS 2008a). Two key habitat elements within a nest patch are: (1) canopy cover of dominant, co-dominant, and intermediate trees (conifers and hardwoods) and (2) the amount of down wood (USDI/FWS *et al*. 2008). Management actions that modify suitable and dispersal habitat within the nest patch are considered likely to affect reproductive success (USDI/FWS 2008b). Table W-3 shows the current habitat conditions with the nest patch of each of the seven northern spotted owl sites within the Analysis Area.

Known Owl Activity Centers (KOACs) is a designation on Matrix lands, of approximately 100 acres of the best northern spotted owl habitat near and usually encompassing nest sites known as of January 1, 1994 (ROD/RMP, pp. 34 and 48). They are managed as Late-Successional Reserves (ROD/RMP, p. 29) and timing restrictions for activities are applied to eliminate disturbance to nesting northern spotted owls (ROD/RMP, p. 48).

Critical Habitat is the habitat in a specific geographical area designated by the FWS as containing the physical and biological features essential to the conservation of a species. Critical habitat for the northern spotted owl includes forested stands that are currently unsuitable habitat but have the capacity to become suitable habitat in the future. The FWS issued revisions to critical habitat (USDI/FWS 2012b), identifying four (4) Critical Habitat Units (CHUs) with multiple subunits on the Roseburg District. The proposed harvest units are located in the Western Cascades South Subunit 6 (WCS-6). Of the approximately 57,210 acres of WCS-6 on the Roseburg District, there are 33,496 acres of suitable habitat and 9,296 acres of dispersal habitat within the WCS-6 subunit.

Special management considerations or protection are required in this subunit to address threats from current and past timber harvest and competition with barred owls *(Strix varia)* (USDI/FWS 2012b, p. 71927). This subunit is expected to function primarily for east-west connectivity between subunits and critical habitat units, and between the Oregon coast and the Western Cascades (USDI/FWS 2012b, p. 71927).

Two Principle Threats to the Northern Spotted Owl's continued survival are 1) habitat loss from timber harvest and catastrophic fire, and 2) competition from the barred owl for habitat and prey (USDI/FWS 2011a, I-6 through I-9).

HABITAT LOSS - Lint (2005) indicated that the Northwest Forest Plan recognized wildfire as an inherent part of managing northern spotted owl habitat in certain portions of the range. He further noted that loss of northern spotted owl habitat did not exceed the rate expected under the Northwest Forest Plan, and that habitat conditions were no worse, and perhaps better than expected. In particular, the percent of existing northern spotted owl habitat removed by harvest during the first decade was considerably less than expected. Courtney *et al.* (2004) indicated that models of habitat growth suggested substantial in-growth and development of habitat throughout the Federal landscape.

Courtney *et al.* (2004) also identified the primary source of habitat loss as catastrophic wildfire. Although the total amount of habitat affected by wildfires has been small, there is concern for potential losses associated with uncharacteristic wildfire in a portion of the species range. Courtney *et al.* (2004) noted that the risk to northern spotted owl habitat from uncharacteristic stand replacement fires is sub-regional, confined to the dry eastern and to a lesser extent the southern fringes of the northern spotted owl range. Wildfires accounted for 75 percent of the natural disturbance loss of habitat estimated for the first decade of Northwest Forest Plan implementation.

BARRED OWL - Barred owls (*Strix varia*) are native to eastern North America, but have moved west into northern spotted owl habitat. The barred owl's range now completely overlaps that of the northern spotted owl (Gutiérrez *et al.* 2004). The barred owl is considered a threat to the northern spotted owl because it is a direct competitor for prey and habitat and largely excludes northern spotted owls from their territories, especially during the breeding season (Hamer *et al.* 2007).

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 (Olson *et al.* 2005, Dugger *et al.* 2011, Forsman *et al.* 2011, Wiens 2014), ultimately resulting in probable range-wide population reductions (Forsman *et al.* 2011). Barred owl effects on spotted owl survival and colonization appear to be substantial and additive to effects of reduction and fragmentation of habitat in northern spotted owl home range area. The magnitude of the barred owl effect may increase somewhat as habitat quantity decreases and fragmentation increases (Dugger *et al.* 2011).

It has been established that activities that reduce the quantity of older forests adjacent to northern spotted owl activity centers reduce the probability of continued occupancy, survival, and reproduction (Franklin *et al.* 2000, Olson *et al.* 2004, Dugger *et al.* 2005, Dugger *et al.* 2011, Schilling *et al.* 2013). When barred owls are present, the effect of such activities on northern spotted owl pair survival (estimated as probability of extinction of a single territory and termed "extinction probability") may be exacerbated by 2-3 times (Dugger *et al.* 2011). However, some spotted owls appear to be able to successfully defend territories and reproduce when barred owls are present (Dugger *et al.* 2011, Weins 2014), but the mechanism that allows them to persist is currently unknown.

Although barred owls and northern spotted owls use the same forest types and both appear to prefer older forests, barred owls appear to use forest stand types in proportion to their availability, while northern spotted owls are reliant on older forest (Dugger *et al.* 2011, Weins 2014). Manipulation of older forest stand structure through silvicultural or other means would alter habitat conditions for both the barred owl and northern spotted owl. The relative effect on barred owls may be lesser because they do not appear as dependent on older forests as spotted owls, but there is no evidence that modification would facilitate barred owl invasion into areas as they do not appear to select disproportionately for young or low density stands (Wiens *et al.* 2014). Northern spotted owls displaced by timber management are unlikely to successfully establish a new territory in areas where barred owls are present (Dugger *et al.* 2011, Yackulic *et al.* 2013). Displaced spotted owls may survive for some period but if they are not able to establish a new territory, their contribution to the population is minimal at best.

Modeling of the relationship between northern spotted owl site extinction probability and proportion of habitat at the core scale indicates that decreasing amounts of old forest increases extinction rates for spotted owls, and when barred owls are detected in northern spotted owl core use areas the extinction rate is 2-3 times higher than it would be if barred owls were not detected. The relative effect of barred owls on extinction probability increases as proportion of older forest habitat at the core area scale decreases (Dugger *et al.* 2011). Based on the modeling done by Dugger *et al.* (2011) when there is 95 percent habitat within the core circle, the extinction probability for northern spotted owl sites is 0.11, with barred owls it increases to 0.33, at 50 percent habitat the extinction probability is ~ 0.17, increasing to ~ 0.42 with barred owl and at 20 percent it is 0.21 without barred owls, increasing to 0.5 with barred owls. This is likely because any reduction of real habitat increases the effect of the effective habitat loss (real habitat reduction plus the effect of exclusion from habitat due to barred owl competition) disproportionally.

The presence of barred owls affects detectability rates during surveys and/or social instability of northern spotted owl pairs, thus affecting occupancy, reproduction, and survival at these sites (Olson *et al.* 2005, Pearson and Livezey 2003). Barred owls were initially detected in the project area in 1994.

There is no data indicating a relationship between forest treatments or lack of treatments and an increase or decrease in the distribution of the barred owl. Independent of the proposed alternative, the barred owl would remain in the Analysis Area and is expected to continue increasing its distribution and numbers displacing northern spotted owls.

b) ***Affected Environment***

For the analysis of effects to northern spotted owls and its habitat in the Calapooya project area, the most recently occupied activity center and its corresponding nest patch, core area, and home range were used to determine habitat impacts for each owl site. Surveys have been completed within the Calapooya project area since 2008. However, consecutive annual protocol surveys have not been completed within the entire project area beginning in 2008; in some cases, random visits to historic sites were completed to establish occupancy status in years prior to beginning protocol surveys. Because of lack of protocol surveys during certain years, all but one site have an unknown status for one or more years within the last five years (Table W-2).

(1) *Disruption/Disturbance*

Noise, human intrusion, and mechanical movement may cause some form of disruption or disturbance to the normal behavioral patterns of nesting northern spotted owls. The **disruption threshold** is the distance activities occurring during the critical breeding period could disrupt the normal behavior pattern of an individual or breeding pair (i.e. flushing from a nest or cause a feeding attempt to fail) (USDI/FWS 2010). The **disturbance threshold** is the distance that effects to northern spotted owl nesting behavior from noise, human intrusion, or mechanical movement would be "discountable" or "insubstantial."

Based on survey results to date, the closest northern spotted owl activity center (Norris Creek, IDNO 3270A) is located approximately 325 yards (0.2 miles) west of Unit 23A (Appendix H, Figure 8). The other activity centers in the project area are located approximately 335 to 940 yards (0.2 to 0.5 miles) from proposed unit boundaries. There are three activity centers located in suitable habitat adjacent to proposed units. Although the activity centers are currently located outside of the disruption distance thresholds (e.g. 65 yards for chainsaws, 35 yards for heavy equipment), seasonal restrictions would apply for harvest operations occurring adjacent to occupied stands during the northern spotted owl critical breeding season (March 1-July 15), until full protocol surveys or spot check surveys have been completed to determine the current location of nesting owls.

(2) *Northern Spotted Owl Habitats*

SUITABLE HABITAT

No suitable habitat within a nest patch, core area, or home range of any northern spotted owl activity center would be removed or modified under the *Proposed Action Alternative*.

DISPERSAL HABITAT

All of the proposed units are considered to be northern spotted owl dispersal habitat because the stands contain relatively small tree sizes (quadratic mean diameter 11 to 22 inches), relatively high tree densities (Table FV-2, p. 34), and lack suitable habitat components (i.e. nest structure and multiple canopy layers). Approximately 1,182 acres of dispersal habitat would be treated with a VDT prescription, including a total of six acres that would be removed for gap creation in two previously thinned units. Approximately 91 acres of dispersal habitat, including 84 acres within Unit 29G and seven acres within Unit 17C, would be treated with a VRH prescription under the *Proposed Action Alternative* (Chapter 2, Table 2, p. 13-14). No dispersal habitat would be removed outside of unit boundaries for construction of spurs roads.

HABITAT FOR PREY SPECIES – Table FV-3 (p. 35) summarizes that the number of snags less than 20 inches dbh is approximately at 1.6 snags per acre and snags at least 20 inches dbh is approximately 0.4 snags per acre within the Calapooya project area. Most wildlife species (including northern spotted owls and their prey) use snags greater than 18 inches dbh to provide multiple life-cycle needs (Mellen *et al*. 2009). Small diameter snags are used primarily as foraging habitat by wildlife (Hagar 2008, Mellen *et al*. 2009).

Table FV-3 (p. 35) presents the average cubic feet per acre and average percent ground cover of coarse down wood measured on line-intercept transects within the proposed units. Coarse down wood of at least 10 percent ground cover is needed to ensure high northern spotted owl prey populations in Douglas-fir forests in southwestern Oregon (Carey and Harrington 2001). The ground cover condition is currently at three percent, below the 10 percent threshold, indicating insufficient coarse down wood to support high spotted owl prey populations within these stands.

Woodrats and other prey species of the northern spotted owl, such as red-backed voles, rabbits, Douglas squirrels, chipmunks, and deer mice are associated with early-and mid-seral forest habitat (Maser *et al.* 1981, Sakai and Noon 1993, Carey *et al.* 1999) and comprise nearly 50 percent of the prey biomass (Forsman *et al.* 2004).

Some units have well developed understories with groups of hardwoods and shrubs, and show signs of use by flying squirrels, dusky-footed woodrats and bushy-tailed woodrats, which are common on the Roseburg District.

(3) *Northern Spotted Owl Analytical Spatial Scales*

DISPERSAL HABITAT – Table W-4 presents the total acres of dispersal habitat that would be modified (thinned) or removed (VRH/ gap creation) within the proposed units at each spatial scale for the northern spotted owl. Effects of the proposed harvest treatments at each analytical spatial scale for the seven spotted owl sites are described below.

HOME RANGE - Approximately 635 acres in 16 of the 26 proposed units are located within the home range of one or more northern spotted owl activity centers (Tables W-4 and W-5; Appendix H, Figure 8). A total of 629 acres of dispersal habitat would be modified within the home ranges of seven spotted owl sites and six acres would be removed through the creation of gaps within the home range of one spotted owl site within the Analysis Area (Tables W-3 and W-4). Variable retention harvest of 91 acres of dispersal habitat would not occur within any spotted owl home range.

CORE AREA - Approximately 90 acres within six harvest units overlap four northern spotted owl core areas (Tables W-4 and W-5; Appendix H, Figure 8); two of the four sites where proposed units overlap core areas have been unoccupied since 2011 (Table W-2). One core area was last determined to have a pair of spotted owls in 2009 and 2010 and has since become unoccupied. The fourth site produced two fledglings during the 2014 breeding season (Table W-2).

NEST PATCH - Timber harvest or road construction would not occur within a nest patch associated with the most recently active northern spotted owl nest site (Tables W-4 and W-5). However, eight acres of thinning would occur within the original nest patch for the Norris Creek nest site (IDNO 3270O) which is currently occupied by barred owls.

Table W-4. Current Habitat Conditions and Acres of Habitat Proposed for Modification or Removal at each Spatial Scale for the Northern Spotted Owl within the Analysis Area.

SITE NAME	NEST PATCH (NP) (70 ACRES)					CORE AREA (CA) (500 ACRES) *[PERCENT FED ACRES]*						HOME RANGE (HR) (2,955 ACRES) *[PERCENT FED ACRES]*					
		NRF (ACRES)		DISPERSAL (ACRES)			NRF (ACRES)		DISPERSAL (ACRES)				NRF (ACRES)		DISPERSAL (ACRES)		
	FED ACRES	CURRENT	REMOVED/ MODIFIED	CURRENT	REMOVED/ MODIFIED	FED ACRES	CURRENT	REMOVED/ MODIFIED	CURRENT	REMOVED	MODIFIED	FED ACRES[1]	CURRENT	REMOVED/ MODIFIED	CURRENT	REMOVED	MODIFIED
FIELD CREEK *IDNO 2202B*	41	37	0	3	0	292	104	0	85	0	42	859	326	0	189	0	114
FRENCH CREEK *IDNO 4014O*	70	62	0	0	0	400	289	0	78	0	20	1061	399	0	414	0	63
GOSSETT CREEK *IDNO 0355B*	66	39	0	16	0	306	132	0	22	0	12	923	263	0	333	0	127
KELLY CREEK *IDNO 1794O*	70	68	0	0	0	351	204	0	38	0	0	1220	369	0	353	0	3
MILL CREEK MS *IDNO 3900C*	38	29	0	0	0	212	130	0	38	0	0	1,336	405	0	505	6	180
NORRIS CREEK[1] *IDNO **3270A***	***36***	***18***	***0***	***0***	***0***	***198***	***38***	***0***	***37***	***0***	***16***	***963***	***305***	***0***	***326***	***0***	***198***
SCOTTS TERRACE *IDNO 4013O*	35	24	0	0	0	337	33	0	184	0	0	1135	307	0	433	0	9

[1] ***Bold italicized*** font indicates the spotted owl site that produced young in 2014.

Table W-5. Northern Spotted Owl Dispersal Habitat by Spatial Scales within Calapooya Proposed Units[1].

PROJECT	*GREEN GAS*																	
UNIT	**7H**	**17B**	**17D**	**19B**	**29G**	**29H**	**33A**	**23A**	**25A**									**TOTAL ACRES**
UNIT ACRES	***39***	***40***	***35***	***6***	***84***	***10***	***64***	***223***	***4***									***505***
HOME RANGE	38	40	35	0	0	0	63	194	4									374
CORE AREA	11	29	2	0	0	0	20	16	0									78
NEST PATCH	0	0	0	**0**	0	0	0	0	0									0
PROJECT	*GOOD BOYD*																	
UNIT	**1A**	**1B**	**9C**	**13A**	**13B**	**13C**	**15A**	**5A**	**5B**	**7B**	**7C**	**9C**	**9D**	**11A**	**11B**	**11C**	**17C**	**TOTAL ACRES**
UNIT ACRES	***64***	***20***	***149***	***23***	***7***	***43***	***25***	***11***	***42***	***27***	***57***	***63***	***25***	***88***	***35***	***47***	***14***	***740***
HOME RANGE	43	20	0	22	7	26	0	0	0	26	56	0	0	55	**3**	**3**	0	261
CORE AREA	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	12
NEST PATCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SUMMARY	**CALAPOOYA**		
PROJECT	**GREEN GAS (ACRES)**	**GOOD BOYD (ACRES)**	**TOTAL ACRES**
PROJECT ACRES	***505***	***740***	***1245***
HOME RANGE	374	261	**635**
CORE AREA	78	12	**90**
NEST PATCH	0	0	**0**

[1] Gray shading indicates units that are proposed for VRH or Gap Creation only (units 11B and 11C) that would result in the removal of dispersal habitat

(4) *Known Owl Activity Centers*

Proposed Unit 23A overlaps with the KOAC associated with the Norris Creek northern spotted owl site. The 104-acre KOAC is comprised of 84 acres of suitable habitat and 20 acres of dispersal habitat. Approximately 15 acres of dispersal habitat, 14 percent of the KOAC, would be thinned at the northeast corner. Currently, the Norris Creek pair occupies an alternate activity center outside of the KOAC. Recent protocol surveys for the northern spotted owl have documented the KOAC to be occupied by a pair of barred owls since 2010. The first barred owl was detected within the KOAC in 1994, so it is likely the site has been occupied by a pair of barred owls prior to 2010, which is presumably the reason the spotted owls relocated outside of the KOAC.

(5) *Designated Critical Habitat*

None of the Good Boyd units are located within critical habitat designated for the northern spotted owl (Table W-6). Five Green Gas units (204 total acres) and two acres of Unit 17D are located within the WCS-6 subunit (Table W-6). Of the 206 acres within critical habitat, 84 acres of dispersal habitat are proposed for treatment (Unit 29G) through VRH and 122 acres would be modified with VDT treatments (Table W-6). These harvest activities would affect 0.3 percent (206 of 71,984 acres) of the critical habitat sub-unit.

Table W-6. Calapooya Unit Acres Located within Designated Critical Habitat (Sub-unit WCS 6) for the Northern Spotted Owl.

PROJECT	***GREEN GAS***									
UNIT	**7H**	**17B**	**17D**	**19B**	**29G**	**29H**	**33A**	**23A**	**25A**	**TOTAL ACRES**
UNIT ACRES	*39*	*40*	*35*	*6*	*84*	*10*	*64*	*223*	*4*	*505*
ACRES IN NSO CHU WCS 6	0	40	2	6	84	10	64	0	0	206
DISPERSAL ACRES REMOVED	0	0	0	0	84	0	0	0	0	**84**
DISPERSAL ACRES MODIFIED	0	40	2	6	0	10	64	0	0	**122**
PROJECT	***GOOD BOYD***									
ACRES IN NSO CHU WCS 6	No Critical Habitat									0
TOTAL ACRES AFFECTED WITHIN CRITICAL HABITAT										***206***

c) ***Environmental Consequences***

(1) **No Action Alternative**

(i) Disruption/Disturbance

Current northern spotted owl occupancy and home range viability would not be directly affected by disruption due to proposed activities, but may be affected by harvest on private timber lands.

(ii) Effects to Dispersal Habitat

The quality and availability of northern spotted owl habitat would be unaffected under the *No Action Alternative*. Forest development would proceed along trajectories described in the *Forest Vegetation* section (pp. 35-36). This alternative would not increase habitat diversity as quickly as expected under the *Proposed Action Alternative*.

The proposed Calapooya units would continue to function as dispersal habitat. At the unit-scale, habitat conditions would remain generally unchanged in the short-term unless a major disturbance such as fire, wind, ice, insects, or disease occurred. Otherwise, the primary influence on long-term habitat development would be the growth and mortality of overstory trees. Without silvicultural treatment or natural disturbance, canopies would remain closed and individual tree growth would slow even as stand growth continues.

Stand diversity and complexity would decrease over time as a result of stem exclusion. In the short term, the amount of dispersal habitat would remain unchanged. However, as canopy cover continues to increase towards 100 percent over the next 10 or more years, the representation of existing shrubs (currant sp. (*Ribes sp.*, huckleberry *(Vaccinium sp.)*, ocean spray *(Holodiscus discolor)*, etc.) and hardwoods (alder, big-leaf maple, golden chinquapin *(Chrysolepis chrysophylla)*, and oaks *(Quercus sp.)* would decline in abundance, diminishing the quality of dispersal habitat. As stand structure begins to diversify, suppression mortality would be replaced by irregular mortality due to insects, disease, windthrow and stem breakage, which could occur across all crown classes at any age. Multi-layered tree canopy would be evident at about 100 years (Oliver and Larson 1990; Munger 1940), but development of habitat features such as large limbs to support nesting platforms, large diameter trees and snags with cavities, and large down wood would be delayed until approximately 160 years of age. Scattered and isolated legacy trees would continue to provide habitat diversity.

EFFECTS ON HABITAT USE BY NORTHERN SPOTTED OWLS – Dispersal habitat would continue to function in its current condition. However, as the existing understory diversity declines in abundance, the quality of dispersal habitat would be diminished for spotted owls due to a potential reduction in prey availability and a high tree density limiting the ability for owls to effectively maneuver through the stands. Thus, dispersal habitat would decline in function for the northern spotted owl.

EFFECTS ON PREY SPECIES - Populations of northern spotted owl prey species, such as northern flying squirrels, would remain near existing levels and existing habitat would be subject to natural processes. Woodrats would be indirectly affected by a decline in forage and habitat as shade intolerant hardwoods and shrubs, where present, would be suppressed and eventually die. Competition mortality would need to continue until the dominant tree density decreases enough to allow understory development. A continuous closed canopy would limit the opportunity for increasing the horizontal and vertical heterogeneity in vegetation structure and species diversity that would provide habitat complexity important for small mammals (Carey and Harrington 2001).

The *No Action Alternative* would produce the highest amount of dead wood from passive recruitment since trees would not be removed (q.v., p. 35; Table FV-5, p. 36). Suppression mortality would occur primarily in the smaller size classes of trees and would be the main source for snag and coarse down wood recruitment. Dead trees would stand for a relatively short time and ultimately fall but would not create openings as in late-seral stands because of the small size of the snags. The large number of small snags and coarse down wood would provide foraging habitat but would provide fewer nesting or denning opportunities for northern spotted owl prey species.

(iii) Effects to Northern Spotted Owl Spatial Scales

Current northern spotted owl occupancy would not be directly affected by proposed actions. No habitat modification or removal would occur that could affect the present viability of home ranges and core areas within the Analysis Area. These sites would continue to function in their present condition.

(iv) Designated Critical Habitat

Primary Constituent Elements (e.g. dispersal habitat) would not be removed or modified and the current quality and availability of northern spotted owl habitat would be

unaffected under the *No Action Alternative.* The Critical Habitat Sub-Unit WCS-6 would continue to function in its current condition. Stands within the Critical Habitat Sub-unit would develop more slowly through natural processes and the structural complexity would be insufficient to provide nesting habitat or gaps large enough for the survival or development of diverse grass, forbs, shrubs, and hardwoods, to support abundant prey populations.

(2) **Proposed Action Alternative**

(i) Disruption/Disturbance

Under the *Proposed Action Alternative,* there would be no disruption concerns for northern spotted owls because all harvest activities would be conducted outside of the minimum disruption thresholds established by the FWS from any northern spotted owl site. If nesting northern spotted owls move within the disruption distance from the project area, seasonal restrictions would be applied from March 1 to July 15, as described in *Chapter 2* (p. 28). This would ensure that noise disruption would not cause northern spotted owls to abandon nests or fledge prematurely.

(ii) Effects to Dispersal Habitat

Wildlife features were identified during field review of the units, including pockets of coarse down wood and/or snags, rock outcrops, wetland meadows, pockets of vegetative diversity with hardwoods, shrubs, and trees within structure/characteristics. Most of the wildlife features that were identified would be maintained within "skips" or aggregates and would not be treated. Additional skips include no harvest buffers within Riparian Reserves and areas of unstable soils. Approximately 224 unit acres (18 percent), including Riparian Reserves, would be maintained as aggregates dispersed within the Calapooya units (Table 3b, p. 15).

THINNING TREATMENTS - Thinning treatments would be conducted on 1,176 acres and would modify habitat features important to spotted owl dispersal, including horizontal and vertical structure, canopy cover, and hardwoods.

The quality of dispersal-only habitat would be temporarily degraded by the thinning treatments because decreasing tree density and removing overstory canopy cover would modify vertical and horizontal cover. Large remnant trees, dominant and co dominant hardwoods, snags, and coarse down wood would be reserved and protected to the extent practicable. Thinning may initially reduce shrub and herbaceous vegetation cover, where present; however, plant diversity and cover would increase to levels beyond pre-treatment conditions (Chan *et al*. 2006, Bailey *et al*. 1998).

Post-treatment canopy closure would be maintained between 44 and 76 percent (Table W-7) and the quadratic mean diameter would be between 11 and 16 inches (q.v. Table FV-6, p. 39). Thus, treated stands on approximately 1,065 acres would maintain dispersal function because canopy cover would remain above the 40 percent canopy cover threshold and other structural elements important for northern spotted owl dispersal would be retained. A conservative assumption based on the ORGANON model output is crown cover would recover about one percent per year following treatment. However, canopy closure, as measured by percent skylight, would recover faster, up to two percent per year (q.v. *Forest Vegetation*, p. 37).

Table W-7. Canopy Cover Impacts to Northern Spotted Owl Dispersal Habitat for Thinning Units.

PROJECT	***GREEN GAS***													
UNIT	**7H**	**17B**	**17D**	**19B**	**29H**	**33A**	**23A**	**25A**						
UNIT ACRES	***39***	***40***	***35***	***6***	***10***	***64***	***223***	***4***						
PRE-HARVEST CANOPY COVER	83	86	83	89	96	93	75	96						
POST-HARVEST CANOPY COVER	54	66	64	60	65	72	70	65						
PROJECT	***GOOD BOYD***													
UNIT	**1A**	**1B**	**9C**	**13A**	**13B**	**13C**	**15A**	**5A**	**5B**	**7B**	**7C**	**9C**	**9D**	**11A**
UNIT ACRES	***64***	***20***	***149***	***23***	***7***	***43***	***25***	***11***	***42***	***27***	***57***	***63***	***25***	***88***
PRE-HARVEST CANOPY COVER	91	99	90	90	88	88	92	85	85	89	97	78	75	55
POST-HARVEST CANOPY COVER	75	76	60	69	69	66	62	74	65	67	72	60	56	44

The treatments, particularly VDT that includes heavy thinning treatments and gap creation, would improve dispersal habitat conditions as canopy cover increases and multi-canopy and multi-species layers develop, creating more favorable roosting and foraging habitat conditions. Portions of stands would develop the structural components used by northern spotted owls, such as multiple canopy layers, large diameter trees, large snags, and coarse down wood. Over time, the proposed thinning treatments would enhance nesting, roosting, and foraging habitat, improve habitat connectivity, and reduce the risk of habitat loss from stand-replacing wildfires. Consequently, the *Proposed Action Alternative* would benefit northern spotted owl habitat in the long-term.

THINNING EFFECTS ON HABITAT USE BY NORTHERN SPOTTED OWLS- Scientific reports show the effects of thinning on the northern spotted owl are varied. Much of the research work treated stands with nesting, roosting, and foraging components and illustrated the variability of northern spotted owl responses to treatments. Thinning may reduce use of the stands by northern spotted owls because of increased exposure to weather and increased risk of predation from other raptors as they move across the landscape, which would persist until the stands return to pre-thinning levels of canopy cover.

Under the *Proposed Action Alternative,* a total of approximately 38 acres are proposed for heavy thinning treatment, eight acres (20 percent of unit) and 30 acres (19 percent of unit), within Unit 7H and Unit 9C, respectively (Appendix H, Figures 4 and 5). Meiman *et al*. (2003) found that heavy thinning reduced stand use by northern spotted owls. Northern spotted owls increased the size of their home ranges to use untreated stands in preference to heavily treated stands both during and after harvest (Meiman *et al*. 2003).

Factors that reduce the quality of habitat within a home range or cause increased movement by northern spotted owls to find prey may decrease the survival and reproductive fitness of the owls at that site (Meiman *et al*. 2003).

In contrast, work by Forsman *et al*. (1984) in older late-successional forests and by Lee and Irwin (2005) in younger forests indicates lightly thinned stands receive moderate to high use by northern spotted owls. Preliminary research in southwest Oregon and northern California has indicated northern spotted owls generally foraged within thinned stands on BLM-administered lands (Irwin *et al.* 2010). Generally, research data supports that northern spotted owls continue to use thinned stands for foraging when overall canopy cover remains above 50 percent (Forsman *et al.* 2004, Hanson *et al*. 1993).

Post-harvest canopy cover in 21 thinning units is predicted to range between 54 to 76 percent (Table W-4). Even though there would be a variable treatment of tree densities within the thinning units, including heavy thinning in two units (Unit 7H and Unit 9C), stand average canopy cover on 877 acres would remain above the minimum threshold of 50 percent post-treatment. Thus, it is expected that northern spotted owls would continue to use the dispersal habitat within these stands because sufficient canopy cover would be maintained to support foraging spotted owls (Forsman *et al.* 2004, Hanson *et al*. 1993). The habitat would increase in forage quality as the understory components, including forbs and shrubs, develop to provide resources for prey species.

Post-harvest canopy cover for Unit 11A is projected to be approximately 44 percent and would remain above the 40 percent threshold. However, because the post-harvest canopy cover would be below 50 percent, northern spotted owls may utilize this stand less than those stands with a post-harvest canopy cover of 50 percent or more. Canopy cover in unit 11A is expected to return to 50 percent or more in 6-10 years, creating more favorable conditions for foraging spotted owls in the future.

THINNING EFFECTS ON PREY SPECIES - Northern spotted owl prey species, such as brush rabbits, woodrats, and other rodents are primarily associated with forest stands less than 80 years old (Maser *et al.* 1981, Sakai and Noon 1993, Carey *et al.* 1999). These small mammals would benefit from increased understory and shrub development created by the proposed thinning treatments (Carey 2001, Carey and Wilson 2001, Haveri and Carey 2000), which would subsequently benefit northern spotted owls by providing more prey available for capture.

Thinning, particularly VDT can have rapid positive effects for many forest-floor prey species (e.g. mice, voles, and chipmunks) because of increased understory development (Carey 2001, Carey and Wilson 2001, Haveri and Carey 2000). However, flying squirrel populations may be suppressed for several decades until long-term ecological processes provide sufficient structural complexity (Wilson 2008). Wilson (2008) suggests short-term effects to flying squirrels could be reduced while trying to create forest complexity that would benefit them in the long-term. The *Proposed Action Alternative* incorporates some of the suggestions, including:

- retention of existing large decadent trees and snags;
- retention of no-harvest areas to provide travel corridors from adjacent late seral habitats and across the landscape;
- retention of a range of tree size classes throughout the stand;
- improvement of foraging opportunities by promoting the development of understory and shade-tolerant tree species throughout the stand; and

- maintenance of canopy cover within the stands (e.g. light and moderate thinning areas), which would provide protective cover from predators and tree densities allowing flying squirrels to glide between trees and move through a stand to access foraging areas.

The residual stands following harvest would provide a pool of candidate trees for future snag and coarse down wood recruitment in addition to the coarse woody debris and snags created incidentally through the harvest operations (e.g. damage leading to broken-out tops or individual tree mortality) or through weather damage (e.g. wind and snow break). Although fewer snags would develop over time when compared to the *No Action Alternative* (q.v. Table FV-5, p. 36), they would be larger with more resiliency and limb structure (Reukema and Smith 1987) than snags that develop under a more competitive stand condition (Neitro *et al.* 1985). The coarse down wood ground cover is predicted to be between five and eight percent (q.v. Table FV-5, p. 36), which is below the 10 percent threshold needed for high northern spotted owl prey populations (Carey *et al*. 1999a).

GAP CREATION –Units 11B and 11C would each be treated by creating two gaps, totaling approximately three acres within each unit (Appendix H, Figure 5). The maximum size of a proposed gap is approximately 1.8 acres and the average gap size is 1.6 acres. Both units were previously thinned with light and moderate thinning prescriptions within the last 10 years. Gaps would be created to provide some variability and diversity within these C/D stands.

Initially, the creation of gap openings would allow sufficient light to reach the forest floor to allow for the natural regeneration of conifer and hardwood species that are less shade tolerant. Gaps within the stand would also promote the establishment and growth of herbaceous plants, forbs and shrubs that would provide organic nutrients, and shelter and forage for an array of birds, mammals, and invertebrate species. These conditions would be expected to persist for a period of approximately 15-20 years. Over the longer term, these gaps would allow for the growth of larger trees adjacent to the openings, with full crowns and large limbs more typical of open-growth conditions. Gaps within the stand would also benefit small mammals that inhabit and/or forage in the forest understory, and those species that prey upon them.

GAP EFFECTS ON HABITAT USE BY NORTHERN SPOTTED OWLS - Approximately six acres of dispersal habitat would be removed due to gap creation within the two units. At the stand level, canopy cover would be maintained at 42 percent within Unit 11B, above the 40 percent canopy cover threshold for dispersal habitat (Table W-8). This stand is expected to continue functioning as dispersal habitat because canopy cover is above the 40 percent threshold.

Table W-8. Canopy Cover impacts to Northern Spotted Owl Dispersal Habitat for Gap Creation Treatment Units.

PROJECT	***GOOD BOYD***	
UNIT	**11B**	**11C**
UNIT ACRES	***35***	***47***
PRE-HARVEST CANOPY COVER	45	40
POST-HARVEST CANOPY COVER	42	37

The pre-treatment stand average canopy cover for Unit 11C is currently approximately 40 percent, at the dispersal habitat threshold. After removing three acres of dispersal habitat to create two gaps within the stand, the stand average canopy cover would be reduced to approximately 37 percent. At the stand level, Unit 11C (47 acres) would temporarily become capable habitat because gap creation would reduce the canopy cover below the 40 percent threshold for dispersal habitat by definition (Thomas *et al.* 1999) (Table W-8). Canopy cover is expected to recover to 40 percent or greater at the stand level within five years or less, at which point the stand, as a whole, would again function as dispersal habitat.

Capable habitat would not typically provide habitat conditions for dispersing northern spotted owls. However, within this unit the gap creation would be localized in the southwest portion of the stand and would be surrounded by untreated dispersal habitat. Therefore, approximately 44 acres (94 percent) of the 47-acre unit would be maintained at or above 40 percent canopy cover and is expected to continue to function as dispersal habitat. Northern spotted owls may avoid the newly established gaps until vegetation begins to develop and prey species (i.e. small mammals) become available to forage upon within the gaps, particularly along the gap edge.

Forsman *et al.* (2002) found that northern spotted owls could disperse through highly fragmented forest landscapes, yet the stand-level and landscape-level attributes of forests needed to facilitate successful dispersal have not been thoroughly evaluated (Buchanan 2004). In addition, there is little evidence that small openings in forest habitat influence the dispersal of spotted owls, but large, non-forested valleys such as the Willamette Valley apparently are barriers to both natal and breeding dispersal (Forsman *et al.* 2002). Therefore, it is expected that spotted owls would continue to use these stands after the gaps are created. Dispersal habitat quality is expected to improve as canopy cover increases which would provide better thermal cover and protection from predators for the northern spotted owl. In addition, as shrub layers and forbs continue to develop that benefit prey species within the stand and the gaps, northern spotted owls would be expected to use the gaps for foraging.

GAP EFFECTS ON PREY SPECIES – Gap creation would remove a total of six upland acres of flying squirrel habitat. Although flying squirrels would be expected to avoid the gaps, the remaining unmodified stand surrounding the gaps would continue to provide travel corridor habitat through the stand from adjacent late seral stands. In addition, maintenance of canopy cover within the stands would continue to provide protective cover from predators allowing flying squirrels to glide between trees and move through a stand to access foraging areas.

Northern spotted owl prey species, such as brush rabbits, woodrats, would benefit from increased understory and shrub development within the gaps, which would subsequently benefit northern spotted owls by providing more prey available for capture.

VARIABLE RETENTION HARVEST – Variable retention harvest would remove habitat features important to northern spotted owl dispersal, including horizontal and vertical structure, canopy cover, and hardwood trees. Stand-level canopy cover that falls below 40 percent dispersal function threshold (Thomas *et al.* 1990) would become capable habitat.

Within Unit 29G, approximately 37 acres (44 percent) of the unit would be maintained in aggregate retention areas. In addition, nine green trees per acre would be retained as individual trees or small aggregates on approximately 47 acres (56 percent of the unit acres) of dispersed retention in the unit. The post-harvest stand average canopy cover would be approximately 39 percent (Table W-9, FV-8), below the 40 percent threshold for dispersal habitat at the stand level.

Table W-9. Canopy Cover Impacts to Northern Spotted Owl Dispersal Habitat for Variable Retention Harvest Units.

PROJECT	*GREEN GAS*	*GOOD BOYD*
UNIT	**29G**	**17C**
UNIT ACRES	***84 acres***	***14 acres***
PRE-HARVEST CANOPY COVER (Table FV-2)	75%	94%
POST-HARVEST CANOPY COVER(Table FV-8)	39%	45%
Aggregate Retention Areas	*86%*	*100%*
Thinning Areas	*N/A*	*62%*
Dispersed Retention Areas	*11%*	*14%*

Unit 17C would be comprised of approximately three acres of aggregates (21 percent of unit acres), approximately four acres of moderate thinning (29 percent of unit acres), and seven acres (50 percent of unit acres) of dispersed retention harvest. The post-harvest stand-average canopy cover would be approximately 45 percent (Table W-9), remaining above the 40 percent dispersal function threshold (Thomas *et al.* 1990). The three portions of the unit that would have regeneration harvest would have a predicted post-harvest canopy cover of approximately 14 percent (Table FV-8, p. 42). Post-harvest canopy cover within the moderately thinned areas is predicted to be approximately 62 percent and the aggregates would remain at 100 percent. The seven acres of thinning and aggregates combined would have a canopy cover average of approximately 81 percent which is above the 40 percent dispersal function threshold. The aggregated and thinning areas would be contiguous, as well as contiguous with an adjacent stand of suitable habitat (Appendix H, Figure 5). Given the aggregated and thinning areas would not be fragmented by the dispersed retention harvest area and would have a post-harvest canopy cover maintained well above 60 percent, approximately seven acres of this stand would continue to function as dispersal habitat. However, there would be an overall loss of seven acres of dispersal habitat due to dispersed retention harvest in this unit.

Therefore, 84 and seven acres of dispersal habitat in Units 29G and 17C, respectively, would be removed by variable retention harvest within the Analysis Area. Removal of dispersal habitat would fragment forest habitat within two stands downgrading a total of 91 acres of dispersal habitat to capable habitat.

In the long term, variable retention harvest would provide other ecological benefits by allowing retention trees to grow larger faster, and to develop other suitable wildlife habitat characteristics, such as large limbs and crowns, including trees along edges of dispersed retention. These trees would become a future source for large trees and then subsequently large snags and downed wood. As discussed previously for gap creation, areas where dispersed retention occurs would promote the establishment and growth of herbaceous plants, forbs and shrubs that would provide organic nutrients, and shelter and forage for an array of birds, mammals, and invertebrate species, including prey species for the spotted owl.

VARIABLE RETENTION HARVEST EFFECTS ON HABITAT USE BY NORTHERN SPOTTED OWLS- Variable retention harvest would create retention aggregates interspersed with concentrated harvest with dispersed retention. Canopy closure outside of the retention aggregates would be reduced to 11 to 14 percent (Table W-9). Although important components of suitable habitat (snags, down wood, hardwood, legacy conifers and residual green trees) would be retained, VRH would create conditions that would not support northern spotted owl use.

Variable retention harvest would create larger openings where northern spotted owls moving through the stands would be subject to a greater risk of predation from other raptors until the replacement stands begin to function as dispersal habitat in approximately 40 years. However, retention of no-harvest aggregated retention areas and Riparian Reserve would provide travel corridors for the northern spotted owl, as well as protection from weather and predators, as they travel across the landscape.

In VRH units, retained habitat components would contribute to future development of suitable habitat providing the necessary habitat diversity such as multi-layered canopy, large trees and snags. Treated areas would begin functioning as dispersal habitat in approximately 40 years. Development of suitable habitat would occur as the stands regenerate in approximately 60-80 years.

VARIABLE RETENTION HARVEST EFFECTS ON PREY SPECIES -Variable retention harvest would remove 63 upland acres of flying squirrel habitat, reducing the flying squirrel prey base for the northern spotted owl. Removal of dispersal habitat would fragment forest habitat within two stands. Within Unit 29G, 37 acres (44 percent) of the unit would be maintained in aggregates. In addition, nine green trees per acre would be retained, either as individual trees or within small aggregates, within the dispersed retention portion of the units. As described in the thinning section above, retention of no-harvest areas would provide travel corridors for flying squirrels from adjacent late-seral stands which would continue to provide habitat and the flying squirrel prey base for the northern spotted owl.

For species like brush rabbits, woodrats, and other rodents that are found in early- and mid-seral forest habitat (Maser *et al.*, 1981; Sakai and Noon, 1993; Carey *et al.*, 1999), populations would be expected to increase from the creation of 63 upland acres of early-successional habitat with diverse communities of flowering and fruiting shrubs, herbs and grasses that would provide cover and abundant forage for northern spotted owl prey species, hence benefitting the owl.

(iii) Effects to Northern Spotted Owl at the Analytical Spatial Scales

Variable retention harvest would not occur within a northern spotted owl home range, core area, or nest patch. In addition, no harvest activities would occur within a currently or recently occupied nest patch.

HOME RANGE - Proposed thinning and gap-only creation would occur in 16 harvest units within one or more northern spotted owl home ranges. A total of 635 acres of dispersal habitat would be affected within the seven home ranges (Tables W-3 and W-4). Thinning treatment would modify a total of 629 acres and gap creation would remove six acres of dispersal habitat within northern spotted owl home ranges.

THINNING TREATMENT - Dispersal habitat would be modified by thinning activities in 14 harvest units within the home ranges of seven northern spotted owl sites. Thirteen of the 14 harvest units (532 acres) under the *Proposed Action Alternative* would have a post-harvest canopy cover that exceeds 50 percent (ranging from 54 to 76 percent) and therefore, would continue to provide foraging and dispersal opportunities for spotted owls. The remaining unit (Unit 11A; 55 acres) would have a post-harvest canopy cover of 44 percent.

GAP CREATION - Dispersal habitat would be removed by gap creation within two previously thinned units (Units 11B and 11C) within the home ranges of one northern spotted owl site (Mill Creek MS; IDNO 3900C).

CORE AREA- Within the Analysis Area, thinning is the only harvest treatment that would occur within one or more core areas. In core areas with less than 50 percent suitable habitat, dispersal habitat plays an important role in allowing northern spotted owls to move between and forage in patches of suitable habitat. Northern spotted owls using sites below the threshold would be most vulnerable to the effects from thinning.

THINNING TREATMENT - A total of approximately 90 acres of dispersal habitat would be thinned within four core areas (Tables W-3 and W-4). Three of the four core areas are habitat limited. Although dispersal habitat function would be maintained, thinning acres of dispersal habitat within the core areas would temporarily reduce habitat quality in areas that are currently insufficient to assure the successful survival and reproduction of the northern spotted owl at these sites (USDI/FWS 2009). Thinning under these circumstances may result in adverse effects to northern spotted owls. In the long-term, thinning would improve habitat quality of suitable habitat by promoting development of large trees and multiple canopies.

HABITAT LIMITED CORE AREA- Three of the seven core areas affected by thinning, including Field Creek, (IDNO 2202O), Gosset Creek (IDNO 0355B), and Norris Creek (IDNO 3270A), are currently below the 50 percent suitable habitat threshold (Table W-3). However, thinning would not limit northern spotted owl movement through these three thinning units because post-harvest canopy closure would be maintained well above 40 percent canopy cover threshold, averaging between 66 and 72 percent. Therefore, northern spotted owls are expected to continue to use these thinned stands for foraging because overall canopy cover would be maintained above 50 percent (Forsman *et al*. 2004, Hanson *et al*. 1993).

NOT HABITAT LIMITED CORE AREA- The French Creek (IDNO 4014O) core area, where 20 acres of thinning is proposed has more than 50 percent suitable habitat. Although surveys have determined this site has been unoccupied for four of the last five years, thinning would not cause a decline in productivity or use of this core area if it were to become re-occupied by spotted owls because of the amount of suitable habitat present. In addition, Unit 33A, located within this core area would have a post-harvest stand average canopy cover at approximately 72 percent, which would reduce potential effects to the spotted owl because canopy cover would remain above 50 percent (Forsman *et al*. 2004, Hanson *et al*. 1993). Therefore, thinning dispersal habitat in the core area of the French Creek site, currently above the core area threshold, would not alter the viability of the home range because the amount of suitable habitat would remain unchanged and the function of treated dispersal habitat would be maintained.

NEST PATCH – No harvest activities are proposed within a nest patch in the Analysis Area. Therefore, nest patches would remain in their current condition.

(iv) Effects to Known Owl Activity Centers

Although dispersal habitat does not support all spotted owl life history functions, it can provide foraging and roosting opportunities. Thinning treatment of 15 acres within the Norris Creek KOAC would not reduce the capability of the dispersal habitat because post-harvest canopy cover would be approximately 70 percent, above the 50 percent threshold (Thomas *et al.* 1990). Currently, the KOAC is unoccupied by spotted owls, therefore no direct effects would be expected due to habitat modification.

The proposed treatment of 15 acres (Unit 23A) of dispersal habitat within the KOAC associated with the Norris Creek original activity center (IDNO 3270O) would improve dispersal habitat conditions as canopy cover increases and multi-canopy and multi-species layers develop, creating more favorable roosting and foraging habitat in the long term. Because the thinning treatment would accelerate the development of late-seral characteristics used by northern spotted owls, it is consistent with the *Revised Recovery Plan for the Northern Spotted Owl* (USDI/FWS 2011a).

(v) Effects of Barred Owls

Spotted and barred owls differ in the relative use of old conifer forest (greater for spotted owls) and slope conditions (steeper slopes for spotted owls) (Wiens *et al.* 2014). Timber sales that reduce suitable habitat levels near the accepted minimum levels necessary to support a spotted owl pair, may in effect reduce levels below minimum if a barred owl pair is nearby, excluding use of habitat (unavailable habitat) (Pearson 2010). Because no suitable habitat would be removed or modified, it is not expected that there would be an increase in competition for nesting habitat between existing barred owls and spotted owls. However, if the nomadic, non-territorial and juvenile spotted owls spend time within barred owl home ranges, as seems likely, then the "unavailable" suitable and dispersal spotted owl habitat within barred owl territories would be important to retain (Pearson 2010).

The Wiens *et al.* (2014) study did not find evidence that the two species differed in their use of young, mature, and riparian-hardwood forest types. Additionally, similarities between spotted owls and barred owls were observed in resource use indicating a high potential for exploitative competition, especially in times of low prey abundance or in cases where individuals shared overlapping foraging areas (Wiens *et al.* 2014). However, Olsen (1999) suggests that because barred owls are generalist predators, habitat selection may be influenced more by prey availability than by a strong affinity for any specific type of forested habitat. Northern flying squirrels, woodrats, and lagomorphs (i.e. brush rabbits) were primary prey for both owl species, accounting for 81 percent and 49 percent of total dietary biomass for spotted owls and barred owls, respectively (Wiens *et al.* 2014). Woodrats and brush rabbits or evidence of these animals have been observed within the Analysis Area; the northern flying squirrel is expected to be present within the Analysis Area.

THINNING EFFECTS TO BARRED OWLS – A decrease in dispersal habitat quality is expected to have a short-term impact on prey species for both northern spotted owls and barred owls. Competition for prey resources by barred owls may exacerbate the short-term impacts to spotted owls, by reducing prey availability to the spotted owl in areas where foraging overlaps with the barred owl.

However, VDT can have rapid positive effects for many forest-floor prey species (e.g. mice, voles, and chipmunks) because of increased understory development (Carey 2001, Carey and Wilson 2001, Haveri and Carey 2000). As shrubs and forbs develop within the thinning units, prey is expected to become more abundant, potentially reducing the competition impacts between the owl species.

GAP CREATION EFFECTS TO BARRED OWLS – High-contrast edges, mostly associated with clear-cuts, is a landscape feature that influenced use of foraging sites by both owl species (Wiens *et al.* 2014). Although the effect was slightly stronger for barred owls, it was determined that the relative probability of use increased in a unimodal (convex) relationship with increasing distance to a forest–nonforest edge for both species. Thus, both species appeared to select foraging sites within the interior of forest patches, usually 300-500 meters from edges (Wiens *et al.* 2014). Therefore, both owl species may avoid gaps in the short term until canopy cover increases and prey becomes more available after the development of forbs, shrubs, and tree seedlings within the gaps. In the meantime, a decrease in foraging areas could increase interactions between species with barred owls potentially excluding northern spotted owls from remaining foraging areas.

In the long term, prey species, such as brush rabbits, woodrats, would benefit from increased understory and shrub development within the gaps, which would subsequently benefit barred owls by providing more prey available for capture. Barred owls are more generalists in prey selection than northern spotted owls, and would benefit from an increase of prey selection due to the creation of vegetative diversity within the stand which could potentially reduce foraging interactions between the species.

VARIABLE RETENTION HARVEST EFFECTS TO BARRED OWLS – Variable retention harvest would remove habitat features important to northern spotted owl dispersal, including horizontal and vertical structure, canopy cover, and hardwood trees. Though there is no research to support it, VRH would be expected to have the same impacts on barred owls as discussed for spotted owls previously. Due to low canopy cover, dispersed retention harvest areas would be avoided for travel or foraging until canopy cover increases and prey resources become more available. Therefore, reducing dispersal habitat and its availability for the spotted owl may increase encounters between species when nomadic, non-territorial or juvenile spotted owls are moving across the landscape. The more aggressive barred owl could potentially exclude northern spotted owls from existing foraging areas.

(vi) Effects to Designated Critical Habitat

Thinning treatment and VRH would occur within designated critical habitat for the northern spotted owl. Gap creation in Units 11B and 11C would not occur within critical habitat.

THINNING EFFECTS TO CRITICAL HABITAT - Thinning approximately 122 acres would modify dispersal habitat on 0.2 percent of Critical Habitat Sub-Unit WCS-6 (Table W-5). Variable density thinning would result in a stand-average post-harvest canopy in excess of 50 percent, which would continue to provide foraging and dispersal opportunities for the northern spotted owl.

The proposed treatment would not change the amount or pattern of dispersal habitat within or between critical habitat units. As structural components develop, such as large diameter trees and snags, multiple canopy layers, large coarse woody debris, and hunting perches, the amount of northern spotted owl nesting habitat within the critical habitat unit would increase in the long term.

VARIABLE RETENTION HARVEST EFFECTS TO CRITICAL HABITAT- Unit 29G is the only unit proposed for VRH treatment in the Calapooya project area that is located in critical habitat. Within the 84-acre harvest unit, approximately 37 acres (44 percent) would be maintained in Riparian Reserve and in aggregates to protect key wildlife habitat features, such as rock outcrops, pockets of large down wood and snags, and vegetative diversity that includes shrubs, forbs, hardwoods, and minor tree species. In addition, nine green trees per acre would be retained on the 47 upland acres (56 percent) proposed for dispersed retention harvest that would provide a dominant overstory for future legacy structure in the stand.

Variable retention harvest would remove or modify primary constituent elements of northern spotted owl critical habitat including horizontal and vertical structure, canopy cover, conifer trees, and hardwood trees. Unit 29G is not expected to maintain its present function as dispersal habitat for northern spotted owls because of insufficient canopy cover and other structural elements that would be removed or modified. Because the stand-level canopy cover would fall to approximately 39 percent, below the 40 percent threshold, it would be considered capable habitat - habitat that is capable of becoming dispersal and subsequently suitable habitat in the future. Variable retention harvest would remove and downgrade 84-acres of dispersal habitat to capable habitat, affecting 0.1 percent of Critical Habitat Sub-Unit WCS-6.

Canopy closure (cover) is expected to recover up to two percent per year (q.v. *Forest Vegetation*, p. 37) and given that the dispersed retention areas have a predicted canopy cover of 11 percent at post-harvest (Table FV-4, p. 36), it is expected that the canopy cover would reach 40 percent within 25-30 years. However, at the stand level, averaging in the high canopy cover of the aggregates, the stand is expected to function as dispersal habitat much sooner than 25 years and is expected to be higher quality dispersal habitat then pre-treatment dispersal habitat conditions. In 100 years, it is predicted that stand average canopy cover would be approximately 68 percent and the stand would have developed suitable habitat components and would function as NRF (Table FV-7, p. 39).

(vii) Consistency with the Northern Spotted Owl Recovery Plan

The Calapooya Project was evaluated against the following Recovery Actions contained within the Revised Recovery Plan for the Northern Spotted Owl (USDI/FWS 2011).

Recovery Action 6*: In moist forests managed for spotted owl habitat, land managers should implement silvicultural techniques in plantations, overstocked stands and modified younger stands to accelerate the development of structural complexity and biological diversity that will benefit spotted owl recovery* (USDI/FWS 2011, p. III-43).

The *proposed action* is comprised of younger stands, within dispersal quality habitat, and includes project design criteria to retain and/or promote structural diversity and complexity in treated stands. In addition, Recovery Action 6 places an emphasis on retaining the oldest and largest trees in the stand or any trees that create stand diversity. All harvest prescriptions in the *proposed action* include retention of legacy structures, large trees and snags, and avoidance of portions of stands with structural complexity. Reasonable efforts were taken to locate and configure the *proposed action* so as to minimize impacts to spotted owls and meet the intent of Recovery Action 6.

Recovery Action 10: *Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population* (USDI/FWS 2011, p. III-43).

With the assistance of the Service through their involvement in interdisciplinary team meetings, the BLM reviewed the occupancy status of the seven spotted owl sites in the Analysis Area and made efforts to avoid and conserve sites that are currently contributing to demographic support of the species. As a result, the *proposed action* does not include harvest activities or road construction within a nest patch.

The proposed action includes activities within the core area of four spotted owl sites (Tables W-3 and W-4). Three of the four owl sites are below habitat thresholds (i.e., < 50 percent suitable NRF in core area) and one is above the suitable habitat threshold (Table W-3)

No core area or home range of any known, historic spotted owl site would be reduced below habitat thresholds by the *proposed action* (i.e., no site would be taken from above a threshold to below a threshold by the proposed treatment). Therefore, the intent of Recovery Action 10 has been met by not reducing the amount of suitable NRF habitat within any home range or core use area to below habitat thresholds.

Recovery Action 32: *Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service as described below to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high-quality spotted owl habitat stands are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees* (USDI/FWS 2011, p. III-67).

Harvest treatments would not impact "older and more structurally complex multi-layered conifer forests" as described in Recovery Action 32 (USDI FWS 2011). No structurally complex, multi-layered stands potentially meeting *Recovery Action 32* would be included in timber harvest prescriptions or road construction for the Calapooya project. Therefore, the proposed action is consistent with the intent of Recovery Action 32 in the spotted owl recovery plan (FWS 2011).

d) ***Cumulative Effects***

(i) Northern Spotted Owl

The Calapooya project is located primarily in the Calapooya Creek Watershed. Of the approximately 157,470 acres (Federal and private) within the Calapooya Creek Watershed, approximately eight percent (11,845 acres) are under Federal ownership. There are approximately 3,932 acres of suitable habitat (33 percent) and 4,180 acres (35 percent) of dispersal-only habitat on Federal lands.

The *Proposed Action* would remove two percent (91 acres) and modify approximately 28 percent (1,156 acres) of the dispersal habitat on Federal lands within the Calapooya Watershed. Approximately 1,200 acres in the watershed have been thinned in the past ten years, including approximately 600 acres proposed for treatment in the Back in Black project. The Back in Black project proposes regeneration harvest of dispersal habitat outside of Riparian Reserves. Thus, including the *Proposed Action*, approximately 2,275 acres (54 percent) of the dispersal-only habitat would be modified and 690 acres (16 percent) would be removed within the watershed spanning 12 years (2004-2016).

Future timber harvest planned for Fiscal Year 2016-2017, the Back in Black project, would have cumulative effects to two northern spotted owls within the Analysis Area, including the Gossett Creek (IDNO 0355B) and Mill Creek MS (IDNO 3900C) spotted owl sites (Table W-10). There are no proposed or future foreseeable actions planned within the nest patches of these two owl sites, or within the core area for the Mill Creek MS site. The Back in Black project would remove an additional 13 acres of suitable habitat and 70 acres of dispersal habitat (which includes 13 acres within the core area) within the home range of the Gossett Creek spotted owl site (Table W-10). The Back in Black project would also remove an additional six acres of dispersal habitat within the home range of the Mill Creek MS site (Table W-10).

Table W-10. Cumulative Effects for the two Northern Spotted Owl Sites within the Analysis Area at the Core Area and Home Range Analytical Spatial Scales.

SITE NAME	CORE AREA (500 ACRES) *[PERCENT FEDERAL ACRES]*												
	NRF							DISPERSAL					
	FEDERAL ACRES[1]	BASELINE ACRES[1]	CALAPOOYA ACRES REMOVED	CALAPOOYA ACRES MODIFIED	BACK IN BLACK ACRES REMOVED	BACK IN BLACK ACRES MODIFIED	TOTAL ACRES IMPACTED[2]	BASELINE ACRES	CALAPOOYA ACRES REMOVED	CALAPOOYA ACRES MODIFIED	BACK IN BLACK ACRES REMOVED	BACK IN BLACK ACRES MODIFIED	TOTAL ACRES IMPACTED[2]
GOSSETT CREEK *IDNO 0355B*	306 *[61%]*	132 *[26%]*	0	0	0	0	0	22	0	9	13	0	22 *[100%]*
MILL CREEK MS *IDNO 3900C*	212 *[42%]*	130 *[26%]*	0	0	0	0	0	38	0	0	0	0	6 *[16%]*
SITE NAME	**HOME RANGE (2,955 ACRES)** *[PERCENT FEDERAL ACRES]*												
	NRF							DISPERSAL					
	FEDERAL ACRES[1]	BASELINE ACRES[1]	CALAPOOYA ACRES REMOVED	CALAPOOYA ACRES MODIFIED	BACK IN BLACK ACRES REMOVED	BACK IN BLACK ACRES MODIFIED	TOTAL ACRES IMPACTED[2]	BASELINE ACRES	CALAPOOYA ACRES REMOVED	CALAPOOYA ACRES MODIFIED	BACK IN BLACK ACRES REMOVED	BACK IN BLACK ACRES MODIFIED	TOTAL ACRES IMPACTED[2]
GOSSETT CREEK *IDNO 0355B*	923 [31%]	263 [9%]	0	0	13	0	13 *[1%]*	333	0	127	70	0	197 [59%]
MILL CREEK MS *IDNO 3900C*	1,336 [45%]	405 [14%]	0	0	0	0	0	505	6	180	6	0	*192 [38%]*

1. *Percent of total acres within spatial scale.*
2. *Percent of habitat baseline acres.*

Because the Gossett Creek owl site is below the suitable habitat threshold in both the core area and home range, it is likely unable to support a breeding northern spotted owl pair due to the lack of suitable habitat at either spatial scale. Therefore, cumulative impacts would affect all 22 acres of dispersal habitat existing within the core area and would not affect the current viability of the core area. In addition, total habitat impacts would affect one percent of the suitable habitat and 59 percent of dispersal habitat within the home range. Because the amount of BLM ownership (31 percent) is less than 50 percent in the Gossett Creek home range, it is assumed that the suitable habitat viability threshold of 40 percent would not be achievable under any scenario due to the lack of sufficient Federal ownership.

No habitat would be removed within the core area for the Mill Creek MS northern spotted owl site. However, at the home range scale, the Calapooya project would modify 180 acres and remove six acres of dispersal habitat, and the Back in Black Project would remove six acres of dispersal habitat. Therefore, cumulative effects to the home range would be the modification of 35 percent and the removal of approximately two percent of dispersal habitat, affecting a total of 38 percent (192 acres) of dispersal habitat within the Mill Creek MS home range. The core area and the home range is comprised of 42 and 45 percent BLM ownership, respectively, and therefore it is assumed that the suitable habitat viability threshold at either spatial scale would not be achievable due to the lack of sufficient Federal ownership.

Although the proposed action may temporarily reduce the quality and amount of dispersal habitat within the project area, the watershed would still continue to function for the dispersal of northern spotted owls. Therefore, the proposed project would not preclude or appreciably reduce northern spotted owl movement within the watershed, between critical habitat units, or within the Physiographic Province.

Cumulative effects to spotted owls would likely continue within the Analysis Area. To date, the Oregon Forest Practices Act requires protection of a 70-acre area around occupied nest sites, and does not provide any protection or conservation of other surrounding habitat on private lands. Therefore, harvest activities on private timber lands may disrupt nesting owls and reduce the amount of available habitat, rendering some core areas and/or home ranges unable to support northern spotted owl life functions.

(ii) Critical Habitat

Federally-administered lands would continue to provide for dispersal and connectivity between critical habitat subunits. The BLM consulted with the FWS to ensure the function of WCS-6 would not be impaired by the proposed action. It was determined that activities that treat and maintain 0.2 percent of dispersal habitat in WCS 6 in *"will not impair the function of the subunit as a whole since the functions of the habitats are expected to be maintained within the affected stands."* In addition, the removal of 0.1 percent of the dispersal habitat from the subunit in the Action Area *"will not impair the overall function of the subunit because there will be sufficient habitat remaining"* (USDI/BLM 2013, p. 146).

2. Fisher (Proposed for Federally Threatened Status)

a) *Environmental Baseline*

Fishers do not exhibit selection for particular seral conditions at the home range, but are associated with specific forest structural elements (tree cavities, logs, snags, live hardwood trees, and shrubs) (Raley *et al*. 2012) and moderate to dense forest canopy (Lofroth *et al*. 2010; Raley *et al*. 2012) Fishers rarely use early-successional stages (Lofroth *et al*. 2010; Raley *et al*. 2012) and select home ranges with ≥ 30 percent canopy cover and show positive correlations with canopy cover up to 60 percent (Raley *et al*. 2012).

Habitat for the fisher is divided into three categories, denning, resting, and foraging habitat (Lofroth *et al.* 2010).

- **Denning habitat:** habitat that fishers use for reproduction, denning, and rearing of young. Cavities in live or dead trees are a key characteristic of denning habitat for fisher. The mean diameter of trees (live or dead) used for denning in Oregon was 91 cm (36 inches).

- **Resting habitat:** habitat that fishers use for resting (thermal regulation, security, and proximity to prey). High canopy cover, an abundance of large trees, and incidence of mistletoe or rust brooms are characteristic of resting habitat. In Oregon, the average canopy cover of fisher resting habitat was 82-84 percent and mean diameter of live trees used for resting was 76 cm (30 inches).
- **Foraging habitat:** habitat that fishers use for locating and capturing prey. Fishers are more active in areas where there is greater structural complexity (vertically and at the ground level) and greater amounts of dead woody structure compared to random locations.

Fishers are solitary animals, interacting with other fishers only during the breeding, kit rearing and territorial defense (Powell 1993 *in* Lofroth *et al.* 2010). Adult fishers of the same sex typically have non-overlapping home ranges whereas home ranges of males overlap those of multiple females. Based on studies in SW Oregon, the home range estimate for fisher ranged from 18.8 square kilometers (7.3 square miles) to 53.4 square kilometers (20.6 square miles). In the Oregon Cascades specifically, the mean home range size for a male fisher is estimated at 62 square kilometers (24 square miles) (Lofroth *et al.* 2010).

Dispersing juveniles are capable of moving long distances and navigating across or around various landscape features including rivers, highways, and rural communities (York 1996, Aubry and Raley 32006, Weir and Corbould 2008 in Lofroth *et al*. 2010). Several western studies have documented fishers traveling up to 135 kilometers (84 miles) (Lofroth *et al*. 2010). In the Cascade Range in southern Oregon, the average estimated dispersal distance of juvenile males ranged from 7 to 55 kilometers (4 to 34 miles), with an average of 29 kilometers (11 miles) (Aubry and Raley 2006 in Lofroth *et al*. 2010).

Principle Habitat Threats to the Fisher, determined by the FWS, are habitat loss due to vegetation management, as well as wildfire and fire suppression (USDI/FWS 2014, pp.60428-60430). These threats to habitat are briefly summarized below.

VEGETATION MANAGEMENT –Vegetation management techniques of the past (primarily timber harvest) have been implicated as one of the two primary causes for fisher declines. Current vegetation management techniques have, and can substantially modify the overstory canopy, the numbers and distribution of structural elements and the ecological process that create them.

The type of vegetation management and where it occurs is important to understanding the impacts to fishers. Vegetation management that removes important habitat elements (such as den sites and canopy cover) has a greater effect on fishers than activities that maintain these elements(USDI/FWS 2014, pp.60429-60430).

Fishers are associated with complex forest structure (i.e. dense and layered canopy, snags, large trees, structures associated with forest pathogens, and large logs) when active, resting, and denning. To conserve fishers, Lofroth *et al.* (2010) emphasizes the critical maintenance of these forest elements as important legacies in younger forests following timber harvest.

Lofroth *et al.* (2010) (pp. 119-120) suggests conservation measures in order to maintain and/or foster the development of critical habitat structure for the fisher. The *Proposed Action Alternative* incorporates some of the suggestions, including:

- retention of existing large decadent trees, snags and down wood.
- improvement of foraging opportunities by promoting the development of understory and shade-tolerant tree species, and;
- retention of no-harvest areas (including Riparian Reserves) to provide travel corridors from adjacent late-seral habitats and across the landscape.

WILDFIRE AND FIRE SUPPRESSION –The U.S. Fish and Wildlife Service consider wildfire and fire suppression to be a threat to fisher habitat now and in the future because the frequency and size of wildfire is increasing. The U.S. Fish and Wildlife Service evaluated the effect of wildfire on fisher habitat and it was determined that high-severity fire has the potential to permanently remove suitable fisher habitat and is very likely to remove habitat for a period of many decades while the forest regrows. Moderate-severity fire may also remove habitat, but likely in smaller patches and for a shorter length of time. Low-severity fire may reduce some elements of fisher habitat, temporarily, but in general is unlikely to remove habitat (USDI/FWS 2014, p.60428).

The U.S. Fish and Wildlife Service predicts that large fires, particularly those of higher severity and larger scale, could cause shifts in home ranges and movement patterns, lower the fitness of fishers remaining in the burned area (e.g. due to increased predation) or create barriers to dispersal. Fire suppression actions and post-fire management have the potential to exacerbate the effects of wildlife on fisher habitat (USDI/FWS 2014, pp.60428-60429).

b) ***Affected Environment***

The Roseburg District is located within the historic range of the fisher, but outside of the West Coast DPS currently proposed for federally *threatened* status. The West Coast DPS is located approximately 55 miles south-southwest of the proposed project area. Although the Roseburg District is not within the West Coast DPS and it is unknown whether or not there are fishers breeding on the Roseburg District, it is reasonable to expect that fishers are at least dispersing within the District, including the proposed project area.

Based on the Oregon Biodiversity Information Center (ORBIC) (OSU, Institute of Natural Resources) and Geographic Biotic Observations (GeoBOB) (USDI/BLM 2014) databases, there are eight (8) incidental observations of fisher within the documented 34-mile estimated dispersal (maximum) distance recorded for fisher in SW Oregon, with the closest observation 10 miles northeast of the proposed project area (ORBIC 2014). However, the fisher has not been documented with incidental observations within the watershed in the last two decades. The most recent and closest documented sighting occurred in May 2014 approximately 53 miles southeast of the proposed project area , outside of the West Coast DPS (USDI/BLM 2014).

Fisher would be expected to use the 1,245 acres of forest habitat within the proposed units for dispersal and foraging activities. There is no suitable denning and resting habitat within the proposed Calapooya units.

c) ***Environmental Consequences***

(1) **No Action Alternative**

Stands would remain unsuitable for denning and resting until late successional characteristics develop, including open, multi-layered canopy and the presence of large, hollow snags. Large trees or snags would develop at a slower rate. However, the habitat would continue to function for dispersing and foraging activities.

(2) **Proposed Action Alternative**

While the *Proposed Action Alternative* may affect unknown individuals, harvest activities are unlikely to affect the population of fisher. Fisher, in the long term, would benefit from harvest treatments under the *Proposed Action Alternative*. However, the development of suitable habitat components within a stand, that would benefit the fisher in the long term, is dependent on the intensity of the treatments.

THINNING TREATMENT – The proposed thinning treatments would remove canopy cover, however canopy cover would remain above the thirty percent (FV-6) level associated with fisher home ranges. Any existing down wood and large snags would remain on site after treatment. Snags felled for safety reasons would be left to function as coarse down wood. The Riparian Reserves would provide travel corridors across the landscape between stands of late-successional and mid-seral stands.

The most heterogeneity would develop from a combination of treatment intensities. Fisher would benefit most from treatments which would create conditions fostering the development of suitable denning, foraging, or resting habitat. Stands treated with VDT would be expected to develop more structural and vegetative diversity because of the addition of the gaps, skips, and heavy thinning in the treatment prescription.

Variable density thinning would promote development of early-successional plant communities in gaps and edge habitat that support greater small mammal populations which would increase prey for foraging fishers. In addition, fisher would benefit from an increase of interior habitat containing suitable habitat structure that develops in stands adjacent to existing suitable habitat.

In the long term, as structural components continue to develop, such as multiple canopy layers with a diverse understory of forbs and shrubs, large diameter trees and eventually large snags and coarse woody debris, the amount of diverse micro habitats would increase for this species associated with late-successional forest habitat structure.

VARIABLE RETENTION HARVEST –The VRH would remove a total of 63 acres of mid-seral forested habitat resulting in fragmentation of stands which may serve as dispersal habitat for fisher. Riparian reserves and aggregates would provide travel corridors around dispersed retention areas.

The VRH treatment would create edge habitat coupled with early-successional conditions dominated by flowering shrubs, forbs and herbs, and sprouting hardwoods. In the long term, VRH would provide other ecological benefits by allowing retention trees to grow larger faster, and to develop other suitable wildlife habitat characteristics, such as large limbs and crowns, in trees adjacent to openings. Larger trees in dispersed and aggregate retention areas would, over time, develop deeply fissured bark or die and become large snags and down wood. Open canopy conditions, combined with aggregates and thinned forest habitat would ultimately result in habitat with multi-canopy layers with vegetative and structural diversity important for fisher.

d) ***Cumulative Effects***

The Calapooya project is not expected to cause cumulative effects to fisher. The proposed harvest treatments are expected to create structural diversity and complexity within stands that are currently lacking these components. An increase of characteristics associated with older forests would increase the amount of habitat available to this species in the future.

3. Bureau Sensitive Species

a) *Environmental Baseline*

Bald eagle *(Haliaeetus leucocephalus)* - The bald eagle is protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d) and is identified on the agency's list of "Birds of Conservation Concern" as discussed in the *Landbirds* section below (p. 85).

The bald eagle is associated with late-successional conifer forests with multi-canopies generally within two miles of a major water source or in conifers or cottonwoods in close proximity/ adjacent to a major water source. The proposed project would not affect suitable nesting habitat for the bald eagle.

Purple Martin (*Progne subis)* - Purple martins are associated with snags with woodpecker cavities in open habitats (e.g. grasslands, brushlands, open woodlands), and typically found in open areas near water (Brown 1997, Horvath 2003). The proposed project units do not contain suitable habitat for the purple martin.

SSS Bats – Fringed myotis *(Myotis thysanodes),* **Pacific pallid bat** *(Antrozous pallidus pacificus) and* **Townsend's big-eared bat** *(Corynorhinus townsendii)* – These species are insectivorous bats found in the Pacific Northwest (Verts and Carraway 1998). Hibernacula and roost sites include caves, mines, buildings, large snags and hollow trees (Weller and Zabel 2001, Lewis 1994, Fellers and Pierson 2002). These species are known to forage in open areas, including forest edges and roads (Christy and West 1993) and along streams and in riparian zones (Cross and Waldien 1995, Marshall 1996, Verts and Carraway 1998, Fellers and Pierson 2002). These bat species would be expected to forage within the harvest units, particularly in units adjacent to older forests.

b) *Affected Environment*

Bald Eagle - There is a known bald eagle site approximately 0.4 miles southeast of Unit 25A. In addition, based on numerous observations of bald eagles through the breeding season of 2014 and the presence of suitable habitat, it is suspected there may be other bald eagle nest sites located along the major streams (i.e. Coon Creek, Calapooya Creek and Gassey Creek) or reservoirs within the vicinity of the Calapooya project area. Attempts have been made to locate nests based on these observations, but no new nest sites have been located to date.

Purple Martin - The closest purple martin observation was 2.8 miles north of the project area and the closest known colony is located on the North Bank Habitat Management Area, approximately 4.0 miles from Unit 23A (GeoBOB data query; July 2014). Foraging activities above forest canopies would be expected within the project area.

SSS Bats – Data from the GeoBOB database (USDI BLM 2014) shows the Townsend's big-eared bat has been documented within the Calapooya Creek Watershed, within 2.3 miles of Unit 23A. The fringed myotis and pallid bat have been documented within three miles in adjacent watersheds, and therefore are expected to be present in the project area.

Hibernacula and roost sites include caves, mines, buildings, large snags and hollow trees (Weller and Zabel 2001, Lewis 1994, Fellers and Pierson 2002). No caves or mines are known to be present in the harvest units. The closest known Townsend's big-eared bat hiberncula is located on the northwest side of Mount Scott, approximately 0.3 miles east of Unit 33A. Some units contain trees and snags that may provide roosting opportunities. Rock outcrops are present within some of the harvest units, particularly in Unit 29G. The rock outcrop in Unit 29G and some large snags

within units, where present, would be included in aggregates in order to maintain microsite conditions around these features.

Small ponds, marshy areas, and other riparian areas are expected to provide foraging habitat. There are three ponds located within 0.3 miles of proposed Unit 23A and Unit 1B. Dense forest stands generally do not provide quality foraging habitat because they are less open making navigation difficult, and poor understory development does not support abundant populations of insects that bats feed upon. Open stands with a well-developed understory supporting diverse and abundant populations of insects provide high quality foraging conditions.

c) ***Environmental Consequences***

(1) **No Action Alternative**

Under the *No Action Alternative*, no forest habitat features would be affected. *Special Status Species* within the project area would be expected to persist at their current levels. It is expected that the forest habitat currently present within the proposed units would continue to function in its current capacity. The development of suitable habitat characteristics that would benefit the bald eagle, fisher, Townsend's big-eared bat and fringed myotis, such as multi-layered and multi-species canopy with large overstory trees, large snags, coarse woody debris, and a well-developed understory, would occur more slowly when compared to the *Proposed Action Alternative*.

Without treatment or natural disturbances, a multi-layered and multi-species canopy would not be well-developed within 50 years because of the closed canopy conditions. Although a large number of small snags and coarse woody debris recruited passively would provide foraging opportunities, they would not be as beneficial as large snags and coarse woody debris. The lack of these structural attributes would limit the amount of diversity and micro habitats used for foraging, denning, or roosting, particularly for fisher and bats.

(2) **Proposed Action Alternative**

(i) Disturbance

Bald eagle - Noise, human intrusion, and mechanical movement may cause some form of disruption or disturbance to the normal behavioral patterns of nesting bald eagles. In order to minimize disturbance impact to nesting eagles, a bald eagle nest within 0.5 miles line-of-sight of harvest activities would typically require seasonal restrictions from January 1 August 31st, both days inclusive. However, based on GIS analysis and the location of the known nest trees within 0.4 miles, the topography provides a visual barrier between nest trees and harvest Unit 25A. Therefore, seasonal restrictions would not be required for this proposed project and no disturbance impacts are expected for known nest sites.

For undiscovered nest sites, surveys are planned in 2015 to continue attempts to locate nest sites within the project area. If a new nest location is determined, the need for seasonal restrictions would be evaluated based on the nest's distance from harvest activities. Seasonal restrictions would be required for nest trees located within 0.25 miles and/or 0.5 miles in-line-of –sight of harvest activities, from January 1 through August 30, both days inclusive. Monitoring of a nest site would determine nesting status and if it is determined that the nesting attempt has failed, seasonal restrictions may be waived for that current year.

(ii) Effects to Habitat

Special Status Species that are associated with structurally complex forests would benefit from harvest treatments under the *Proposed Action Alternative*. However, the development of suitable habitat components within a stand is dependent on the intensity of the treatments

THINNING TREATMENT - Under conditions of high tree densities (low and moderate thinning treatments) in the uplands under the *Proposed Action Alternative,* post-harvest conditions would limit the development of diverse, multi-storied stands because canopy cover would recover to pre-harvest conditions in 10 to 20 years. Large trees or snags containing large limbs or structural characteristics would not develop or develop at a slower rate in areas of higher post-harvest tree density and tree competition (i.e. light and moderate thinning intensities). In the Riparian Reserves, more structural components would be expected to develop because those areas would be treated with greater intensity and variability.

The most heterogeneity would develop from a combination of treatment intensities. Under the *Proposed Action Alternative,* Unit 9C and Unit 7H are expected to develop into a stands with more structural and vegetative diversity because of the addition of the gaps, skips, and heavy thinning in the treatment prescription. These species would benefit most from treatments of heavy thinning and gap, which would create conditions fostering the development of suitable nesting, denning, foraging, or roosting habitat.

In the long term, as structural components continue to develop, such as multiple canopy layers with a diverse understory of forbs and shrubs, large diameter trees and eventually large snags and coarse woody debris, the amount of diverse micro habitats would increase for these species associated with late-successional forest habitat. In addition, the amount of interior habitat would increase as suitable habitat structure develops adjacent to existing suitable habitat. Larger blocks of forested habitat support larger numbers of wildlife and provide a larger diversity of micro habitats, increasing species diversity and richness.

Bald eagle – No suitable habitat would be modified or removed. Thinning forest stands to develop multi-layered canopies, particularly in units within 2.0 miles of a major water source (i.e. Units 9C, 13C, 17B and 23A) would increase available suitable habitat. In the long term, trees along gap edges would develop larger limbs that may be suitable for roosting and nesting. Retention of large remnant trees within stands would provide future roosting and nesting structure.

Purple Martin – There would be no measurable effect to foraging habitat due to thinning treatments. Thinning modifies forest stands by increasing the openness of the forest stands such that interior portions of the thinning stands would be available for foraging. Variable density thinning would promote development of early-successional plant communities in gaps and edge habitat that support greater insect populations which would increase prey for foraging purple martins.

SSS Bats – Thinning modifies forest stands by 1) increasing the openness of the forest stands such that interior portions of the thinning stands would be available for foraging and 2) retaining large remnant trees and suitable snags that would provide roosting habitat. Variable density thinning would promote development of early-successional plant communities in gaps and edge habitat that support greater insect populations which would increase prey for foraging bats.

VARIABLE RETENTION HARVEST - The VRH would create edge habitat coupled with early-successional conditions dominated by flowering shrubs, forbs and herbs, and sprouting hardwoods. In the long term, VRH would provide other ecological benefits by allowing retention trees to grow larger faster, and to develop other suitable wildlife habitat characteristics, such as large limbs and crowns, including trees along gap boundaries. Larger trees in dispersed and aggregate retention areas would, over time, develop deeply fissured bark or die and become large snags and down wood. Open canopy conditions, combined with aggregates and thinned forest habitat would ultimately result in habitat with multi-canopy layers with vegetative and structural diversity important for these species associated with more a complex forest habitat.

Bald eagle – No suitable habitat would be modified or removed due to VRH. The development of forest habitat with multi-canopy layers containing large trees with large limbs and with deep crowns would provide future nesting and roosting structure for the bald eagle.

Purple Martin – Nesting habitat could be created by VRH activities in the long term, particularly if dispersed retention trees become snags in open areas. The creation of gaps with flowering shrubs, forbs and herbs, and sprouting hardwoods would support larger insect populations for foraging martins.

SSS Bats – The dispersed retention treatment in variable retention harvest units would remove 54 upland acres of bat roosting habitat, but would create the same amount of foraging habitat in the open areas. Retention of larger trees with deeply fissured bark or large snags would contribute to roosting habitat for bats.

d) ***Cumulative Effects***

The Calapooya project is not expected to cause cumulative effects to *Special Status Species*. The proposed harvest treatments are expected to create structural diversity and complexity within stands that are currently lacking these components. An increase of characteristics associated with older forests would increase the amount of habitat available for these species in the future.

4. Survey & Manage (S&M) Species

Under the current guidance for S&M Species, (Chapter 1, pp. 7-8) all of the proposed thinning units under 80 years of age are exempt from complying with the 2001 ROD (as amended in March 21, 2004). With the exception of Units 17C and 29G, the remaining 24 units are proposed for thinning treatments and would therefore, not require pre-disturbance surveys for S&M Species. Tables B-1 and B- 2 in Appendix B document the 1,147 acres that are exempt from survey requirements under the *Proposed Action Alternative* as stated in Pechman Exemption 'a'.

The *Proposed Action Alternative* would apply VRH in Units 17C and 29G. Therefore, these units do not meet the Pechman Exemption criteria and would be subject to pre-project clearance surveys for S&M Species. Protocol surveys would be conducted in Units 17C and 29G using the 2001 S&M ROD species list.

a) ***Affected Environment***

Within the proposed Analysis Area, there are six terrestrial *Survey & Manage Species* associated with conifer forest habitats, including the **great gray owl** (*Strix nebulosa*), **red tree vole** (*Arborimus longicaudus),* **Siskiyou sideband** *(Monadenia chaceana),* **Crater Lake tightcoil** (*Pristiloma arcticum crateris),* **Oregon megomphix** *(Megomphix hemphilli),* and **Oregon shoulderband** *(Helminthoglypta hertleini*), all of which are associated with mature and late-successional forests. Appendix C: *Survey & Manage Species* contains a summary of survey requirements (Appendix C, Table C-1) and general habitat requirements, status of species within the project area, and impacts of the proposed action on the species (Appendix C, Table C-2).

Great Gray Owl - In general, because these stands do not contain suitable habitat characteristics for the great gray owl, including large diameter nest trees and/or suitable nesting structures and proximity to natural-openings 10 acres in size or greater, they do not qualify as nesting habitat. Therefore, pre-disturbance surveys are not required (*Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0,* p. 14).

However, a large owl species, suspected to be a great gray owl, was observed within Unit 17C in spring 2014. First-year pre-disturbance surveys have been completed with second year surveys planned for 2015 to determine if great gray owls occupy the stand.

Oregon Red Tree Vole - The analysis area is not located within the area covering the North Oregon Coast distinct population segment identified as a candidate for Federal Endangered Species Act protection in October 2011 (USDI/FWS 2011c).

The "Survey Protocol for the Red Tree Vole, Version 3.0 (Huff *et al.* 2012, pp. 5-10)" lists the following criteria that must be met to require pre-disturbance surveys:

1. The project is within the Northern Mesic, Mesic, or Xeric survey zones.
2. The quadratic mean diameter (QMD) of the stand is greater than or equal to the diameters for the survey zone.
3. The stand is conifer forest at least 80 years old or conifer or conifer-dominated mixed conifer-hardwood forests with canopy closure of intermediate, co-dominant and dominant trees greater than or equal to 60 percent, and with two or more superdominant conifer trees per acre.
4. The proposed project is habitat-disturbing activity that has the potential to cause a "significant negative effect on the species habitat or the persistence of the species at the site."

Under Pechman Exemption *'a'* for *Survey and Manage Species* (q.v. pp. 7-8), surveys for red tree voles are not required in stands less than 80 years old and proposed for thinning only. Pechman Exemptions would apply to all proposed Calapooya Units except 17C and 29G.

Units 17C and 29G would be treated with a VRH prescription and therefore do not meet Pechman Exemption 'a' for thinning-only stands. The Calapooya project area is in the Mesic survey zone for the red tree vole and survey protocol indicates stands with QMD greater than or equal to 18 inches may be suitable habitat. The QMD for Unit 17C is 13 inches (Table FV-2) and does not meet the 18 inch QMD threshold to be considered suitable habitat (Huff *et al*, 2012, p. 9), therefore surveys of this unit are not required. Unit 29G has a QMD of 20.9 inches dbh, however, the stand contains only one super dominant tree and thus does not meet protocol criteria 3. Thus, Unit 29G is not considered suitable habitat for the red tree vole and surveys are not required.

Mollusk Species – Of the three Survey & Manage mollusk species, surveys are required for the Oregon shoulderband. Unit 17C does not require pre-disturbance surveys because there is no suitable habitat present within the stand. A four-acre rock outcrop and small aggregates of rock would be buffered from harvest in Unit 29G. However, there are rocky inclusions that would not be buffered and these areas would require pre-disturbance clearance surveys. No-harvest buffers of at least one-tree height (180 feet) would maintain microsite conditions, including maintaining vegetation and shade, coarse wood debris and soil temperatures, and moisture regime of the refugia sites (*Management Recommendations for Survey and Manage, Terrestrial Mollusks*, Version 2.0, 1999, pp. 6-7).

b) ***Environmental Consequences***

(1) **No Action Alternative**

Under the *No Action Alternative*, no forest habitat features would be affected. *Survey & Manage Species* within the project area would be expected to persist at their current levels. It is expected that the forest habitat currently present within the proposed units would continue to function in its current capacity. Large down wood, leaf litter, rock outcrops, rock fissures, talus, and rock-on-rock habitats would remain available as refuge sites for mollusks.

(2) **Proposed Action Alternative**

As described for Special Status Species, *Survey & Manage Species* associated with structurally complex forests would benefit from treatment under the *Proposed Action Alternative*.

(i) *Disturbance*

If pre-project clearance surveys locate a new great gray owl site in or within the vicinity of Unit 17C, the site would be protected by establishing a quarter-mile protection zone around the nest site (ROD/RMP, p. 44). Therefore, effects to a known site would not occur due to the implementation of seasonal restrictions during the critical breeding season (March 15 – July 15).

(ii) *Effects to Habitat*

THINNING TREATMENT - The most stand heterogeneity would develop from a combination of treatment intensities. Under the *Proposed Action Alternative*, Calapooya thinning units are expected to develop into a stand with more diversity because of the gaps, skips and heavy thinning in the treatment prescription.

In the long term, the Survey and Manage species would benefit most from treatments including heavy thinning and gap creation under the *Proposed Action Alternative,* which would create conditions fostering the development of larger trees with large, deep crowns and large limbs providing suitable nesting and foraging habitat As structural components develop, such as multiple canopy layers with a diverse understory of forbs and shrubs, large diameter trees, and large snags and coarse woody debris, the amount of diverse micro habitats would increase for mollusk species and small mammal prey species for the great gray owl.

GAP CREATION - Forest gaps would increase understory growth, contributing to increased prey production for the great gray owl and suitable habitat conditions for mollusk species.

VARIABLE RETENTION HARVEST - Under the *Proposed Action Alternative*, Calapooya VRH units are expected to be a mosaic of large openings with aggregates within the treatment prescription. With the exception of the great gray owl, the *Survey & Manage Species* associated with structurally complex forests, in the short term, would not benefit from treatment under the *Proposed Action Alternative*, because the suitable habitat components would be removed or modified for these species. However, retention areas around known sites and untreated areas in Riparian Reserves would provide for persistence of these species and serve as a source population for re-colonization of regeneration areas.

The creation of large openings would increase foraging habitat for the great gray owl. Foraging habitat would improve as forbs and shrubs develop providing food sources and cover for small mammal prey species.

c) ***Cumulative Effects***

The Calapooya project is not expected to cause cumulative effects to *Survey & Manage Species*. The proposed harvest treatments are expected to benefit *Survey & Manage Species* in the long term, by creating structural diversity and complexity within stands that are currently lacking these components. An increase of characteristics associated with older forests would increase the amount of suitable habitat available to these species.

5. Landbirds

Guidance for meeting agency responsibilities under the Migratory Bird Treaty Act and Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds" is provided by Instruction memorandum OR-2008-050 (USDI/BLM 2008c). The guidance identifies lists of "Game Birds Below Desired Condition" and "Birds of Conservation Concern" to be addressed during environmental analysis of agency actions and plans.

RMP Protected Landbirds -The northern goshawk is protected under the guidance of the Roseburg District's Resource Management Plan (RMP). Management directions within the RMP are designed to enhance and maintain habitat for the species (USDI BLM 1995, pp. 48-49). The northern spotted owl, marbled murrelet, bald eagle, and peregrine falcon are also RMP protected landbirds; these species are listed as Bureau Sensitive Species and are addressed previously in the Special Status Species section.

Golden Eagle - The golden eagle is protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). This law provides for the protection of the golden eagle by prohibiting, except under certain specified conditions, the taking, possession and commerce of such birds. One objective of the act is to avoid taking of eagles by disturbance during the breeding season or habitat removal within nest sites.

Birds of Conservation Concern - The most recent "Birds of Conservation Concern" list (USDI/FWS 2008d) identifies 32species of concern in Region 5 (North Pacific Rainforest), an area that includes the Roseburg District BLM. Of those 32 species, there are 10 species that occur on the Roseburg District. These species are priorities for conservation action, with the goal to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions. It is anticipated that by focusing attention on these highest-priority species, as well as habitats and ecological communities upon which these species depend, would thereby contribute to healthy avian populations and communities.

Of the 10 species on District, seven species are suspected or known to occur within the project area. Three of the seven species, including the bald eagle, peregrine falcon, and northern spotted owl are also *Special Status Species* and addressed previously.

Focal Avian Species - The *Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington* (Altman and Alexander 2012) identifies 19 focal species to consider during forest management actions in the Western Cascades of Oregon. By managing for a group of species representative of important components (i.e. focal species) in a functioning coniferous forest ecosystem, many other species and elements of biodiversity also would be conserved.

Of the 20 species, 18 species would be expected to occur within the proposed project area, either within the proposed units or within adjacent forest habitat. The two species not expected within the project area would be the Black Swift (*Cypseloides niger*) and the Lincolon's sparrow (*Melospiza lincolnii*).

Game Birds- "Game Birds Below Desired Condition" identifies six species documented or suspected on the Roseburg District, of which three species are suspected or known to occur within the vicinity of the Calapooya project area. One game bird species, the band-tailed pigeon is expected to occur within the Calapooya harvest units. This species is also identified as a focal species.

a) ***Affected Environment***

The appropriate avian species lists, indicated above, were reviewed for the Calapooya project. Those species and habitat that are within the project area are incorporated and effects discussed in this analysis. Table C-1 in *Appendix C: Landbirds* summarizes general habitat requirements, status of species within the project area, and impacts of the proposed action for each of the 18 landbirds on the Roseburg District.

Six of the 18 species, including the Band-tailed Pigeon (*Columba fasciata),* Black-throated Gray Warbler *(Setophaga nigrescens),* Hermit Warbler (*Dendroica occidentalis),* Hutton's Vireo *(Vireo huttoni),* Pacific-slope Flycatcher *(Empidonax difficilis*), and Pacific Wren *(Troglodytes troglodytes),* are analyzed below because they are known or suspected to be present within the younger (< 80 years old) conifer forest habitat that is present within the proposed harvest units. These species are also associated with mature and old growth forests. All six of these species are *focal species* identified by Partners in Flight's *Conservation Strategy for Landbirds in Coniferous Forests of Western Oregon and Washington* (Altman and Alexander 2012). This conservation strategy document is used as a guide by the BLM, which provides information on suitable habitat for each *focal species* native to the Pacific Northwest and provides information (if available) on how these species may respond to management of conifer forest habitats.

The conservation priority for coniferous forests is forest management that provides habitat conditions and attributes for focal and/or declining species at site and landscape scales. For this analysis, the landbird analysis area includes BLM-administered lands in the fifth-field watersheds in the Western Cascades within the Swiftwater Resource Area. BLM-administered lands within the landbirds analysis area currently provide approximately 119,000 acres of forest habitat.

b) ***Environmental Consequences***

(1) **No Action Alternative**

Under the *No Action Alternative*, no forest habitat features would be affected. The six *Landbird Species* associated with younger forests within the project area would be expected to persist at their current levels.

The development of suitable habitat characteristics such as multi-layered canopy with large overstory Douglas-fir trees, large snags and coarse down wood, and a well-developed understory for *Landbird species* associated with late-successional forest habitat would occur more slowly than compared to the *Proposed Action Alternative (Appendix C).*

(2) **Proposed Action Alternative**

As described for Special Status Species, *Landbird species* associated with structurally complex forests would benefit from treatment under the *Proposed Action Alternative* in the long term. Within the short term, species associated with early seral habitat would benefit from treatment within the VRH units *(Appendix C).*

(i) Disturbance

Nests, eggs, and/or nestlings would be harmed or destroyed if nest sites are present and units are harvested during the breeding season (generally April – July). For portions of units requiring seasonal restrictions (April 1 – July 15) for the northern spotted owl, would also benefit *Landbird* species during their breeding season. Therefore, where seasonal restrictions would be implemented, harvest activities would not cause direct disturbance to breeding *Landbirds* that occur adjacent to or within units. In the units, where seasonal restrictions would not be implemented and harvest activities occur within the breeding season, disturbance to nesting birds and their young would be expected.

There may noise disturbance impacts associated with timber harvest activities within 0.25 mile of nesting raptors, including the golden eagle or northern goshawk, during the nesting season (January through August). It is unknown if these species are present within the late-successional stands adjacent to the units.

(ii) Effects to Habitat

The proposed treatments would cause potential loss of nesting and foraging habitat due to the modification or removal of overstory canopy. The degree of impacts depends on the individual species' habitat requirement and the intensity of treatment.

THINNING TREATMENT – Thinning would modify and partially remove stand overstory, reducing foraging and nesting opportunities over the short term, particularly within the heavily thinned areas for the six focal species. However, the development of understory deciduous shrubs and trees would increase habitat suitability within 5-10 years. Retention of remnant trees, snags, and down wood would also benefit some species, such as the pacific wren, which relies on these features, regardless of stand age.

As described previously, the most stand heterogeneity would develop from a combination of treatment intensities. Under the *Action Alternative*, the Calapooya thinning units are expected to develop into a stand with more diversity because of the gaps, skips and heavy thinning in the treatment prescription, developing habitat in the long term for *Landbird* species associated with late-successional forest habitat.

GAP CREATION - Gap creation would remove stand overstory, reducing foraging and nesting habitat for all six species. Creating gaps in thinned stands would create patches of diversity within generally homogenous stands. After the development of a shrub layer, these species would be expected to use the gaps for nesting and/or foraging.

VARIABLE RETENTION HARVEST - Under the *Action Alternative*, Calapooya VRH units are expected to be a mosaic of large openings with aggregates within the treatment prescription. Abundance of these six avian focal species within the VRH units would be expected to decline due to removal of canopy cover and the modification or removal of forest floor habitat components, including shrubs, forbs, and large down wood. Dispersed retention harvest would modify canopy overstory precluding nesting or foraging within these areas for approximately 5 - 20 years before canopy closure recovers.

c) ***Cumulative Effects***

The landbirds analysis area (as defined previously) currently provides approximately 28,000 acres of early forest (< 40 years), approximately 35,360 acres of younger forest (40 to 79 years), and 55,780 acres of older forest (≥80 years). Within the landbird analysis area, the Calapooya project in combination with the planned Back in Black project would modify approximately 1,182 acres (0.8 percent of 147,850 acres) of mid-seral forest habitat by thinning and removing approximately 810 acres (0.5 percent) of mid-seral forest habitat and 21 acres (0.03 percent) of late-seral forest habitat (111 years old) where dispersed retention is implemented within the analysis area. Including the proposed project approximately 3,300 acres (9.0 percent) of mid-seral habitat and 230 acres (0.4 percent) of late-seral habitat would be modified by 2021within the landbird analysis area. In addition, approximately 525 acres (1.5 percent) of mid-seral habitat and 25 acres (0.04 percent) of late-seral habitat would be removed within the landbird analysis area.

The disturbance and habitat effects due to the Calapooya project is not expected to have measureable effects to *Landbird* species at the population level within the landbird analysis area because sufficient young forest habitat, as well as older forest habitat, would be available to maintain viable populations within the watershed and adjacent watersheds. In addition, young forest habitat that occurs on private lands prior to their harvest may provide suitable habitat where key habitat attributes occur for *Landbird* species.

C. Soils

1. Affected Environment

The landscape within the Calapooya project area consists of terrain ranging from gently sloping broad ridges, foot slopes and side slopes to steep side slopes and very steep side slopes, with occasional headwalls (Johnson *et al.* 2004). About one third of the unit acres are located on stable broad ridges and foot slopes, and gentle to moderately sloping convex to concave side slopes, with slopes of 30 percent or less. These soils are deeply weathered with moderate to high amounts of clays in the subsoil, predominantly with silty clay loam, clay loam, silt loam or gravely clay loam textures. These soils are moderately to highly susceptible to compaction and displacement by heavy equipment because of the clay content and the low to moderate amount of gravels (Johnson *et al.* 2004, Williamson and Nielsen 2000). Soil compaction is still present in skid trails and landings where ground-based yarding occurred during past timber harvesting operations. Soil productivity is recovering very slowly where the topsoil was displaced and the subsoil was exposed. The main skid trails are predominantly vegetated with forbs, moss, or shrubs with little erosion occurring.

About half of the unit acres are located on moderate slopes of 30 to 60 percent, with convex and concave topography. The soils in these areas are moderately deep, 20-40 inches, to deep, more than 60 inches. The soil textures are loams, clay loams, and silty loams with moderate amounts of gravels. Slopes in these areas are stable to moderately stable but would be moderately susceptible to displacement, based on slope steepness. The potential for erosion would be greater than on the gentler terrain, due to the steeper slope gradient.

The remaining acres (about 15 percent) are located on steep to very steep side slopes of 60 to 90 percent or more, with deep to moderately deep soils. Soil textures generally range from gravely loam to gravely silty clay loams. Rock outcrops are common, surrounded by areas of shallow soils. Soil in these areas are not well developed, with moderate to extremely high amounts of gravels and cobbles on very steep slopes greater than 90 percent. The soils on the steep to very steep slopes are classified as fragile due to the slope gradients. These sites are subject to unacceptable soil and organic matter losses from surface erosion or mass soil movements, such as shallow, rapid soil failures, as a result of forest management activities, unless measures such as project design features and best management practices are used to protect the soils/growing site (USDI/BLM 1986).

The project area lies in the transition zone between the Coast Range and Cascades with geology that is complex, ranging from sedimentary rock (sandstones and siltstones) to volcanic rock (tuffs and andesitic/basaltic material). This has led to different degrees of weathering of the rock resulting in variable slope stability. The change in slope stability can occur within a short distance and on relatively gentle slopes.

Analysis of the Calapooya project area using aerial photos taken from 1964 through 1983 indicated that the majority of slope failures were small debris avalanches (less than 1/10 acre in size). Most of the identified landslides occurred during the 1964 storm event in areas that had been clearcut or were in an early-seral condition. Consistent with this analysis of landslides in the Calapooya project area, aerial photo inventories within the Swiftwater Resource Area have shown a declining number of landslides during the past 25 years. The reduction in landslide occurrence corresponds with the implementation of improved management practices especially in road location and construction.

Fluctuations in slope stability occur because of variations in weather and levels of management activity. Because of improvements in land management practices, the distribution of landslides in time and space, and their effects, more closely resemble those within relatively unmanaged forests (Skaugset, *et al*. 2002). The majority of the project area is currently stable. The areas affected by slides in the Calapooya project area are not currently experiencing erosion except for a naturally occurring, deep seated earth flow in Unit 15A where the toe of the slide is located within the stream and thus constantly experiencing erosion.

2. Environmental Consequences

a) *No Action Alternative*

Under the *No Action Alternative*, there would be no effect on the soils in the project area because there would be no soil displacement or compaction associated with road and landing construction, cable yarding, or ground-based yarding. The duff layer and soil organic matter would continue to increase slowly with the accumulation of needles, twigs and small branches, and decomposing larger woody material, absent a fire of sufficient intensity to consume the material.

The compacted soils in the skid trails would continue to recover very slowly, especially at depths greater than six inches (Amaranthus *et al*. 1996, Powers *et al.* 2005). These compacted soils would recover as the processes of freezing and thawing, the penetration of plant roots, and the burrowing of small animals break up the compaction and incorporate organic matter into the soil.

There would be no change in the stability of the soils within the project area however there could be occasional shallow, rapid slope failures during storm events and it is likely that the earth flow area within Unit 15A would continue to erode. The stands in the project area are 40-62 years old and the Oregon Department of Forestry found that landslide numbers were lowest in stands 31-100 years old following the intense 1996 storms (Robison *et al*. 1999.

b) ***Proposed Action Alternative***

(1) Soil Displacement and Compaction

Severe soil compaction can reduce soil productivity, resulting in reduced height and volume growth of conifer species (Wert and Thomas 1981). Extensive displacement of the mineral surface soil and mixing with the subsoil can reduce site productivity because subsoils are generally denser and lower in nutrients and organic matter. Extensive soil displacement can also alter slope hydrology, increasing the potential for surface soil erosion (Page-Dumroese *et al.* 2009).

Ground-Based Yarding

Monitoring of ground-based operations, which include rubber-tired skidders, tractors, excavators, and harvest/forwarder systems on the Roseburg District from 2000 through 2012 has shown that with application of appropriate project design features and Best Management Practices, the spatial extent affected by ground-based machinery ranged from 3-9 percent of the ground-based harvest area (USDI/BLM 2004, 2006, 2007, and 2009). Effects included soil compaction deeper than four inches and/or soil displacement deeper than the organic enriched surface soil layer. The effects of ground-based yarding varies by the type of equipment used, number of equipment passes over the trails, terrain, access routes, climatic conditions, and operator skill.

Project design features would limit the total surface area displaced and compacted in ground-based yarding areas to 3-9 percent or affecting approximately 9 to 26 acres (depending on the equipment used and number of landings and large pile areas). Project design features which restrict ground-based yarding on designated trails and on slopes less than 35 percent would reduce soil displacement and limit the extent of affected area. The extent of disturbance would also be limited by maintaining an average skid trail spacing of at least 150 feet and limiting equipment track width to 12 feet. Soil compaction would be minimized by suspending the use of ground-based equipment during periods of wet weather and when soil moisture levels are high. Additionally, main skid trails in VRH units would be subsoiled. Main skid trails and landings in thinning units would be subsoiled if deemed necessary.

Cable Yarding

Monitoring of timber sales that have used cable yarding systems on the Roseburg District has shown that the amount of ground affected by cable systems ranged from 2-3 percent of the harvest unit when the proposed project design features are applied (USDI/BLM 2007, 2008c, 2009). The monitoring included uphill cable yarding on gentle to very steep slopes (i.e. slopes up to 90 percent) and downhill cable yarding on gentle to moderate slopes (i.e. slopes less than 40 percent). Based on this monitoring, 2-3 percent of uphill cable yarding areas (irrespective of slope) and downhill cable yarding areas (on less than 40 percent slopes) have shown extensive soil displacement or compaction. Soil disturbance from cable yarding would vary by topography (e.g. convex vs. concave slope, slope steepness, and the presence or absence of pronounced slope breaks) and by the volume of logs yarded.

Approximately 70 acres of Calapooya would be downhill yarded. The maximum downhill yarding distance proposed in this project would be about 850 feet. The downhill cable yarding areas identified in both proposed timber sales have favorable deflection. Although the downhill cable yarding would occur on slopes steeper than 40 percent, the topography allows the potential for soil disturbance to be similar to that expected on slopes less than 40 percent. Monitoring in 2010 of downhill yarding effects on a Boyd Howdy commercial thinning unit directly adjacent to proposed Calapooya Unit 13A, showed less than one percent of the area had noticeable effects to soil (Barner 2011). Downhill cable yarding generally would produce more soil disturbance than uphill yarding on equivalent slopes because there would be less control of the logs. Disturbed soil, gravel, and slash material would be moved downslope by gravity with the downward movement of the logs. Increased soil disturbance increases the potential for surface soil erosion on the steeper slopes. However, for the Calapooya project, downhill yarding would eliminate the additional road construction needed for uphill yarding thus reducing overall soil disturbance.

Cable yarding (either uphill or downhill) would produce localized areas of soil disturbance, such as duff removal or displacement of the top 1-6 inches of soil, along the yarding corridors. The most soil disturbance would be within 100 to 150 feet of landings. Low to moderate soil compaction would be concentrated in the center of the corridors at depths of 3-4 inches. High soil compaction up to six inches deep would occur in small pockets.

The project design feature to obtain a minimum of one-end suspension would reduce the degree of soil displacement and compaction in cable yarding corridors. This would also help reduce the potential for shallow, rapid slope failures by minimizing soil surface disturbance. The project design features requiring lateral yarding capability of at least 75 feet and average corridor spacing of 150 feet would reduce the number of yarding corridors and landings and the spatial extent of soil disturbance and compaction.

(2) Slope Stability

The overall effect on slope stability from the proposed harvest activities would be low because of the retention of residual canopy, exclusion of unstable areas, and implementation of road Best Management Practices. Of the 1,245 acres proposed for treatment, VDT would be applied to 1,182 acres and only 63 acres would be treated with VRH. Variable density thinning has a lower risk to slope stability than VRH because of retention of residual canopy however the VRH units were designed to reduce the risk to the extent possible.

The stands in Calapooya are 40-62 years old and would have a low risk for slope failure or landslides. The Oregon Department of Forestry studied stands 0-100 years of age and older that were previously clearcut or replaced by fire (Robison *et al.* 1999). After the extreme storms of 1996, forested areas 31-100 years old were found to have the lowest landslide densities and erosion (Robison *et al.* 1999).

Trees transpire water and intercept moisture in their canopies, and live roots increase soil strength, contributing to slope stability. The proposed VDT would decrease the current tree canopy and live root mass helping to hold soil in place for a short period, until the canopy and remaining roots of the residual trees expand into the thinned and cleared areas. Residual trees would have accelerated canopy growth which would help intercept rainfall and transpire water and their live roots would also help retain soil strength and slope stability. The gradual loss of soil holding strength from decaying roots of the cut trees would be compensated over time by the increased root coverage of the residual trees.

In gaps and dispersed retention, root strength would drop to a low point in seven to ten years and then improve rapidly. After 10 years, the landslide susceptibility would drop substantially (USDI 2008a; p. 348; Robinson *et al.* 1999). As in thinned areas, the gaps and dispersed retention areas would accelerate the growth of residual trees along the border that would grow into the open areas. Understory vegetation such as shrubs, forbs and grasses, as well as planted and natural seedlings, would respond to the increased light in openings taking up increased soil moisture and stabilizing the soil.

In addition to the benefit of residual canopy and root elements, areas of concern would be avoided, which would reduce the overall effect of the proposed action on slope stability. Units were field reviewed by the project soil scientist and areas of existing instability were flagged and excluded from treatment. Gaps and dispersed retention treatments in units would be located in areas that do not have existing slope stability issues. Additionally, the Riparian Reserves in the VRH units would be untreated skip areas which would further reduce the likelihood of slope failure and landslides impacting streams.

Landslide-prone portions of the landscape most commonly occur within the steep inner-gorge of streams; however, under the *Proposed Action Alternative*, these areas would be included in the no-harvest areas. On landslide-prone portions of the landscape, timber harvest can increase the probability of landslides, but only if a damaging storm occurs in the vegetation re-growth period: up to 10 years following harvest (USDI/BLM 2008a).

The highest risk for shallow, rapid slope failures was found on slopes over 70 percent, depending on landform and geology (USDI/BLM 2008a). In Calapooya, the most likely slope failure would be occasional shallow (three feet or less in depth), rapid slope failures. The occasional shallow, rapid slope failures or other small slope failures would not exceed the level and scope of soil effects considered and addressed in the PRMP/EIS (USDI/BLM, Roseburg District 1994).

If a slope failure were to occur on the steep to very steep slopes, the travel distance of the material would depend on a variety of factors, including the initial failure size (amount of material), the initial and down slope steepness, proximity to stream channels, the downstream channel junction angles, stream channel gradients, and the riparian condition along the resulting debris flow path (Robison *et al.* 1999; Benda and Cundy 1990).

Best Management Practices were designed to reduce the likelihood of road and harvest activities contributing to landslides. Road runoff would be directed away from unstable fill slopes, fragile and unstable areas would be avoided, bare soil as a result of road construction would be stabilized, waterbars would control runoff on skid trails and yarding corridors.

Overall, the Calapooya project would have little effect on slope stability for the following reasons:

- Thinning would retain trees to intercept rainfall and transpire water, helping reduce the degree and duration of soil saturation.
- Gaps and dispersed retention treatments would be located on stable soils
- Live roots from residual trees would retain soil strength.
- Unstable slopes would be excluded from treatments.
- Best Management Practices and project design features would control runoff and protect unstable slopes.

(3) Soil Productivity

The creation and use of landings and roads would displace and compact soil, thereby decreasing soil productivity. The proposed road construction of 1.8 miles would occur on approximately nine acres and would result in new soil displacement and compaction. The maintenance or renovation of existing roads that have been closed since the last entry would re-disturb these areas with moderate to heavy soil compaction. All roads are proposed to be rocked to allow for winter harvest operations, however this would eliminate the opportunity for amelioration of soil compaction.

New road cut and fill slopes would be mulched with weed-free straw (or its equivalent) or seeded to prevent surface soil erosion from road construction. With the project design features described in Chapter 2, resulting soil erosion would be limited to localized areas, and any reduction of soil productivity due to erosion would be minor.

With implementation of the project design features described in Chapter 2, soil displacement and compaction from cable and ground-based yarding would be consistent with the effects addressed in the PRMP/EIS (USDI/BLM, Roseburg District 1994). The area disturbed by cable yarding would be less than three percent (about 30 acres) and the area disturbed by ground-based yarding would be less than 10 percent (about 26 acres). Road construction would create new soil displacement and compaction that would exclude tree growth on approximately nine acres (less than one percent) of the project area.

3. Cumulative Effects

The past effects of forest management on soil productivity and slope stability are documented in the affected environment section. There are no ongoing actions occurring in the project area that impact soil productivity and slope stability. No projects proposed in the foreseeable future overlap Calapooya treatment units; however the Back in Black Project proposes regeneration harvest in four stands adjacent to Calapooya units. The spatial scope for cumulative effects to soil productivity and slope stability are considered to be those within the proposed treatment units and new roads where disturbing activities would occur. Because the proposed actions in the Back in Black units do not overlap Calapooya units, no cumulative effects would occur for the soil resource.

D. Hydrology, Aquatic Habitat & Fisheries

1. Affected Environment

The Calapooya project area lies within the Coon Creek, Oldham Creek, Cantell-Gilbreath Creek, and Gassy Creek 14 digit Hydrologic Unit Code (HUC) Drainages of the Hinkle Creek-Calapooya Creek, Oldham Creek, and Gassy Creek-Calapooya Creek 12 digit HUC Subwatersheds of the Calapooya Creek 10 digit HUC Watershed. It is also within the French Creek and Idleyld Park Drainages, of the Bradley Creek-North Umpqua River Subwatershed, of the Lower North Umpqua River Watershed, and the Headwaters Elk Creek Drainage, of the Headwaters Elk Creek Subwatershed, of the Elk Creek Watershed. Approximately 88 percent of the project is within the Calapooya Creek Watershed. Approximately six percent of the project is within the Lower North Umpqua Watershed, and six percent is within the Elk Creek Watershed. All of the treated acres within the Elk Creek and Lower North Umpqua Watersheds are located on ridge tops of these watershed divides with the Calapooya Creek Watershed.

(1) *Water Quantity and Water Quality*

There are approximately 70 first- or second-order headwater streams and five higher order streams (Gossett Creek, Boyd Creek, Mill Creek, Field Creek, and Norris Creek) adjacent to or within the proposed units totaling approximately 18 miles of stream length. Approximately 30 percent of this stream length is classified as perennial (i.e. surface water flows year-round with the channels passing some volume of water throughout the year) and 70 percent is classified as intermittent (i.e. they stop flowing in the dry season and surface water is no longer transported downstream). All of the streams within and adjacent to treatment units in the Calapooya project area are high gradient cascade and step-pool stream types. Unit 13C and 33A each have a wetland greater than one acre in size, and Unit 9D and 7H each have a natural pond (beaver pond). All of these features would be allocated as Riparian Reserve as discussed in Chapter 2.

Elk Creek, which is one mile downstream of the nearest treatment unit, and Calapooya Creek which is 1.3 miles downstream, had previously been placed on the Clean Water Act 303(d) list for exceeding water temperature standards essential to salmon and trout rearing and migration. The 303(d) list identifies streams where water quality is impaired or threatened and a Total Maximum Daily Load (TMDL) is needed. Once a TMDL for a listed stream has been approved by the EPA, the stream is removed from the 303(d) list. Elk Creek and Calapooya Creek are now covered by the Oregon Department of Environmental Quality's 2006 Umpqua Basin Total Maximum Daily Load and Water Quality Management Plan, which was approved by the U.S. Environmental Protection Agency on April 12, 2007.

The potentially affected beneficial uses of water within the project area are for resident fish, aquatic life, and salmonid spawning and rearing. Beneficial uses of water immediately downstream of the project area include fish and aquatic life, domestic use, and irrigation. There are approximately 50 points of diversion registered as water rights listed by the State of Oregon within one mile downstream of the project area. The Calapooya project lies within three municipal drinking water source areas. The intake locations for the cities of Glide and Sutherlin are approximately five miles downstream of the project area, and the city of Oakland intake is approximately 16 miles downstream.

Average annual precipitation in the Calapooya project area ranges from approximately 47 inches to 77 inches, occurring primarily between October and April. Elevations in the Calapooya project area range from 780 to 2,820 feet. Most of the project area (83 percent) lies within the rain dominated hydroregion where snow accumulation is uncommon (i.e. below 2,100 feet elevation). The rest (17 percent) of the project area lies within the rain-on-snow hydroregion (i.e. 2,100-4,000 feet in elevation) where some snow accumulation occurs transiently throughout the wet season.

Stream flows are dependent upon the capture, storage, and runoff of precipitation. Timber harvest can alter the amount and timing of peak flows by changing site-level hydrologic processes. These hydrologic processes include changes in evapotranspiration, snowmelt, forest canopy interception of rain and snow, road interception of surface and subsurface flow and changes in soil infiltration rates and soil structure (2008 Final EIS; p. 352). Based on a compilation of watershed studies in the Northwest, completed in small catchments, a peak flow response is detected when at least 29 percent of the drainage area is harvested (Grant *et al.* 2008). No experimental study shows a peak flow increase when less than 29 percent of a drainage area in the rain dominated hydroregion has been harvested (2008 Final EIS, p. 353). None of the subwatersheds in the Calapooya project area are susceptible to increases in peak flow stemming from unrecovered canopy openings (2008 Final EIS; p. 755). Research by Poggi *et al.* (2004) suggests that forest thinning treatments maintain normal patterns of snow accumulation and have little effect on snowmelt rates during rain-on-snow events (2008 Final EIS, p. 355).

Increases in peak flow can also occur when roads and other impermeable areas occupy more than 12 percent of a drainage that is in a rain-on-snow hydroregion (2008 Final EIS, p. 355). Within the project area, roads occupy approximately three to four percent of the drainages and do not pose a risk of increased peak flows.

Roads that cross streams represent potential sources of sediment to streams depending upon road conditions and the volume of water passing at any given time. Road segments linked to the channel network also increase flow routing efficiency and offer a mechanism for peak flow increases (Wemple *et al.* 1996). Within the Calapooya project area, there are approximately 100 stream crossings; 30 within the timber units, and 70 along the associated haul route.

Roads total approximately 315 miles in the seven drainages encompassing the project area. The average road density in the project area is 4.8 road miles per square mile. Assuming a 40-foot average width, roads cover approximately 1,527 acres and represent between three and four percent of the seven drainages that comprise the project area. Roads cover approximately 3.5 percent of the project area.

(2) *Woody Structure in Streams*

From an aquatic habitat perspective, there are two major components of woody material – small functional wood (< 20 inches diameter), and large wood (≥ 20 inches diameter and ≥ 50 feet long; also called key pieces). Large wood is needed in fish bearing streams to trap and store smaller pieces of wood. Because decay rates and displacement probability are functions of size, large wood has more influence on habitat and physical processes than small functional wood (Dolloff and Warren 2003).

Small Functional Wood

Nearly all wood that falls into stream channels has the capacity to influence habitat and aquatic communities (Dolloff and Warren 2003). Small functional wood material that enters stream channels is important to overall channel function because it can store sediment and organic material, contribute nutrients, and provide temporary pool habitat and slow-water refugia. Pools formed by smaller wood generally are not as deep or complex as those formed by large wood. In addition, small functional wood does not persist for long periods of time because it deteriorates quickly and is more likely to be flushed from the system (Naiman *et al.* 2002, Keim *et al.* 2002).

Small functional wood is generally lacking in the larger, fish bearing channels throughout the project area. Based on professional judgment, this is likely due to the lack of stable large wood available to trap and store this material, not a lack of available small functional wood for recruitment. Where there are pockets of large wood, the amount of small functional wood is relatively high compared to other streams without large wood.

In smaller streams adjacent to previously harvested stands, field surveys indicated relatively large amounts of existing (in-stream) and potential (standing) small functional wood are present (McEnroe 2014). Field surveys also indicate that the majority of the down wood in these areas originated from within 50 feet of the stream channel. This is consistent with findings by Minor (1997), who found that in second-growth coniferous riparian forests in the Oregon Coast Range, 70-84 percent of the total in-stream wood was recruited from within 49 feet (15 meters) of the channel. McDade *et al.* (1990) and Welty *et al.* (2002) also found 80 percent and 90 percent, respectively, of the wood loading occurred within 66 feet (20 meters) of the stream channel in coniferous forests.

Current stand densities in the proposed units range from 105 to 385 trees per acre (TPA). Based on studies in the Oregon Coast Range by Tappeiner *et al.* (1997), conifer stands that initiated and grew at relatively low densities with little self-thinning were reported to have stand densities ranging from 40 to 50 TPA. This suggests that the available source of small functional wood was naturally lower in these areas and the current average stand density is three to five times higher than what was likely found when the previous stands in the Calapooya project area were of similar age. These stand densities would thus be expected to provide a large amount of small functional wood to the streams, a condition supported by field survey results that indicate a large amount of instream and standing wood (McEnroe 2014).

Large wood

Based on field surveys within the Calapooya project area (McEnroe 2014), large wood levels are moderate in all channel sizes and in all areas adjacent to previously harvested stands. Areas with large wood in the stream are dominated by gravel and cobble substrates, deep scour pools, point bars, and an abundance of habitat diversity where fish and other organisms can find suitable cover throughout the year. Aquatic habitat conditions are substantially different in areas without large wood, lacking gravel and cobble substrates and deep pools.

(3) *Fish Populations*

A variety of anadromous (sea run) fish are found within the project area, including coho salmon (*Oncorhynchus kisutch*), winter steelhead trout (*O. mykiss*), coastal cutthroat trout (*O. clarki clarki*), and Pacific lamprey (*Lampetra tridentata*). In addition, a variety of non-anadromous (resident) fish are also found within the project area, including resident forms of rainbow and cutthroat trout (*O. mykiss and O. clarki clarki*), sculpin (*Cottus sp.*), dace (*Rhinichthys sp.*), brook lamprey (*Lampetra richardsoni*), and redside shiner (*Richardsonius balteatus*).

On February 4, 2008, National Oceanic and Atmospheric Administration (NOAA) Fisheries listed the Oregon coast coho salmon evolutionary significant unit (ESU) as threatened under the Endangered Species Act. This included the designation of critical habitat for Oregon Coast (OC) coho salmon. The OC coho salmon is the only fish species on the Roseburg BLM District currently listed under the Endangered Species Act (ESA). The fish bearing portions of Coon Creek, Gossett Creek, Haney Creek, Mill Creek, Boyd Creek, Oldham Creek, Gassy Creek, Slide Creek, and Field Creek within the project area are considered to be critical habitat for OC coho salmon (Appendix H, Figures 6 and 7).

Streams and habitat that are currently or were historically accessible to Chinook and coho salmon are considered essential fish habitat. Essential fish habitat is designated for fish species of commercial importance by the Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Federal Register 2002, Vol. 67/No. 12). Within the Calapooya project area, there are approximately 13.2 miles of essential fish habitat. The streams listed above that are OC coho critical habitat are also identified as essential fish habitat.

The anadromous version of the coastal cutthroat trout and the Pacific lamprey have very similar habitat needs to the OC coho salmon, and are also found in the coho bearing portions of the streams within the project area. Steelhead trout are listed as a Bureau Sensitive Species in Oregon and are found in all fish bearing streams within the project area. Chum salmon and Umpqua chub are also listed as Sensitive Species on the BLM's Special Status Species list, but these fish are not found within the project area.

Extensive timber and stream management actions in the Pacific Northwest from the 1950's through the 1980's have resulted in a large proportion of aquatic habitats that are considered degraded (Meehan 1991, Williams *et al.* 1997). This is especially true in and along the larger, fish bearing stream channels. Aquatic habitat conditions in fish bearing streams within the project area are representative of this trend. The past practices of splash damming, riparian clearing, physical removal of large wood from streams (stream cleanout), construction of roads along stream channels, and harvest of unstable areas have all led to simplified aquatic habitat conditions throughout the project area.

2. Environmental Consequences

a) *No Action Alternative*

(1) *Water Quantity and Water Quality*

Canopy Opening Impacts on Peak Flow Susceptibility

Under the *No Action Alternative*, no canopy openings would be created. Therefore, peak flow would not be affected and there would be no susceptibility of increased peak flow.

Road Impacts on Peak Flow Susceptibility

There would be no increase in road density within the project area since there would be no road construction. Therefore, peak flow would not be affected and there would be no susceptibility of increased peak flow.

(2) *Sedimentation from Roads*

Under the *No Action Alternative*, routine road maintenance would not fully repair existing sediment sources (e.g. culvert failures, natural surface road erosion, or cut slope failures). The lack of road maintenance would be most prominent on roads that are infrequently used or blocked. As they age, existing roads and drainage structures are subject to ongoing degradation or failure in the event of a storm. Most road or culvert failures would result in direct inputs of sediment to the drainage network. The amount of introduced sediment would vary depending on the size of the storm event and the infrastructure's condition, stability, and proximity to a stream.

(3) *Sedimentation from Harvesting/Yarding Operations*

Under the *No Action Alternative*, the Riparian Reserves would not be treated. Under normal conditions, very little sediment would be delivered to the stream network because there would be no ground disturbance near streams and the duff layer and stream banks would remain intact to intercept overland flow and filter any sediment naturally moving downslope.

(4) *Stream Temperature*

Under the *No Action Alternative*, effective stream shade would be maintained at current levels because there would be no treatment within the Riparian Reserves. Vegetation that provides primary shading for perennial streams would remain, which would maintain canopy closure and prevent increased stream and air temperatures (2008 FEIS, p. 761).

(5) *Woody Structure in Streams*

Under the *No Action Alternative*, there would be no treatment within Riparian Reserves. Without thinning treatment, tree growth rates in these areas would continue on their current trajectory leading to increased suppression mortality and decreasing diameter growth rates (q.v. *Forest Vegetation*; p. 35).

Small Functional Wood

The *No Action Alternative* would maintain existing stand densities. This alternative would not affect the amount of small functional wood available to enter stream channels.

Large Wood

Based on the trend of increasing suppression mortality and decreasing diameter growth rates in these stands, the *No Action Alternative* would result in an increase in the time needed for average stand diameters to reach 20 inches dbh, when compared to disturbances that decrease stand density and increase tree growth rates.

(6) *Riparian Vegetation Conditions*

Under the *No Action Alternative*, riparian areas would continue to be dominated by dense, even-aged, Douglas-fir stands. Individual tree growth rates would continue to decline and suppression mortality would increase. Overtime, as individual or small groups of trees die, the natural processes of stand development would eventually lead to structural and vegetative diversity within the stand. These areas would take longer to attain late-seral characteristics when compared to the *Proposed Action Alternative*. In addition, there would be a higher risk of mass tree mortality from a natural disturbance, such as a windstorm or fire.

b) ***Proposed Action Alternative***

(1) *Water Quantity and Water Quality*

Canopy Opening Impacts on Peak Flow Susceptibility

The 2008 Final EIS (pp.753-759) analyzed peak flow effects from forest management on subwatersheds across western Oregon. Although some subwatersheds would be susceptible to increases in peak flows, this does not automatically imply adverse effects on stream form. It is presumed that hydrologic impacts, such as peak flow increases, would vary depending on the intensity of a treatment (i.e. regeneration harvest having the greatest impact and thinning having the least impact), although past experimental studies in the Pacific Northwest did not fully examine the differences (Grant *et al*. 2008; 2008 Final EIS, p. 353). Stream flow fluctuates with climate and over time, channels have developed under a wide range of stream flows including infrequent peak flows. These stream flows have the potential to affect the frequency of sediment transport and the depth of scour. However, the potential for peak flow effects would vary depending on stream type (Grant *et al*. 2008). The 2008 Final EIS (p. 758) indicated within high gradient cascade and step-pool stream types there is little potential to affect sediment transport and peak flow enhancement. All of the streams within and adjacent to treatment units in the Calapooya project area are these types of streams.

Approximately three percent of the proposed treatment area would be treated with heavy thinning and approximately one percent treated with gaps under the VDT prescription as described in Chapter 2. Approximately four percent of the treated area would receive a dispersed retention prescription under the VRH treatment. These three prescription types have the most potential to influence stream flow response. To assess the potential sensitivity to hydrologic impact, the amount of Equivalent Clearcut Area (ECA) was determined from aerial photography and GIS data of the Coon Creek, Oldham Creek, Cantell-Gilbreath, Gassy Creek, French Creek, and the Headwaters Elk Creek HUC 14 Drainage Areas. Equivalent Clearcut Area is an accounting method that includes the area in roads within a watershed and unrecovered canopy openings resulting from recent timber harvest.

Existing ECA in these drainages ranges between 3 and 21 percent. Coon Creek has the highest ECA at 21 percent, due to approximately 2000 acres of private timber harvest within the last 15 years. The Gassy Creek drainage is next highest at 12 percent. The VRH treatment of approximately seven acres in Coon Creek would result in no measurable change to ECA which would remain at 21 percent. The combination of dispersed retention, gap creation, and heavy thinning proposed in the Calapooya project would increase the ECA by approximately one percent in the Gassy Creek and Oldham Creek drainages. The ECA would remain unchanged by the Calapooya project in all other drainages. All of these drainages in the project area would remain below the 29 percent ECA threshold when measurable increases in peak flows would be expected (Grant *et al.* 2008).

Road Impacts on Peak Flow Susceptibility

There would be approximately 1.8 miles of new spur road construction in Calapooya with 1.3 miles of the new construction decommissioned after use. Approximately 1.4 miles of existing spur roads in the project area would also be decommissioned following use, resulting in a total of 2.7 miles of decommissioning in the project area (q.v. *Road Activities,* p.21). Thus there would be no increase in road density in the project area. Although the net amount of roads within the project area would decrease, the resulting area covered by roads within the project area drainages would remain unchanged at approximately 3.6 percent, which is

less than the 12 percent threshold where measurable increases in peak flows would be expected (Harr *et al.* 1975). By decommissioning roads, the potential for peak flow effects and sediment routing would be diminished.

(2) *Sedimentation from Roads*

According to Reid (1981) and Reid and Dunne (1984), forest roads can be a major contributor of fine sediment to streams, through down-cutting of ditch lines and erosion of unprotected road surfaces by overland flow.

Road maintenance associated with the Calapooya project would occur prior to timber haul and would install cross drains and maintain ditchlines along proposed haul routes to disconnect roads from the stream system. This would reduce the amount of road related sediment entering streams in the project area.

Little sediment would reach streams from yarding trails and corridors because overland flow is rare on soils with high infiltration and covered with duff and slash such as the soils in the project area. The "no-harvest" stream buffers would also intercept run-off from roads allowing for deposition of sediment transported by overland flow before it reaches active stream channels and would prevent soil disturbance to stream channels and stream banks.

Timber hauling could occur in both the dry and wet seasons. During the dry season there is no mechanism for sediment transport from the roads to the streams. However, with the first seasonal rains there could be a small pulse of sediment at stream crossings. During the wet season, sediment carried by runoff from road surfaces to ditchlines can ultimately result in sediment transport and delivery to the aquatic system. This sediment has potential to impact water quality by increasing turbidity. Potential total sediment inputs from existing roads would be negligible because these roads would have well vegetated ditchlines to filter and trap sediments. Past monitoring of timber haul and sediment delivery on similar road systems indicates that vegetated ditchlines are effective at filtering sediment from water in road ditchlines (McEnroe 2012) (Figure HF1).

There would be the potential for localized soil disturbance and erosion associated with road construction, renovation/maintenance, and improvement within Riparian Reserves under the *Proposed Action Alternative*. The amount of sediment contributed from these sources during the first seasonal rains would be negligible when compared to the amount of sediment that has accumulated from all intermittent channel beds and stream banks within the stream network during the dry season. Following the first seasonal rains, erosion rates would stabilize and sediment delivery would be indistinguishable from background levels resulting in no measureable change to water quality.

Road segments must be connected directly to channels in order to deliver sediment-laden water. There are no stream road crossings associated with any of the road construction in this project. Therefore, none of the new road construction length would be connected to the streams through ditchline drainage and therefore would have no effect on stream sediment. All of the new road construction is outside of the no harvest buffers established for this project, however new road construction would occur in the outer half of the Riparian Reserve in three locations.

Spurs GBd and GBm extend approximately 30 feet and 50 feet, respectively, into the Riparian Reserves near their locations. Spur GGc travels approximately 1200 feet through the Riparian Reserve in order to provide a new access route into Unit 17D. This route is necessary to avoid reopening the 25-4-12.0 road, which is located along a fish-bearing segment of Field Creek. Spur GGc would be located approximately 100 feet from an intermittent, non-fish bearing headwater stream, whereas the existing 25-4-12.0 road parallels a perennial, fish-bearing portion of Field Creek, as close as 30-50 feet, for a distance of approximately 1,500 feet, and crosses the stream channel three times according to GIS data. The new route would create little risk of sediment delivery to the aquatic system, versus reopening the existing 12.0 road which would create a very high potential for sediment delivery. The new route would minimize impacts to the aquatic system and provides a stable location for long term management of this area. Road construction would be limited to the dry season and the spurs would be over-wintered in a condition that is resistant to erosion and sedimentation (q.v. *Sediment Control Plan*, pp. 24-26).

Road construction closest to OC coho salmon habitat would be approximately 700 feet away. Well vegetated ditchlines and implementation of the project design features (q.v. pp. 24-26) would trap any sediment before it reaches fish-bearing streams.

Timber hauling would be suspended during wet weather if road runoff would deliver higher sediment concentrations than seen prior to haul. Therefore, the combination of well vegetated ditches, project design features, and the ability to suspend wet weather haul is expected to prevent unacceptable sediment delivery to the aquatic system.

Figure HF1: Example of durable rock surface on a Good Boyd haul route (24-3-21.0 road)). Note the vegetated ditchlines that filter and trap road derived sediment. This photo was taken during a large rain event.

(3) *Sedimentation from Harvesting/Yarding Operations*

Potential effects of timber harvest on aquatic systems come primarily from potential increases in landslide frequency and road activities, including road renovation, construction, and timber haul close to streams.

The no-harvest buffers adjacent to stream channels would be expanded to include unstable areas identified within the Riparian Reserves by the project soil scientist. This would result in a low risk of increased landslide activity and delivery of sediment to streams as a result of thinning in the Riparian Reserves (q.v. *Slope Stability*, pp. 92-93).

The potential for localized soil disturbance and erosion would be associated with harvest and yarding operations within Riparian Reserves. However, the project design feature requiring full suspension, where practical, when yarding across streams (q.v. *Timber Yarding*, pp. 19-20) would reduce the risk of sedimentation arising from streambank and channel disturbance.

No-harvest buffers of 35 feet on intermittent streams, 60 feet on perennial streams, and 100 feet on fish-bearing streams would provide root strength sufficient to maintain bank stability (USDI BLM 2008a), protect stream banks, and prevent additional sediment from entering streams. Rashin *et al.* (2006) found that sediment delivery is unlikely when potential erosion features (e.g. skid trails and yarding corridors) are more than 33 feet (10 meters) from stream channels. As such, the no-harvest buffers reduce ground disturbance near streams and maintain an intact duff layer that would be effective at intercepting and filtering sediment from upslope sites and not concentrating in gullies or yarding/skidding trails (Rashin *et al*. 2006).

(4) *Stream Temperature*

Under the *Proposed Action Alternative*, effective stream shade would be maintained because the vegetation that provides primary shading for perennial and fish-bearing streams would be protected by 60-foot and 100 foot, respectively, no-harvest areas. Maintaining approximately 60-80 percent canopy closure outside of this buffer within the Riparian Reserves (*Forest Vegetation*, Table FV-6, p. 39) would also help prevent increased stream and air temperatures (2008 FEIS, p. 761). No dispersed retention would be implemented within Riparian Reserves and thus would not cause an increase in stream temperatures.

(5) *Woody Structure in Streams*

Small Functional Wood

The *Proposed Action Alternative* would retain no-harvest buffers along stream channels, and thin some of the Riparian Reserves to varying densities. The no-harvest buffers would maintain existing stand densities and the source of small functional wood near streams. Small functional wood is needed to maintain aquatic complexity. Thinning outside of the no-harvest buffers in the Riparian Reserves would reduce the amount of standing small functional wood that could fall and enter stream channels, however, the majority of instream wood entry is triggered by disturbance events, such as windstorms, fire, floods, and landslides, not suppression mortality and random tree fall (May and Gresswell 2003). Based on the findings of Tappeiner *et al.* (1997), the post-thinning stand densities ranging from 73-159 TPA would still be in the high range of stand densities occurring in the previous stands before they were harvested. As a result, these thinned areas would be able to contribute small functional wood to the aquatic system at higher levels than historically seen in similar aged stands.

Large Wood

Based on a retrospective study of Riparian Reserve treatments similar to those under the *Proposed Action Alternative*, average growth rates of residual conifers in thinned areas increased by 36 percent when compared to unthinned stands at 10 to 23 years post-thinning (Marshall *et al.* 1992). This increased growth would enable the residual trees to attain larger diameters sooner than in the absence of thinning. Thus, trees in the proposed Calapooya thinning units would become large trees ($\geq$ 20 inches dbh) and be available for recruitment as large wood in a shorter amount of time than if the stands were not thinned.

(6) *Riparian Vegetation Conditions*

Thinning treatments implemented under the *Proposed Action Alternative* would improve riparian vegetation conditions, structural diversity, and species diversity in comparison to the existing conditions (Tappeiner 1999). Thinning riparian areas would produce stands more resilient to disturbance from wind, flood, and fire. As tree growth rates and structural and species diversity increase, the thinned areas would develop late-seral characteristics in a shorter period of time than if left untreated (q.v. *Forest Vegetation*, p. 37-39).

(7) *Fish Populations*

No direct effects to fish populations, critical habitat for the Oregon Coast Coho Salmon or Essential Fish Habitat are anticipated under the *Proposed Action Alternative* because there would be no direct effects to the aquatic habitat. The indirect effects to fish populations would roughly parallel the effects previously discussed for small functional wood, large wood, and riparian vegetation conditions. Actions that have a positive or negative impact on those three attributes are likely to result in similar impacts to aquatic habitat, and ultimately, fish populations. This is not a direct correlation, however, because fish population variability is influenced by factors other than local habitat conditions including predation, floods, droughts, ocean conditions, disease, and recreational and commercial harvest. In addition, the processes of small and large wood entry, as well as changes to riparian vegetative diversity, take decades for the effects to be realized, and then more time for those changes to influence physical stream habitat conditions.

While there would be a reduction in the amount of standing small functional wood in the outer Riparian Reserves, this would not translate into a measureable impact to aquatic habitat. The amount of small functional wood entry into stream channels would be expected to remain within the range of natural variability in the project area because stand densities after thinning would be higher than those that existed prior to the original harvest (Tappeiner *et al.* 1997). As a result, there is a low probability the action alternative would result in a measureable impact on fish habitat or fish populations.

3. Cumulative Effects

No-harvest buffers and the project design features would prevent disturbance to stream banks and channels. These measures would also help to intercept surface runoff and prevent sediment from entering streams so there would be no cumulative impact on water quality, beneficial uses of water, or municipal drinking water sources in or downstream from the project area.

Under the *Proposed Action Alternative,* the time required for trees to attain large wood size (>20 inches dbh) is expected to decrease. In addition, riparian vegetative diversity is expected to increase. The cumulative increase in the availability of large wood to enter streams, coupled with increasing vegetative diversity in Riparian Reserves would contribute to the trend of gradually improving aquatic habitat in the Calapooya Creek Watershed. When compared to the *No Action Alternative* that does not include riparian thinning, this alternative would hasten the attainment of healthy aquatic habitat capable of supporting the natural fish species mix and population variability typical of healthy western Oregon ecosystems. These changes would rarely be measurable at the site scale and are therefore best considered at the cumulative scale across a watershed.

Within the next five years, BLM is planning the Back in Black project which proposes harvest of approximately 225 additional acres within the Coon Creek Drainage and approximately 150 acres in the Oldham Creek Drainage. This additional proposed harvest would result in an increase in ECA from 21 to 24 percent for Coon Creek and an increase from nine to 10 percent for Oldham Creek. These drainages would remain below the 29 percent threshold where measurable increases in peak flows would be expected (Grant *et al.* 2008). Therefore, no measurable change in hydrologic response would be expected from this additional treatment.

The remaining proposed Back in Black treatment area (approximately 225 acres) is located in other drainages of the Calapooya Creek Watershed and would not have cumulative effects with the Calapooya Creek Harvest Plan project. Although these projects may share the same subwatershed, a synthesis of literature on the effects of forest practices on peak flows predicted that harvest effects diminish as basin size increases (Grant *et al* 2008, p. 45). Therefore, no additional cumulative response is expected within any of the subwatershed (HUC12) or Calapooya Creek Watershed (HUC10) scales.

Aquatic Conservation Strategy

The *Proposed Action Alternative* would meet ACS objectives at the site and watershed scales based on the information presented in *Appendix C: Aquatic Conservation Strategy Assessment.* In addition, the restorative nature of the project would meet the ACS objectives by maintaining or restoring the ecological health of the watershed and ecosystems contained within them on BLM administered lands. Therefore, this action is consistent with the ACS and its objectives at both the site and watershed scales.

E. Noxious Weeds

1. Affected Environment

Surveys for noxious weeds in the proposed Calapooya units and along proposed haul routes located Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus armeniacus*), and English hawthorn (*Crataegus monogyna)*. Scotch broom and Himalayan blackberry are Oregon State designated Category "B" Noxious Weeds, which are weeds of economic importance that are regionally abundant, but may have limited distribution in some counties (Oregon Department of Agriculture Noxious Weed Control Program, 2014). English hawthorn is a Douglas County designated Category "B" Noxious Weed, which means that it is common and well established in Douglas County. Eradication at the county level is not likely. Containment is possible in some cases and is encouraged (Douglas County Noxious Weed Policy and Weed List, 2014).

Scotch broom was found growing in many patches throughout, and extensively along several roads within the Calapooya project area. Scotch broom is a pioneer species known to displace native plant species. The seeds are long lived (over 50 years) and mature plants are prolific seed producers, establishing persistent seed banks. Reducing or eradicating populations requires long-term management.

Himalayan blackberry is located along numerous roads, sometimes restricting passage, within the project area. It aggressively displaces native plant species and dominates most riparian habitats. Himalayan blackberry is a wide spread noxious weed problem in Douglas County and has an economic impact on right-of-way maintenance and forest production.

English hawthorn is common along roadsides and scattered within Units 11A, 11B, and 11C. Hawthorn spreads rapidly by seed into woodlands and open fields, often creating a dense thicket.

Other noxious weed species found in the project area include: Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), tansy ragwort (*Senecio jacobaea*), and St. Johnswort (*Hypericum perforatum*). These species are Oregon State listed "B" noxious weeds and are generally found sparsely invading disturbed areas along roadsides and off-road vehicle tracks.

2. Environmental Consequences

a) ***No Action Alternative***

Noxious weeds in the Calapooya project area are managed under the Roseburg District Noxious Weed Program (USDI/BLM 1995a). Under the No Action Alternative, the BLM would not implement new management actions that would result in ground disturbance, changes in canopy cover, or importation of noxious weed seeds or plant parts into the Calapooya project area and therefore would result in no direct or indirect impacts to noxious weeds. Noxious weed treatment in the Calapooya project area was implemented in 2014 using approved herbicides and/or manual treatment and ongoing treatments for 2015 are planned. Weed sites would continue to be monitored and treatments repeated if needed.

b) ***Proposed Action Alternative***

Soil disturbance associated with harvest operations (e.g. ground-based yarding, cable-yarding corridors, road construction, and slash pile burning) would create areas of exposed mineral soil, which would provide conditions suitable for seed germination and seedling establishment of noxious weeds. New weed infestations on exposed mineral soil would be

expected as long as openings in the canopy and available seed sources are present. Noxious weeds would decrease in abundance as the canopy closes and native understory species eventually overtop and out-compete the weeds for sunlight, soil moisture, and soil nutrients.

In units with the VRH prescription, a flush of noxious weeds would be expected in the first five years with several thistle species, Himalayan blackberry, and Scotch broom being dominant weedy species. Noxious weeds compete with native vegetation and lower the overall plant, insect, and wildlife diversity in the stand. Because trees would be planted within the dispersed retention areas in proposed VRH units, thistle species would be expected to decline over time as closure of the tree canopy prevents light from reaching the ground. Blackberry would also decline slowly, with lower light levels. This is not the case with Scotch broom, because populations of the noxious weed are frequently found in the forest understory growing under various light-levels. Scotch broom plants begin producing seed around 3 years of age, each mature plant produces hundreds of seeds, and the seed bank can remain viable for over 50 years. As canopy cover increases, germination of new plants would diminish, however, mature plants would persist for up to 30 years.

Existing infestations of Himalayan blackberry, Scotch broom, and hawthorn would be treated prior to implementing ground disturbing activities in the Calapooya project area to limit the spread of seeds. Noxious weed treatment in the Calapooya project area occurred in 2014 using approved herbicides and/or manual treatment. Project design features include washing logging and road construction equipment prior to entry on BLM administered lands to limit the spread of weed seed and other propagules transported to new sites by way of dirt and vegetation that cling to various parts of the equipment.

Application of the project design features would result in no substantial spread of weeds from the proposed action.

3. Cumulative Effects

Implementation of the project design features in conjunction with ongoing monitoring and treatment of noxious weeds would help reduce the spread of noxious weed populations in the Calapooya project area. The proposed future BLM project, Back in Black, would have the same project design features implemented to reduce the spread of noxious weeds. Monitoring and treatment of noxious weed populations would also occur in the proposed Back in Black units and along associated roads. However, due to soil disturbance and removal of the tree canopy, it is expected that there would be an increase in noxious weed populations in the Calapooya Creek watershed.

F. Botany

1. Affected Environment

Threatened and Endangered species and *Special Status Species* documented or suspected to occur on the Roseburg District but not in the project area are discussed in Appendix D. No *Bureau Sensitive* or *Bureau Strategic Species* were found during surveys of proposed units, along proposed haul routes, or in the proposed hazardous fuels treatment areas.

a) *Federally Listed Species*

Kincaid's Lupine

Kincaid's Lupine (*Lupinus sulphureus* ssp. kincaidii), is a Federally Listed Threatened species of vascular plant. Habitat for Kincaid's Lupine in Douglas County is likely to be shaded with canopy cover as high as 50 to 80 percent. Tree and shrub species that dominate known sites of Kincaid's lupine include Douglas-fir (*Pseudotsuga menziesii*), California black oak (*Quercus kelloggii*), Pacific madrone (*Arbutus menziesii*), ponderosa pine (*Pinus ponderosa*), incense cedar (*Calocedrus decurrens*), hairy manzanita (*Arctostaphylos columbiana*), and poison oak (*Toxicodendron diversilobum*).

The proposed units in Calapooya contain habitat matching this description for Kincaid's lupine sites within Douglas County. However, Kincaid's lupine was not found during surveys of the project area completed in 2012 and 2014, therefore the species would not be affected by any of the proposed actions.

Rough Popcorn Flower

Rough popcorn flower (*Plagiobothrys hirtus*) is a Federally Listed Endangered species of vascular plant. The rough popcorn flower is found only in the Umpqua River drainage in Douglas County at sites ranging from 328 to 755 feet in elevation. The northernmost site is near Yoncalla, Oregon and the southernmost near Wilbur, Oregon. The species range extends about 10 miles east and 5 miles west of Sutherlin.

The Calapooya project units are outside of the described range and suspected habitat for the rough popcorn flower. Therefore, rough popcorn flower would not be affected by any of the proposed actions.

b) *Survey and Manage Species*

Surveys for vascular and nonvascular Survey and Manage Species in the proposed harvest units were completed during the summer and fall of 2014. Two sites of the Survey and Manage Category B yellow-headed pin lichen (*Chaenotheca chrysocephala)* were found in Units 17C and 29G. Two sites of the Survey and Manage Category E Pacific stickpin (*Stenocybe clavata)* were found along the 25-4-12.1 Road in Section 33, T25S-R03W.

There are 207 species of fungi identified in the Survey and Manage standards and guidelines. Most Special Status and Survey and Manage fungi species are highly isolated in occurrence, producing short-lived, ephemeral sporocarps or fruiting structures that are seasonal and annually variable in occurrence (USDA/FS and USDI/BLM 2000, S&M SEIS, p. 191). Richardson (1970) estimated that sampling every two weeks would fail to detect about 50 percent of macrofungal species fruiting in any given season. In another study (O'Dell *et al*., 1999), less than ten percent of species were detected in each of two consecutive years at any one of eight sites. Thus, it has been determined that surveys for these species are impractical.

One species, *Bridgeoporus nobilissimus*, is identified in Survey and Manage Category A. It is dependent upon noble fir and Pacific silver fir (Hibler 1998, p 3-5) which are not present in the project area. There are 10 fungi species that fall within Survey and Manage Category D for which surveys are considered impractical or unnecessary. There are three Survey and Manage Category E species considered to be of rare and undetermined status for which no management recommendations exist, and four Survey and Manage Category F species considered to be uncommon or concern for persistence unknown and status undetermined (USDA/FS and USDI/BLM, 2001 S&M ROD, Standards and Guidelines pp. 7-13).

The remaining 189 fungi species are in Survey and Manage Category B, considered rare, and pre-disturbance surveys are not considered practical. To avoid inadvertent loss, the 2001 S&M ROD (Standards and Guidelines, pp. 9 and 25) states that for projects on which decisions are issued after fiscal year 2011, equivalent-effort surveys for Category B species would be conducted in old-growth forest if strategic surveys were not completed. The proposed harvest units and road locations avoid all forest stands that are characterized as old-growth forest based upon the definition with the Northwest Forest Plan SEIS and FEMAT. Therefore, equivalent surveys are not required for this project.

When a site of Special Status or S&M fungi is discovered during other plant surveys, they are protected according to management directions.

2. Environmental Consequences

a) *Survey and Manage Species*

All Survey and Manage Category B and Category E sites are required to be protected. The site of Category B yellow-headed pin lichen (*Chaenotheca chrysocephala*) found in Unit 29G, would be protected by a 25 foot buffer around the host tree to maintain the appropriate microclimate for the population. The site in Unit 17C is located in a VDT Riparian Reserve and would also be protected by a 25 foot buffer to maintain microclimate for that population.

Two sites of the Survey and Manage Category E Pacific stickpin (*Stenocybe clavata)* were found along the 25-4-12.1 road where fuel reduction treatments are proposed in Section 33 of T25S-R3W. These sites would be protected with 50 foot buffers around the host trees so that burning of slash piles would not impact microhabitat conditions.

G. Fire and Fuels Management

1. Affected Environment

Fire and Fuels Management
The analysis area used for fire and fuels management is comprised of seven Sub-watersheds which includes the proposed harvest units as well as interacting adjacent Sub-watersheds. The total area analyzed is approximately 168,982 acres, of which approximately 31,309 acres (18 percent) are administered by the BLM.

The entire Calapooya project area is within the Wildland Urban Interface (WUI) as identified in the Fire Management Plan for the Coos Bay/Roseburg Fire Management Zone. This area has moderate public use, particularly in Township 25.

Current fuel conditions in the proposed harvest units are best described by photo 1-MC-3 or 2-MC-3 in *Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest* (Maxwell and Ward 1980). Based on this photo series, the estimate of downed fuels in the Calapooya units is 11-20 tons per acre.

Air Quality
The Oregon Department of Forestry – Smoke Management Plan (Oregon SMP) identifies areas sensitive to smoke where impacts should be avoided. The Smoke Sensitive Areas in proximity to the analysis area are the cities of Roseburg, Cottage Grove, Oakridge, and Eugene.

2. Environmental Consequences

a) *No Action Alternative*

Fire and Fuels Management
Under the *No Action Alternative*, downed fuels would gradually accumulate adding to the existing fuel conditions of 11-20 tons per acre. As the stands mature, suppression mortality would occur among the smaller trees, resulting in snags and woody debris (Table FV-5, p. 36) and increased fuel loading. The estimated increase in fuel loading over the next 20-30 years would be represented by photo 3-MC-3, with larger trees and approximately 43 tons per acre of down woody material (Maxwell and Ward 1980). The risk of wildfire would gradually increase as fuels accumulate.

Air Quality
Absent implementation of management activities, there would be no potential effects to air quality from BLM forest management actions. As fuel loading increases, however, potential for wildfire would increase. Under conditions of drought or during severe weather events, fires would be expected to burn with high intensity and long duration producing large amounts of smoke with heavy particulate loading.

b) *Proposed Action Alternative*

Fire and Fuels Management
Under the *Proposed Action Alternative*, the downed fuels would increase as a result of VDT harvest operations to approximately 20-28 tons per acre, as depicted in the photos 2-DF-4-PC or 4-DF-4-PC from *Photo Series for Quantifying Forest Residues in the Coastal Douglas-Fir – Hemlock Type* (Maxwell and Ward 1976). This fuel loading

would be less than under the no action alternative due to harvest of trees that would die as a result of suppression mortality in the untreated stand.

The downed fuels in the VRH units would increase to approximately 28-53 tons per acre as depicted in the photos 4-DF-4-PC or 6-DF-4-PC in Maxwell and Ward (1976). Whole tree yarding, if used, could result in lower fuel loading due to decreasing the amount of 9 inch diameter or larger materials left on site. The amount of material that contributes to fuel loading would vary depending on the prescription.

The downed fuels at landings would be machine-piled and burned to reduce concentrated fuel loads. There would be approximately 184 acres treated by machine-piling of logging slash in Calapooya (Chapter 2, Table 5 p. 26-27). In addition, small fuels, 3-6 inches in diameter, would be hand piled and burned within 50 feet of major roadways, treating approximately 44.5 acres. The remaining fuels created by the proposed action would be predominately less than nine inches in diameter and scattered over the harvest area.

The additional fuels created by the proposed action (i.e. eight to forty-two tons per acre) would increase the fire risk in the short term (5-10 years) because the majority of the fuels left in the units would be fine fuels, less than three inches in diameter, that would likely persist for five to ten years. Fuels less than three inches in diameter are the primary source for ignition and rapid spread of fires while fuels greater than 3 inches diameter influence duration and severity of fires. Once these smaller fuels degrade, the risk for ignition in the units would decrease. The proposed treatment of fuels within 50 feet of major roadways would decrease the likelihood of human-caused fire ignition.

Air Quality

Burning machine and hand piles would occur in the autumn or winter months during fall and winter weather conditions when winds and atmospheric instability favor rapid smoke dispersion, and precipitation which would wash particulates from the air. Burning under an inversion or otherwise very stable conditions would be avoided to minimize the risk of smoke settling into the river drainage or along roadways and persisting for an extended period of time. Potential impacts to air quality in areas within 0.25 to 1.0 mile of units would persist for one to three days and would be characterized by some haziness.

Piles would likely burn for four to 24 hours, depending on pile size. In the event a pile continues to burn for more than 24 hours, additional ignition or suppression would be used to eliminate smoke.

3. Cumulative Effects

There are approximately 2,551 acres of current BLM harvest activity within the analysis area, which have or would generate activity fuel loads similar to those described for the Calapooya project. Proposed future BLM actions within the analysis area would create an additional 801 acres of similar activity fuels.

There have also been approximately 2,900 acres of pre-commercial thinning within the analysis area in the past decade. Pre-commercial thinning and manual stand maintenance on BLM lands would continue to increase short-term (3-5 years) fuel loading in the analysis area. For the past decade, pre-commercial thinning has averaged approximately 300 acres per year in the analysis area. Using Photo 3-DF-1-TH in U.S. Forest Service General Technical Report PNW-51, fuel loading in the pre-commercially thinned stands would increase from

approximately 13 tons per acre to approximately 21 tons per acre post-treatment (Maxwell and Ward 1976, p. 71).

Timber harvest on nearby private lands would continue to generate activity fuels that may increase fire risk. The extent of the risk is difficult to determine, however, as there is no way to forecast the type, scale, manner of harvest, level of utilization, or activity fuel treatments that may be applied.

For the period of 1967-2012 there were 411 fires in the analysis area burning 815 acres, the largest of which was caused by lightning in 1987. Of those 411 fires, approximately 26 percent were caused by lightning, with the remainder being human caused.

At the analysis area level, the increase in fuel loading resulting from the Calapooya project alone would not influence the risk of fire ignition or spread. The natural degradation of small activity fuels, combined with the planned fuels treatments, would result in a decrease, over time, in the risk of fire spread in the Calapooya project units.

However, activity fuels from pre-commercial thinning, harvest on private lands, and harvest under future BLM actions, fire risk would increase at the watershed level as well as the localized scale for approximately five to ten years.

With the application of Oregon Smoke Management Plan restrictions, prescribed burning would have no cumulative or long-term effects to local air quality

H. Carbon

Climate change and greenhouse gas emissions have been identified as a resource concern by the Secretary of the Interior (Secretarial Order No. 3226; January 16, 2009), and the OR/WA BLM State Director (Instruction Memorandum OR-2010-012, January 13, 2010).

Forster *et al.* 2007 (pp. 129-234), incorporated here by reference, reviewed scientific information on greenhouse gas emissions and climate change. Their conclusion was 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 concluding 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. Given this uncertainty, this analysis is focused on calculating carbon emissions and storage, in the context of release and sequestration.

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. Changes in resource impacts as a result of climate change would be highly sensitive to specific changes in the amount and timing of precipitation, which are presently too uncertain to predict. Because of this uncertainty, it is not possible to predict changes in vegetation types and condition, wildfire frequency and intensity, streamflow, or wildlife habitat.

Forests fix and store carbon through photosynthesis, and release carbon through respiration and decay thus affecting atmospheric concentrations of carbon dioxide which thereby affect global climate. Forest management can be a source of carbon emissions through land use conversion and deforestation, or store carbon through forest growth or afforestation (2008 FEIS, p. 220).

Even though a causal link between this project and specific climate change effects cannot be assigned, the amount of carbon released or stored under the alternatives analyzed can be estimated. Values in this analysis, of carbon stored and released, are expressed as tonnes, the most common unit of measure used in scientific literature on the subject. One tonne of carbon is equivalent to 3.67 tons of carbon dioxide (U.S. EPA 2005).

Data from stand exams specific to the proposed units was input into the ORGANON Growth Model (Hann *et al.* 2005). Outputs were then used to calculate amounts of carbon release and sequestration, and the net carbon balance that would result under each of the alternatives. Modeling of effects of each of the alternatives was conducted for three intervals extending out 50 years, a period deemed sufficient to illustrate long-term trends across the alternatives. The net carbon balance was derived from: 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. The methodology used is described in *Appendix G - Calculation Assumptions for Carbon Sequestration and Release*.

1. Affected Environment

Total annual global emissions of carbon dioxide (CO_2) are estimated at 25 billion tonnes (Denman *et al*. 2007), with estimated U.S. emissions of 6.9 billion tonnes of CO_2 (EPA, 2010; Table 2-3). In 2008, fossil fuel combustion accounted for 94.1 percent of CO_2 emissions in the U.S. (EPA, 2010; Executive Summary p. 6).

Land use, land use change and forestry nationally resulted in a net sequestration of 940 million tons of CO_2 in 2008 (EPA, 2010; Table 2-3). Forest management in the U.S., alone, resulted in net CO_2 sequestration of 792 million tonnes (EPA, 2010; Table 2-9), an offset of approximately 11 percent of total U.S. CO_2 emissions.

On lands managed by the BLM in western Oregon and on the Klamath Falls Resource Area of the Lakeview District, there are 222 million tonnes of carbon stored in live trees (2008 FEIS, p. 221). The amount of carbon stored in other than live trees (includes shrubs, brush, snags, woody debris, and organic carbon in the soil) is calculated at 195 million tonnes (2008 FEIS, p. 222).

The Calapooya project would treat approximately 1,245 acres of mid-seral forest stands. Modeling indicates the stands currently hold 159 tonnes of carbon per acre, totaling 197,955 tonnes, approximately 0.05 percent of the estimated 417 million tonnes of carbon stored on BLM-administered lands in western Oregon.

2. Environmental Consequences

a) ***No Action Alternative***

There would be no direct release of carbon as fossil fuels would not be consumed in conjunction with road construction and renovation, timber harvest operations, or timber hauling. Direct release of carbon from the cutting of live trees would not occur. No wood products would be produced which would release carbon over time. Absent the creation of any logging slash, no carbon would be released by the burning and/or decomposition of activity fuels.

Forest stands in the project area would continue to grow and develop. Carbon would be released through the decay of snags, woody debris and dead vegetation, and through the process of respiration. At the same time, carbon would be sequestered as live, growing trees and other vegetation fix atmospheric carbon dioxide through the process of photosynthesis.

Over the course of the next 50 years, the total carbon stored on-site would increase from current levels to 369 tonnes per acre (Tables C-1 and C-2). The future carbon balance for the project area, including the increase in sequestered carbon, would be approximately 459,405 tonnes, representing an increase of 232 percent over current conditions.

Average annual carbon sequestration of approximately 5,229 tonnes would represent an offset of 0.00008 percent of projected annual global carbon emissions of 6.8 billion tonnes, and 0.0003 percent of current annual United States carbon emissions estimated to be 1.7 billion tonnes.

Annual carbon sequestration in the proposed project area would constitute 0.003 percent of the net annual carbon sequestration of 196 million tonnes by all forest management in the United States. In approximately 50 years (ca. 2062), carbon sequestration in the proposed project area would be 0.04 percent of the 596 million tonnes of carbon stored on BLM-administered lands in western Oregon.

b) ***Proposed Action Alternative***

The *Proposed Action Alternative* includes 1,147 unit acres of VDT and 98 unit acres of VRH. The direct release of carbon associated with VDT would release 4.6 tonnes per acre, totaling 5,276 tonnes. The VRH treatment would release an additional 4.7 tonnes per acre with 460 total tonnes of carbon. The total direct carbon release under the action alternative is 5,736 tonnes. Direct release of carbon under this action alternative would represent only 0.0003 percent of annual emissions in the United States, and 0.00008 percent of annual global emissions.

Carbon would be stored in wood products and untreated logging slash. Both of these carbon pools would gradually release carbon over time through processes of decay, sublimation and disposal of wood products by burning. Adjusted for the reduction in acres subject to uniform and VDT described under the *Action Alternative*, 0.32 tonnes per acre would be released annually, with sublimation of 367 tonnes of carbon annually over the first 50 years, post-harvest. The VRH would release approximately 0.3 tonnes per acre annually or 30 tonnes annually for the first 50 years after harvest. Combined, the project would result in the indirect release of 397 tonnes of carbon annually over the first 50 years after harvest.

While there would be a direct release of carbon, and an annual indirect release of carbon from wood products and unburned slash, growth of remaining trees would sequester atmospheric carbon and store it on site in the form of woody biomass. The amount of carbon directly released by VDT would be re-sequestered in just over two years. Taking into account the continued sequestration of carbon by trees in retention aggregates and dispersed retention trees, along with the growth of regeneration established in the areas of dispersed retention, re-sequestration of carbon directly released by VRH would occur in a little less than four years (Table C-4).

In the first 50 years, post-harvest, carbon storage would be 304 tonnes per acre in the VDT units, and 290 tonnes per acre on units proposed for VRH, representing stored carbon of 377,108 tonnes, and 190 percent of the current condition (Table C-3).

The total carbon balance 50 years following harvest would be 377,108 tonnes, an amount approximately 82,297 tonnes less than the No Action Alternative.

Table C-1. Effects of VDT on Carbon Release and Storage per Acre in the *No Action Alternative*

No Action Alternative - VDT (1,147 acres)								
Timestep	**Standing Live Carbon** (tonnes)	**Wood Products** (tonnes)	**Logging Slash*** (tonnes)	**Other Than Live Trees*** (tonnes)	**Fossil Fuels** (tonnes)	**Slash Burning** (tonnes)	**Carbon Balance** (tonnes)	**Net Change (+/-)** (tonnes)
Current	89.60	0.00	0.00	69.47	0.00	0.00	159.07	0.00
At Harvest	89.60	0.00	0.00	69.47	0.00	0.00	159.07	0.00
10 years	131.05	0.00	0.00	69.47	0.00	0.00	200.52	41.45
20 years	173.02	0.00	0.00	69.47	0.00	0.00	242.49	41.97
50 years	281.79	0.00	0.00	87.15	0.00	0.00	368.95	126.46

Table C-2. Effects of VRH on Carbon Release and Storage per Acre in the *No Action Alternative*

No Action Alternative – VRH (98 unit acres) [1]								
Timestep	**Standing Live Carbon** (tonnes)	**Wood Products** (tonnes)	**Logging Slash*** (tonnes)	**Other Than Live Trees*** (tonnes)	**Fossil Fuels** (tonnes)	**Slash Burning** (tonnes)	**Carbon Balance** (tonnes)	**Net Change (+/-)** (tonnes)
Current Condition	88.05	0.00	0.00	68.19	0.00	0.00	156.24	0.00
At Harvest	88.05	0.00	0.00	68.19	0.00	0.00	156.24	0.00
10 years	127.37	0.00	0.00	68.19	0.00	0.00	195.56	39.32
20 years	167.57	0.00	0.00	68.19	0.00	0.00	235.76	40.20
50 years	284.26	0.00	0.00	85.55	0.00	0.00	369.82	134.06

[1] Modeling of carbon release and storage considers the entire unit and all treatments (ie skips, dispersed retention, aggregate retention, thinning) proposed to be applied within that unit.

Table C-3. Effects of VDT on Carbon Release and Storage per Acre in the *Action Alternative*

Proposed Action Alternative - VDT [1] **(**1,147 acres**)**								
Timestep	**Standing Live Carbon** (tonnes)	**Wood Products** (tonnes)	**Logging Slash*** (tonnes)	**Other Than Live Trees*** (tonnes)	**Fossil Fuels** (tonnes)	**Slash Burning** (tonnes)	**Carbon Balance** (tonnes)	**Net Change (+/-)** (tonnes)
Current	89.73	0.00	0.00	69.58	0.00	0.00	159.31	0.00
At Harvest	41.07	23.87	21.04	69.58	-0.34	-0.49	154.71	-4.60
10 years	67.18	21.89	17.50	69.58	0.00	0.00	176.15	21.44
20 years	95.08	20.92	14.91	69.58	0.00	0.00	200.49	24.34
50 years	188.40	19.32	9.22	87.30	0.00	0.00	304.24	103.75

Table C-4. Effects of VRH on Carbon Release and Storage per Acre in the *Action Alternative*

Proposed Action Alternative VRH (98 unit acres) [1]								
Timestep	**Standing Live Carbon** (tonnes)	**Wood Products** (tonnes)	**Logging Slash*** (tonnes)	**Other Than Live Trees*** (tonnes)	**Fossil Fuels** (tonnes)	**Slash Burning** (tonnes)	**Carbon Balance** (tonnes)	**Net Change (+/-)** (tonnes)
Current Condition	88.05	0.00	0.00	68.19	0.00	0.00	156.24	0.00
At Harvest	45.02	21.11	18.61	66.83	-0.38	-1.09	150.10	-6.14
10 years	66.25	19.36	14.93	66.83	0.00	0.00	167.37	17.28
20 years	88.06	18.50	12.72	66.83	0.00	0.00	186.11	18.74
50 years	188.70	17.09	7.87	75.81	0.00	0.00	289.47	103.36

[1] Modeling of carbon release and storage considers the entire unit and all treatments (ie. skips, dispersed retention, aggregate retention, thinning) proposed to be applied within that unit.

I. Monitoring

Monitoring of the Calapooya Creek Harvest Plan would be conducted in accordance with provisions contained in the ROD/RMP, Appendix I (pp. 84-86, 190-199). Monitoring efforts would focus on consideration of the following resources: Riparian Reserves, Matrix, Air Quality, Water and Soil, Wildlife Habitat, Fish Habitat, and Special Status Species.

Chapter 4. Contacts, Consultations, and Preparers

A. Agencies, Organizations, and Persons Consulted

The Agency is required by law to consult with certain federal and state agencies (40 CFR 1502.25).

1. Threatened and Endangered (T&E) Species Section 7 Consultation

The Endangered Species Act of 1973 (ESA) requires consultation to ensure that any action an Agency authorizes, funds, or carries out is not likely to jeopardize the existence of any listed species or destroy or adversely modify critical habitat.

a) *U.S. Fish & Wildlife Service*

Consultation with the U.S. Fish & Wildlife Service (USFWS) for the Green Gas Thinning and VRH timber sale project has been completed. The *Biological Opinion on the Roseburg District Bureau of Land Management's Fiscal Year 2014-2015 Program of Activities which may affect Spotted Owls, the Marbled Murrelet and Spotted Owl and Marbled Murrelet Critical Habitat* (FWS 01EOFW00-2013-F-0200) was received from the USFWS dated September 30, 2013. The Biological Opinion concluded (p. 116) that the District's 2014-2015 program of activities is ***not likely to jeopardize the continued existence*** of the spotted owl or destroy or adversely modify its Critical Habitat. This conclusion was warranted because:

- the proposed action is not likely to impair the capability of Critical Habitat to provide demographic support or facilitate connectivity among adjacent subunits for the spotted owl (p. 118); and
- the proposed action is likely to maintain a sufficient amount and distribution of dispersal habitat to facilitate natal and adult northern spotted owl dispersal (p. 118).

One proposed spur construction outside Green Gas Unit 17D (Spur GGc) has been moved to a different location than what was originally consulted. The impacts to the northern spotted owl and its Critical Habitat have been reanalyzed based on the new spur location. BLM has discussed this change with the U.S. Fish & Wildlife Service to determine if the magnitude of impacts is within the scope of the Biological Assessment and whether or not this change in spur location warrants re-initiation of consultation. It was determined by the Level 1 Team on June 30, 2014, that this change was within the scope of impacts analyzed in the Biological Assessment because the new road location reduced the impacts to suitable habitat and RA32 habitat for the northern spotted owl.

Consultation with the USFWS for the Good Boyd timber sale project is ongoing and a Biological Opinion is expected in May 2015. A FWS representative has been involved with project planning for both sales within the Calapooya project. Because loss of habitat due to VRH would not occur within a spotted owl home range, the determination of *take* is not anticipated. The conclusion of formal consultation for the Good Boyd timber sale is expected to be the same as concluded for the Green Gas timber sale.

b) *NOAA Fisheries Service*

The Swiftwater fisheries staff has determined that any impacts to water temperature, substrate/sediment quality, large wood, pool quality, or habitat access within the project area would be non-existent or immeasurable above background levels. Aquatic habitat in Coon Creek, Gossett Creek, Haney Creek, Mill Creek, Boyd Creek, Oldham Creek, Gassy Creek, Slide Creek, and Field Creek would be unaffected, except for short-term reductions in the amount of large and small functional wood available to the stream. Due to the high volume of wood already in the streams and the high density of trees in the no-harvest buffers, fish species and populations in the

streams in the project area would be unaffected. Therefore, the proposed project would not have an effect on Oregon Coast coho salmon or its habitat and further consultation with the NOAA Fisheries Service is not required.

2. Cultural Resources Section 106 Compliance

The BLM has completed its National Historic Preservation Act Section 106 responsibilities under the guidance of the 2012 National Programmatic Agreement and the 2015 Oregon Protocol. There would be no known effect on any cultural or historical resources since any cultural resources located during future surveys would be managed either through avoidance or mitigation.

B. Public Notification

1. Notification of Landowners

A letter was sent June 23, 2014 to adjacent landowners, landowners along the proposed haul route, registered water-rights users, and tribal governments (Confederated Tribes of Grand Ronde, Confederated Tribes of Siletz Indians, and Cow Creek Band of Umpqua Tribe of Indians.

2. Roseburg District Planning Updates

The general public was notified of the Calapooya Creek Harvest Plan project in the quarterly *Roseburg District Planning Updates* since March 5, 2013 when the Spring 2013 Planning Update was published. These planning updates were published and are available on the Roseburg District BLM Internet website. Electronic notification of the availability of the Roseburg District Planning Update was sent to approximately 40 addressees. These addressees consist of members of the public that have expressed interest in Roseburg BLM District projects.

3. Scoping

Scoping for the Calapooya Creek Harvest Plan project ensued with the publication of the *Roseburg District Spring 2013 Quarterly Planning Update* on March 5, 2013. Two sets of scoping comments was received specific to Calapooya Creek. Key topics raised in the scoping process were reflected in the development of project design features analyzed in this EA.

4. State, County, and Local Government Agencies

This EA, and its associated documents, would be provided to certain **State, County and local government** offices including: U.S. Fish & Wildlife Service, NOAA Fisheries Service, Oregon Department of Environmental Quality, and the Oregon Department of Fish and Wildlife. If the decision is made to implement this project, the Decision Document and Finding of No Significant Impacts (FONSI) would be sent to the aforementioned State, County, and local government offices.

5. Public Comment Period

The BLM is providing a 30-day period for public review and comment on this document, and will accept comments until the close of business (4:30 PM, PDT) on May 1, 2015. In keeping with Bureau of Land Management policy, the Roseburg District posts Environmental Assessments, Environmental Impact Statements, Findings of No Significant Impacts, and Decision Records/Documentations on the district web page under Plans & Projects at www.blm.gov/or/districts/roseburg. On the day that documents are posted to the web page, an electronic notice of availability is transmitted to those individuals and organizations on the District's NEPA mailing list who have expressed an interest in project planning and analysis.

Individuals desiring a paper copy of such documents will be provided one upon request. Individuals with the ability to access these documents on-line are encouraged to do so. Internet use reduces paper consumption and administrative costs associated with copying and mailing. In addition, a copy of this document is available at the public reading desk of the main branch of the Douglas County Library in Roseburg.

C. List of Preparers

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Appendix A. Bureau Sensitive & Bureau Strategic Wildlife Species

ISSSP List Date: *December 1, 2011 (USDI/BLM 2011a; IM-OR-2012-018)*

The following table includes those species which are documented or suspected to occur within the Roseburg District BLM. Those *Bureau Sensitive* or *Bureau Strategic terrestrial wildlife species* which are suspected or documented to occur within the project area are detailed below. Species names indicated in **bold** within Table A-1 identifies the 10 species that are discussed in detail within the *Calapooya Environmental Assessment.*

Bureau Sensitive Species

BLM districts are responsible to assess and review the effects of a proposed action on *Bureau Sensitive* species. To comply with Bureau policy, Districts may use one or more of the following techniques:

a. Evaluation of species-habitat associations and presence of potential habitat.
b. Application of conservation strategies, plans, and other formalized conservation mechanisms.
c. Review of existing survey records, inventories, and spatial data.
d. Utilization of professional research and literature and other technology transfer methods.
e. Use of expertise, both internal and external, that is based on documented, substantiated professional rationale.
f. Complete pre-project survey, monitoring, and inventory for species that are based on technically sound and logistically feasible methods while considering staffing and funding constraints.

When Districts determine that additional conservation measures are necessary, options for conservation include, but are not limited to: modifying a project (e.g. timing, placement, and intensity), using buffers to protect sites, or implementing habitat restoration activities (IM-OR-2003-054).

Bureau Strategic Species

If sites are located, collect occurrence data and record in corporate database.

Table A-1. Effects of the Calapooya Timber Sale Project on Bureau Sensitive & Strategic Terrestrial Wildlife Species.

SPECIES	GENERAL HABITAT REQUIREMENTS	PRESENT IN PROJECT AREA?	IMPACTS TO SPECIES	
			NO ACTION	PROPOSED ACTION ALTERNATIVE
BUREAU SENSITIVE				
American Peregrine Falcon *Falco peregrines anatum*	Cliffs, rock outcrops; open habitats for hunting birds. Known sites in T25S-R03W-Section 34 and 35, approximately 0.8 miles east of Green Gas Unit 33A. No seasonal restrictions would be required because the unit lies outside of the disturbance protection buffer and topographical features present (i.e. a ridge) would provide an adequate buffer to noise during the breeding season. Although peregrine falcons are likely to forage within the proposed project area, the proposed action is not expected to cause measurable effects to foraging habitat.	Documented	No Effect	No effects to nesting habitat. Improve forest habitat conditions by creating more diverse habitat and micro habitat conditions for avian species, thus increasing foraging opportunities and prey species diversity.
Bald Eagle ***Haleaeetus leucocephalus***	Late-successional forests with multi-canopies, generally within two miles of a major water source. 0.4 miles south-southeast of Unit 25A. Based on numerous observations through the summer of 2014 of bald eagles and the presence of suitable habitat, it is suspected (but not confirmed) there may be other bald eagle nest sites located within the project area along the major streams (i.e. Coon Creek, Calapooya Creek and Gassey Creek).	**Documented**	High density of trees would limit the stands' ability to create diverse, multi-storied stands. Large trees or snags containing large limbs or structural characteristics to support a nest would be slow to develop.	No effects to nesting habitat. Improve forest habitat conditions by creating more diverse habitat and large trees or snags containing large limbs or structural characteristics to support a nest in the future.
California Shield-backed Bug *Vanduzeeina borealis California*	A tall grass prairie specialist, this subspecies inhabits high elevation (e.g. 900 meters) natural balds and meadows (Applegarth 1995). *(Xerces Society)*	No Habitat	No Effects	
Columbian White Tailed Deer *Odocoileus virginianus leucurus*	Oak woodland habitats near and north of Roseburg, OR Bottomlands, oak/hardwood forests; cover for fawning. (USDI/FWS 1983)	Out of Range	No Effects	
Crater Lake Tightcoil ***Pristiloma arcticum crateris***	**Also a *Survey & Manage Species*; refer to Table A-1 in Appendix A for habitat requirements and impacts.**			
Fisher ***Martes pennanti***	Large contiguous blocks of mature forest with structural complexity (Verts and Carraway 1998). Denning, resting and foraging habitat consists of structurally complex forests; mature open forests with large live trees, snags, and down wood. Forest stands in the project are not suitable habitat and currently known species range is outside of the West Coast DPS.	**Suspected**	Stands would remain unsuitable until late successional characteristics develop, including open, multi-layered canopy and the presence of large, hollow snags.	Loss of potential foraging habitat due to VRH in two units, by reducing canopy cover below 30 percent. Some large down wood and snags in VRH units would be maintained in aggregates to maintain cover and security from predators. In the long term, harvest treatments is expected to foster the development of structural elements important for fisher, including large trees and snags, and eventually large down wood.

SPECIES	GENERAL HABITAT REQUIREMENTS	PRESENT IN PROJECT AREA?	IMPACTS TO SPECIES	
			NO ACTION	PROPOSED ACTION ALTERNATIVE
Foothill Yellow-legged Frog *Rana boylii*	Low gradient streams/ponds; gravel/cobble, bedrock pools (Corkran and Thoms 1996). No habitat is present within the proposed units.	No Habitat	No Effects	
Franklin's Bumblebee *Bombus franklini*	Project within the historical range of the species, however, undocumented in the Roseburg District. Currently known only from southern Oregon and northern California between the Coast and Sierra-Cascade Ranges. Requires habitat in proximity to water with a sufficient supply of floral resources to provide continuous blooming throughout the colony season. Additionally, probably requires abandoned rodent borrows or clumps of grass for nesting, population sites may be limited by the abundance of rodents and the presence of undisturbed grassland. Closest known documentation of species is in Roseburg and just west of Sutherlin at Ford's Pond. *(Xerces Society)* Not reasonably expected to occur in the analysis area due to lack of suitable habitat.	No Habitat	No Effects	
Fringed Myotis ***Myotis thysanodes***	Hibernacula and roost sites includes caves, mines, buildings and large snags (Weller and Zabel 2001). Late-successional forest features (e.g. snags or trees with deeply furrowed bark, loose bark, cavities), caves, mines, bridges, rock crevices. Suitable habitat is located adjacent to units. Snags present in the analysis area. All units considered foraging habitat. The species has been documented within the fifth-field watershed, but not within unit boundaries (GeoBOB data query; July 2014).	**Suspected**	Stands will continue to function as foraging and roosting habitat. Suitability of habitat will increase as late successional characteristics develop, including open, multi-layered canopy and the presence of large, hollow snags.	Some groups of snags have been retained in skips (i.e. Unit 29G). PDF would retain existing snags $\geq$ 10 inches dbh and $\geq$ 16 feet tall.
Green Sideband *Monadenia fidelis beryllica*	Coast Range, riparian forests at low elevations; deciduous trees & shrubs in wet, undisturbed forest - low elevation; strong riparian associate (USDA/USDI 1994, Frest and Johannes 2000)	Out of Range	No Effects	
Harlequin Duck *Histrionicus histrionicus*	Mountain Streams in forested areas on west slope of the Cascade Mountains in swift, rocky, large streams or rivers. Nest under rock overhangs, vegetation or streamside debris. Late spring migrant or summer visitor. The North Umpqua River contains suitable nesting and brooding habitat. Nesting has not been documented in the Umpqua River Basin (Dowlan 2003, p. 116). In the western Cascades, breeding pairs are observed on low to moderate gradient (1-7 percent) third to fifth-order streams in the western hemlock zone (Dowlan 2003, p. 116). Nesting has not been documented on the District.	No Habitat	No Effects	

SPECIES	GENERAL HABITAT REQUIREMENTS	PRESENT IN PROJECT AREA?	IMPACTS TO SPECIES	
			NO ACTION	PROPOSED ACTION ALTERNATIVE
Lewis' Woodpecker *Melanerpes lewis*	Open woodland habitat near water; open woodland canopy and large diameter dead/dying trees, snag cavities (Tobalske 1997).	No Habitat	No Effects	
Marbled Murrelet *Brachyramphus marmoratus*	Forests where trees have large diameter branches, mistletoe brooms or other nesting platforms within 50 miles of the Oregon Coast (Hamer and Nelson 1995, McShane *et al.* 2004).	Out of Range	No Effects	
Northern Spotted Owl ***Strix occidentalis caurina***	Forests older than 80 years with habitat for nesting, roosting and foraging, and dispersal. Suitable habitat typically has multi-layered, multi-species canopy dominated by large overstory trees > 20 inches DBH. Canopy cover is typically 60-80 percent, with open spaces in and below the overstory canopy. Trees with large cavities and other deformities, large snags, and large down wood are typically abundant (Thomas *et al.* 1990; Forsman *et al.* 1984; Hershey *et al.* 1997). Analysis area is within multiple historical territories of this species.	**Documented**	No Effect	Proposed action would modify or remove dispersal habitat within seven home ranges and Critical Habitat. *(Details provided in the Wildlife Resources section.)*
Oregon Shoulderband ***Helminthoglypta hertleini***	**Also a *Survey & Manage Species*; refer to Table A-1 in Appendix A for habitat requirements and impacts.**			
Oregon Vesper Sparrow *Pooecetes gramineus affinis*	Grassland, farmland, and sage habitats. Dry, open habitat with moderate herb and shrub cover (Jones and Cornely 2002).	No Habitat	No Effects	
Pacific Pond Turtle *Actinemys marmorata*	Marshes, ponds, lakes, streams, and rivers with emergent structure (Csuti *et al.* 1997). Nesting habitat is in areas of high solar exposure and sparse vegetation consisting of grass, forbs, compact soil composed of clay, silt or sandy loam and sometimes a mix of soil and gravel/cobble (Rosenberg et. al. 2009). No suitable habitat is present within the unit boundaries. There is one documented occurrence in the analysis area 0.3 miles east and outside of proposed Good Boyd Unit 17C.	No Habitat	No Effects	
Pacific Pallid Bat ***Antrozous pallidus***	Hibernacula and roost sites in caves, mines, rock crevices, bridges, hollow trees and snags (Lewis 1994). Usually rocky outcroppings near dry open areas; occasionally near evergreen forests. All units are considered foraging habitat. Snags present. Rocky outcrops also present within the project area and units, but not associated with dry open areas within the units. The pallid bat has not been documented within the watershed, but has been documented within adjacent field-field watersheds to the north, south, and east (GeoBOB data query; July 2014).	**Suspected**	No Effect	No effect to potential roost sites in cliff area.

SPECIES	GENERAL HABITAT REQUIREMENTS	PRESENT IN PROJECT AREA?	IMPACTS TO SPECIES	
			NO ACTION	PROPOSED ACTION ALTERNATIVE
Purple Martin ***Progne subis***	Snags with woodpecker cavities in open habitats (e.g. grasslands, brushlands, open woodlands); typically found in open areas near water (Brown 1997, Horvath 2003). Foraging expected within the project area. Closest purple martin observation was 2.8 miles north of the project area and the closest known colony is located on the North Bank Habitat Management Area, approximately 4.0 miles from Green Gas Unit 23A (GeoBOB data query; July 2014).	**Suspected**	No Effect	No measurable effect to foraging habitat due to thinning. Nesting and foraging habitat created by VRH activities, particularly if snags are created in open areas.
Rotund Lanx *Lanx subrotundata*	Major rivers and large tributaries with cold, well-aerated water and rocky substrate (USDA/ FS and USDI/BLM 1994).	Out of Range	No Effects	
Siskiyou (Chace) Sideband ***Monadenia chaceana***	**Also a *Survey & Manage Species*; refer to Table A-1 in Appendix A for habitat requirements and impacts.**			
Townsend's Big-eared Bat ***Corynorhinus townsendii***	Late-successional forest features (e.g. snags or trees with deeply furrowed bark, loose bark, cavities), caves, mines, buildings, bridges, tunnels. Suitable habitat is located adjacent to units. Expected to forage in or above units. The closest known Townsend's big-eared bat hiberncula is located on the northwest side of Mount Scott, approximately 0.3 miles east of Unit 33A. This species has not been documented specifically within units, but with the exception of the hibernacula, has been documented within one mile of the proposed project area (GeoBOB data query; July 2014). Some units contain trees and snags that may provide roosting opportunities. Rock outcrops are present within some of the harvest units, particularly in Unit 29G.	**Suspected**	Stands would remain unsuitable until late successional characteristics develop, including open, multi-layered canopy and the presence of large, hollow snags.	Snags retained in units, to the extent possible. The rock outcrop in Unit 29G will be buffered within an aggregate in order to maintain microsite conditions around these features.
Western Bumblebee *Bombus occidentalis*	Western bumble bees forage on flowering shrubs and forbs usually found in open spaces including lupines and California poppy (Xerces Society 2008). Limited data but project within the historical range of the species. Undocumented in the Roseburg District. Not reasonably expected to occur in the analysis area due to lack of suitable habitat.	Unknown	Stands would continue to be unsuitable because of the lack of understory development until suppression mortality created gaps and edge habitat allowing for the development of forage habitat – flowering plants and shrubs.	Habitat creation from VRH. Tree removal would create openings where flowering vegetation important for foraging would persist until the canopy cover increases and closes in 20+ years.
Western Ridged Mussel *Gonidea angulata*	Streams of all sizes in low to mid-elevation watersheds inhabiting mud, sand, gravel, and cobble substrates (Duncan 2008); Umpqua R., major tributaries, and possibly smaller creeks.	Unknown	No Effect	No measurable effects to habitat due to35, 60, and 120-foot buffers along perennial streams within Riparian Reserve.
White-Tailed Kite *Elanus leucurus*	Open grasslands, meadows, emergent wetlands, farmlands, lightly, wooded areas; wooded riparian habitats close to open hunting; tall trees and shrubs. (Dunk 1995). Project at	No Habitat	No Effects	

SPECIES	GENERAL HABITAT REQUIREMENTS	PRESENT IN PROJECT AREA?	IMPACTS TO SPECIES	
			NO ACTION	PROPOSED ACTION ALTERNATIVE
	unsuitable elevations, lack suitable habitat.			
BUREAU STRATEGIC				
Broadwhorl Tightcoil *Pristiloma johnsoni*	Moist forest sites, typically with deciduous component; Coast/Cascades in WA, Coast Range in OR, as far south as Lane County.	Out of Range	No Effects	
Klamath Tail-Dropper *Prophysaon sp. nov.*	Moist, open areas along streams or springs in Ponderosa Pine forests; as far North as Crater Lake.	Out of Range	No Effects	
Merlin *Falco columbarius*	Coniferous forests adjacent to open habitats, along forest edges; units within winter range.	No Habitat	No Effect	
Oregon Giant Earthworm *Driloleirus macelfreshi*	Deep, moist, undisturbed soils of riparian forests.	Out of Range	No Effect	

Appendix B. Survey & Manage Wildlife Species

S&M List Date: *2001 Record of Decision and Standards and Guidelines for Amendments of the Survey and Manage, Protection Buffer, and other Mitigation Measures Stands and Guidelines (2001 ROD).*

The Roseburg District compiled the species listed below from the 2001 ROD and includes those vertebrate and invertebrate species with pre-disturbance survey requirements (Category A, B, or C species), whose known or suspected range includes the Roseburg District according to:

- *Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0*, January 12, 2004; (refer to IM-OR-2011-063, Attachment 1-26, July 21, 2011).
- *Survey Protocol for the Red Tree Vole: Arborimus longicaudus (= Phenacomys longicaudus) in the Record of Decision of the Northwest Forest Plan),* Version 3.0, Revision November 2012 (refer to IM-OR-2003-003, October 23, 2002 and Memorandum from the Regional Interagency Executive Committee, November 21, 2012).
- *Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan,* Version 3.0, 2003 (refer to IM-OR-2003-044, February 21, 2003).

This list also includes any Category D, E, or F species with known sites located within the Calapooya Project (thinning and variable retention harvest). Applicable management recommendations include:

- Conservation Assessment for Great Gray Owl (*Strix nebulosa*), USDA Forest Service Region 6 and USDI Bureau of Land Management, Oregon and Washington, Williams, Elizabeth; Klamath Bird Observatory; April 2012
- Interim management recommendations for the Great Gray Owl were put forth in the 2011 Survey and Manage Settlement Agreement Species List (refer to IM-OR-2011-063, Attachment 1-26, July 21, 2011).
- *Management Recommendations for the Oregon Red Tree Vole: Arborimus longicaudus, Version 3.0* (refer to IM-OR-2000-086, September 27, 2000).
- *Management Recommendations for Survey and Manage Terrestrial Mollusks*, Version 2.0, October 1999 (refer to IM-OR-2000-003, October 15, 1999 and to IM-OR-2000-015, November 23, 1999).

Pechman Exemption (a) applies to the 22 units proposed for thinning in the Calapooya project area. Pechman Exemptions do not apply to four units, including 11B, 11C, 17C, and 29G and, therefore will require pre-disturbance surveys for Survey & Manage species as indicated in Table B-1.

Table B-1. Survey & Manage Wildlife Species – Calapooya Project

Species	S&M Category	Survey Triggers			Survey Results			Site Management
		Within Range of the Species?	Contains Suitable habitat?	Habitat Disturbing*?	Surveys Required?	Survey Date	Sites Known or Found?	
VERTEBRATES								
Great Gray Owl *Strix nebulosa*	C	Yes	No[1]	No	Yes[2]	March-July Completed 2014 Planned 2015	0[2]	Protect nest tree with 300 meter no-harvest buffer along with a quarter-mile protection zone to include natural openings in proximity to nest site[2a]
Red Tree Vole *Arborimus longicaudus*	C	Yes	No[3]	No[3]	No[3]	N/A	2[3a]	Maintain nest tree [3a]
MOLLUSKS								
Siskiyou Sideband *Monadenia chaceana*	B	No[4a]	Yes[4]	No[4a]	No[4a]	N/A	0	N/A
Crater Lake Tightcoil *Pristiloma arcticum crateris*	A	No[5]	Yes[5a]	No[5a]	No[5a]	N/A	0	N/A
Oregon Megomphix *Megomphix hemphilli*	F[6]	Yes[6a]	Yes[6a]	No[6a]	No[6a]	N/A	1[6a]	Protection not required [6a]
Oregon Shoulderband *Helminthoglypta hertleini*	B	Yes[7]	Yes[7]	Yes	Yes[7a]	1st Visit - Spring 2014 2nd Visit – Planned Fall 2014 or Spring 2015	0[7a]	PDFs will be in place[7a]

*"Habitat disturbing" and thereby a trigger for surveys as defined in the 2001 ROD S&Gs (p. 22).
N/A = Not Applicable

[1] The stands in the Calapooya project area do not contain the habitat characteristics, including large diameter nest trees and/or suitable nesting structures or have proximity to natural-openings ≥ 10 acres (A.Worthing, staff review, 2013). Pre-disturbance surveys are not suggested in suitable nesting habitat adjacent to man-made openings at this time (pg. 14, *Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0*, January 12, 2004).

[2] A large owl species was observed during field review of Good Boyd Unit 17C. The species observed was originally thought to be a possible great gray owl. First year of pre-disturbance surveys (March 15-July 15, 2014) have been completed and a great horned owl has tentatively been detected within the unit in 2014. A second year of protocol surveys are planned to be completed March 15-July 15, 2015 to verify species and determine nesting status *(Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0*, January 12, 2004).

[2a] *Conservation Assessment for Great Gray Owl (Strix nebulosa), USDA Forest Service Region 6 and USDI Bureau of Land Management, Oregon and Washington, Williams, Elizabeth; Klamath Bird Observatory; April 2012, pg. 32* and *USDI Bureau of Land Management, Record of Decision and Resource Management Plan; June 1995, p. 44.*

[3] Habitat for the red tree vole in the Mesic Zone, which includes Roseburg District, is described as (a) conifer forest stands with a merchantable QMD ≥18 inches dbh and (b) are either mature and old-growth conifer forests containing Douglas-fir or conifer or conifer-dominated mixed conifer-hardwood forests with canopy closure of intermediate, co-dominant and dominant trees ≥ 60 percent, and with two or more superdominant conifer trees per acre *(Survey Protocol for the Red Tree Vole: Arborimus longicaudus* (= *Phenacomys longicaudus* in the *Record of Decision of the Northwest Forest Plan*) Version 3.0, November 2012; pg. 9). Under Pechman Exemption 'a' for Survey and Manage Species (q.v. pg. 8), surveys for red tree voles are not required in stands less than 80 years old and proposed for thinning only. Therefore, with the exception of VRH units 17C and 29G, surveys are not required.

Units 17C and 29G would be treated with a VRH prescription and therefore, do not meet Pechman Exemption 'a' for thinning-only stands. The QMD for Unit 17C is 13 inches (Table FV-2) and does not meet the 18 inch QMD threshold to be considered suitable habitat (Huff et al, 2012, p. 9), therefore surveys of this unit are not required. Unit 29G has a QMD of 20.9 inches dbh, however, the stand contains only one super dominant tree and thus does not meet protocol criteria 3. Thus, Unit 29G is not considered suitable habitat for the red tree vole and surveys are not required.

[3a]There were three (3) incidental findings of active red tree vole nests (fresh resin ducts) located in Units 1A and 9C during a field evaluation of the units. These trees would not be removed or modified during harvest activities.

[4] Suitable habitat for the Siskiyou Sideband (previously known as "Chace sideband") may be found within 30 meters (98 feet) of rocky areas, talus deposits and in associated riparian areas in the Klamath physiographic province and adjacent portions of the south-western Oregon Cascades. In Oregon, known sites occur in southern Douglas County, within the South River Resource Area on the Roseburg BLM District. Areas of herbaceous vegetation in these rocky landscapes adjacent to forested habitats are preferred. Areas that contain moist, shaded rock surfaces are preferred for daily refuges. In more mesic, forested habitats, especially in the Oregon Cascades, the species is associated with large woody debris and the typical rocky habitat is not required. Forest habitats without either rock features or large woody debris are not currently considered to be suitable habitat for this species (*Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan, Version 3.0, 2003*, p. 42)

[4a] Pre-disturbance surveys are not required within the variable retention harvests for Siskiyou Sideband because it falls outside its distribution range of Roseburg BLM (South River Resource Area) (*Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan, Version 3.0, 2003*, pg. 38).

[5] Suitable habitat for the Crater Lake Tightcoil is "perennially wet situations in mature conifer forests, 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…above 2000 feet elevation and east of Interstate 5" (*Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan, Version 3.0, 2003*, pp. 39 and 43).

[5a]Suitable habitat is present within 7C, 29C and 33A. However, Pechman Exemptions apply because thinning is proposed for these units containing forest habitat that is less than 80 years of age. Therefore, pre-disturbance surveys are not required.

Of the two VRH units, Unit 17C in below 2000 feet in elevation and therefore would not require surveys. Although Unit 29G is above 2000 feet in elevation, it does not contain suitable habitat within the unit, and therefore pre-project disturbance surveys are not required.

[6] Management of known sites is NOT required for Category F because species are uncommon, not rare, and species within this category would be assigned to other categories or removed from Survey & Manage as soon as new information indicates the correct placement. Until that time, inadvertent loss of some sites is not likely to change the level of rarity. In addition, Pre-disturbance surveys for Category F species and protection of sites located after September 30, 1999 are not required because it is projected to achieve stable populations due to the requirement to manage sites known for this species prior to September 30, 1999 (2001 ROD, Standards and Guidelines, pp. 7, 13-14).

[6a] Suitable habitat for the Oregon Megomphix is mature or late-seral, moist conifer/hardwood forests, usually in hardwood leaf litter and decaying non-coniferous plant matter under bigleaf maple trees. The species may also be present in the absence of bigleaf maple, especially at moist sites where deciduous shrubs, coarse woody debris, rotten logs or stumps and large sword ferns provide abundant cover (p. 42, *Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan, Version 3.0, 2003*).

Two (2) Oregon Megomphix sites were incidentally located during spring 2014 surveys for the Oregon shoulderband in Green Gas Unit 29G. Protection of this species is not required because sites known as of September 30, 1999 are protected and are projected to achieve stable populations (2001 ROD, Standards and Guidelines, p. 14).

[7] Suitable habitat for the Oregon Shoulderband is rocky areas, including talus deposits and outcrops, which contain stable interstitial spaces large enough for snails to enter. Within rocky habitat, the species is associated with herbaceous vegetation and deciduous leaf litter, generally within 30 meters (98 feet) of stable talus deposits or other rocky areas (*Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan, Version 3.0, 2003*, p. 41). The distribution range of the species is all of the Roseburg District. (*Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan, Version 3.0, 2003*, p. 37)

[7a] Pre-disturbance surveys are required for this species. Good Boyd Unit 17C does not require pre-disturbance surveys because there is no suitable habitat present within the stand. A four-acre rock outcrop and small aggregates of rock will be buffered from harvest in Unit 29G. However, there are rocky inclusions that will not be buffered and these areas will require pre-disturbance clearance surveys. No-harvest buffers of at least one-tree height (180 feet) will maintain microsite conditions, including maintaining vegetation and shade, coarse wood debris and soil temperatures, and moisture regime of the refugia sites (*Management Recommendations for Survey and Manage, Terrestrial Mollusks, Version 2.0, 1999,* pp. 6-7).

Table B-2. Effects of Proposed Action on Survey & Manage Wildlife Species. Species names indicated in **bold** within Table B-2 identifies the four species that are addressed specifically within the *Calapooya Environmental Assessment.*

SPECIES	GENERAL HABITAT REQUIREMENTS	PRESENT IN PROJECT AREA?	IMPACTS TO SPECIES	
			NO ACTION	PROPOSED ACTION ALTERNATIVE
VERTEBRATES				
Great Gray Owl ***Strix nebulosa***	Habitat characteristics of suitable habitat include: (1) large diameter nest trees, (2) forest for roosting cover, and (3) proximity [within 600 feet] to openings that could be used as foraging areas (*Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0*). No natural meadows are present within proximity to the proposed units. However, clear cuts are present in proximity to suitable forest habitat adjacent to units and, therefore great gray owls could be present within the project area. Great gray owls require two distinct habitat components: (1) a meadow system with a sufficient prey base, mainly *Microtus* spp. and *Thomomys* sp., and (2) an adjacent forest system able to provide adequate cover and nesting structures (Winter 1980, 1986, Greene 1995, van Riper and van Wagtendonk in press). Owls utilize the immediate surrounding forest for roosting and nesting activities, and meadow systems to hunt voles, gophers and various other prey. Characteristics of the habitat, such as vole and gopher abundance and availability, meadow vegetation height and cover, meadow soil moisture, dense forest canopy cover, and presence of large snags, are thought to influence site suitability (Winter 1986, Reid 1989, Bull and Henjum 1990, Greene 1995, Whitfield and Gaffney 1997 *in* Sears, Thesis, 2002). Great Gray Owl surveys will be conducted in Section 17 based on an observation of a possible great gray owl or other large owl within the stand.	**Suspected**	Without treatment or a natural disturbance, a multi-layered and multi-species canopy would not be well-developed within 50 years because of the closed canopy conditions. The development of large Douglas-fir trees with large limbs and deep crowns for the red tree vole would be slow to develop without disturbance and a reduction in the high tree density and closed canopy within the stands. Variable retention harvest (VRH) units have a limited amount of large trees and large hollow snags but would continue to develop into suitable habitat in 20 years.	•The thinning units do not qualify as great gray owl habitat requiring protocol surveys because they are not within 600 feet of a natural meadow that is greater than 10 acres in size (UDSA/FS and USDI/ BLM 2004). Thinning would maintain foraging and roosting opportunities and retention of the largest trees and snags would maintain potential nesting structures. Initially, great gray owls may avoid thinned areas but the retention of remnant trees and large snags would contribute to improving habitat conditions and habitat recovery in 15-20 years. Retained trees and snags may potentially develop into nest trees. Thinning in the vicinity of existing openings would increase foraging habitat. •Forest gaps would increase understory growth, contributing to increased prey production over the next 20 years. Increased forest edge habitat would also enhance foraging opportunities. Gaps created would increase foraging opportunities until canopy cover recovers. •VRH would create foraging habitat until canopy closure occurs. The retention of the largest trees and dispersed aggregates would provide for roosting and foraging during the early successional stages after harvest. Portions of harvest stands over 30 meters from an edge or perch are of little value to foraging great gray owls. However, the retention and aggregates would provide for perch sites throughout the harvest units (Hayward 1994). In the long term, the development of a multi-canopy forest with large trees and subsequently large snags will provide future nesting habitat for the great gray owl.
Red Tree Vole ***Arborimus longicaudus***	Suitable habitat is almost exclusively in forests having Douglas-fir in the canopy, and associated primarily with late-successional (older, structurally complex) forests	**Documented**	Thinning units that have high density of trees would limit the stand's ability to create diverse, multi-storied stands,	•Short term impacts of thinning would reduce tree densities, increasing the space between tree crowns which would limit the ability of tree

SPECIES	GENERAL HABITAT REQUIREMENTS	PRESENT IN PROJECT AREA?	IMPACTS TO SPECIES	
			NO ACTION	PROPOSED ACTION ALTERNATIVE
	(Huff *et al.* 2012).		including large trees with deep crowns. The species would continue to persist where it is present.	voles to move through the tree canopy. Variable density thinning would create more diverse stand conditions and accelerates growth of larger Douglas-fir trees with deeper crowns. •Variable Retention Harvest units would have both a short term and long term impact by creating large openings that would limit the movement of red tree voles in the short term. In the long term (i.e. 50+ years), suitable habitat conditions would be created as canopy closure recovered around the retention trees from proposed harvest.
MOLLUSKS				
Siskiyou Sideband *Monadenia chaceana*	Rocky, talus habitats in the Klamath Province and southwards and large down wood debris habitat in Western Cascade Province. In Oregon, known sites occur in southern Douglas County, within the South River Resource Area on the Roseburg BLM District. Therefore, the Calapooya project area is outside the range of distribution of the species. (*Also listed as a Bureau Sensitive Species on the SSS list (Appendix A).*	Out of Range	No effect	
Crater Lake Tightcoil *Pristiloma arcticum crateris*	Perennially wet areas in late-seral forests above 2,000 feet elevation and east of Interstate-5; seeps, springs, riparian areas. *Also listed as a Bureau Sensitive Species on the SSS list (Appendix A).*	No Habitat	No Effect	• Thinning of stands less than 80 years old would promote development of late seral conditions important to mollusk habitat (large diameter down wood, hardwood development, overstory/understory species diversity, etc).
Oregon Megomphix ***Megomphix hemphilli***	Late-seral or mature conifer/ hardwood forests usually in hardwood leaf litter (i.e. big leafed maple trees) and/or under decaying non-coniferous plant matter. Pre-disturbance surveys are not required for Category F species (*2001 ROD, Standards and Guidelines, Table 1-1, p.49*). Oregon megomphix was incidentally found within Green Gas Unit 29G. Protection for this species is not required because it is projected to achieve stable populations due to the requirement to manage sites known for this species prior to September 30, 1999	**Documented**	No effect	•Thinning of stands less than 80 years old would promote development of late seral conditions important to mollusk habitat (large diameter down wood, hardwood development, overstory/understory species diversity, etc). •Gaps would result in the release of hardwood components, where present, which would be a long-term benefit to mollusks. • In VRH units, areas where dispersed retention would occur in uplands would change microclimate conditions and disturb habitat features (down wood, and other refugia) for mollusk species. Creating aggregates around snags, coarse woody debris and rock outcrops would be a reasonable assurance of species persistence within the stand. In addition, retention areas around

SPECIES	GENERAL HABITAT REQUIREMENTS	PRESENT IN PROJECT AREA?	IMPACTS TO SPECIES	
			NO ACTION	PROPOSED ACTION ALTERNATIVE
				known sites and untreated areas in Riparian Reserves would provide for persistence of these species and serve as a source population for re-colonization of regeneration areas.
Oregon Shoulderband ***Helminthoglypta hertleini***	Talus and rocky substrates, grasslands or other open areas with low-lying vegetation. Suitable habitat is present within Unit 29G; Mollusk surveys are being completed. *Also listed as a Bureau Sensitive Species on the SSS list (Appendix A).*	**Suspected**	No Effect	PDF would minimize impact to the species by buffering out the rocky outcrops and small rocky inclusions from harvest. Sites discovered during pre-disturbance surveys will also be protected with no harvest buffers. •Thinning of stands less than 80 years old would promote development of late seral conditions important to mollusk habitat (large diameter down wood, hardwood development, overstory/understory species diversity, etc). •Gaps would result in the release of hardwood components, where present, which would be a long-term benefit to mollusks. •Areas where dispersed retention would occur in uplands would change microclimate conditions and disturb habitat features (down wood, and other refugia) for mollusk species. Creating aggregates around snags, coarse woody debris and rock outcrops would be a reasonable assurance of species persistence within the stand. In addition, retention areas around known sites and untreated areas in Riparian Reserves would provide for persistence of these species and serve as a source population for re-colonization of regeneration areas.

Appendix C. Landbirds

Table C-1. Summary of Effects of the Calapooya Project on Landbirds.

SPECIES	GENERAL HABITAT REQUIREMENTS[1]	IMPACTS TO SPECIES	
		NO ACTION ALTERNATIVE	PROPOSED ACTION ALTERNATIVE
Bold = species typically associated in stands < 80 years stands that would potentially have direct impacts due to habitat loss or modification. Nonbold = species typically associated with late-successional (mature/old growth) that would potentially have indirect impacts or a species that would have no effect.			
RMP PROTECTED LANDBIRD			
Northern Goshawk *Accipiter gentilis gentilis*	Mature and older mixed conifer forests with high canopies for nesting (Squires and Reynolds 1997). Goshawks have been documented nesting in mid-seral habitat at two sites in the Swiftwater Resource Area on the Roseburg District. An accipiter species, including possibly the goshawk, has been documented within Green Gas unit 23A. Subsequent surveys will be completed to determine species. The closest known goshawk nest site is located 16 miles east (Scaredman) of the proposed project area.	Continuous canopy within the harvest units would continue to preclude the development of diverse forage and nesting habitat for avian species that goshawks may prey upon; thus limiting foraging opportunities for the goshawk. However, high canopy cover would provide nesting habitat if spacing of trees is not too dense.	• Thinning would improve forest habitat conditions by creating more diverse habitat and micro habitat conditions for avian prey species, thus increasing foraging opportunities and prey species diversity. Within the thinning units, post-harvest conditions would create a stand with the highest amount of heterogeneity and would be expected to develop from a combination of no treatment areas, light to heavy thinning treatments, and gap creation within the stands. •VRH would remove stand overstory, reducing foraging and nesting opportunities for another 80 years.
EAGLE PROTECTION ACT			
Bald Eagle *Haliaeetus leucocephalus*	Also a *Bureau Sensitive Species*; refer to Table A-1 *in Appendix A* for habitat requirements and impacts.		
Golden Eagle *Aquila chrysaetos*	Usually associated with open grassland, pasture, and shrub land conditions. In southwestern Oregon, golden eagles nest in a variety of trees including ponderosa pine, Douglas-fir, oak species, and madrone (Csuti *et al*. 1997; Kochert *et al*. 2002). Nest on cliffs, in the upper one-third of deciduous and coniferous trees, or on artificial structures (e.g. artificial nesting platforms, electricity transmission towers, windmills). On the Roseburg District, primarily documented to nest in large conifer trees within late-seral forests near open habitats (e.g. meadows, valleys, and clearcuts). The closest known site, which is currently occupied, is 1.3 miles from the nearest thinning unit (Good Boyd 13C).	Within the harvest units, high density of trees would limit the stand's ability to create diverse, multi-storied stands. Large trees or snags containing large limbs or structural characteristics to support a nest would be slow to develop.	• Within the thinning units, post-harvest conditions would create a stand with the highest amount of heterogeneity and would be expected to develop from a combination of no treatment areas, light to heavy thinning treatments, and gap creation within the stands. Thus, these species would benefit most from treatments of heavy thinning and gap creation which would best create conditions fostering the development of suitable nesting, foraging, or roosting habitat. • VRH stands, post-harvest, would be slow to develop the structural characteristics to support nesting. However, VRH would create open foraging habitat for the golden eagle.
BIRDS OF CONSERVATION CONCERN			

SPECIES	GENERAL HABITAT REQUIREMENTS[1]	IMPACTS TO SPECIES	
		NO ACTION ALTERNATIVE	PROPOSED ACTION ALTERNATIVE
Bald Eagle *Haliaeetus leucocephalus*	Also a *Bureau Sensitive Species*; refer to Table A-1 *in Appendix A* for habitat requirements and impacts.		
Marbled Murrelet *Brachyramphus marmoratus*	Also a *Bureau Sensitive Species*; refer to Table A-1 *in Appendix A* for habitat requirements and impacts.		
Olive-sided Flycatcher *Contopus cooperi*	*Forest Stage: Sapling/Seedling Forest (Early Successional)* *Habitat Attribute: Residual Canopy Trees* Forages in early-seral areas associated with natural or man-made openings with tall trees or snags available for perching and singing (Altman 1999). In the Oregon Coast Range, it is closely associated with edges of older stands with tall trees and snags greater than 21 inches diameter breast height and broken canopy (Carey *et al.* 1991). Habitat is generally absent within the proposed units, except on edges where older stands are adjacent to private clear cuts.	Suitable habitat condition would continue to be absent until suppression mortality created gaps and edge habitat adjacent to older stands.	•Thinning would create more diverse stand conditions and accelerates growth of larger trees that may become snags. Forest gaps would increase understory growth, contributing to increased insect production over the next 20 years. Increased forest edge habitat would also enhance foraging opportunities. • Gaps created by thinning corridors and landings may allow foraging until the canopy eventually closes again and these opportunities are lost. • VRH would create more man-made openings with dispersed trees that could be used for perching and provide for increased foraging opportunities.
Oregon Vesper Sparrow *Pooecetes frameneus affinis*	Also a *Bureau Sensitive Species*; refer to Table A-1 *in Appendix A* for habitat requirements and impacts.		
Peregrine Falcon *Falco peregrinus anatum*	Also a *Bureau Sensitive Species*; refer to Table A-1 *in Appendix A* for habitat requirements and impacts.		
Purple Finch *Carpodacus purpureus*	Primarily nest in Douglas-fir, pine or spruce but may use oak, maple, and fruit trees. Prefer open areas or edges of low to mid-elevation mixed coniferous-deciduous forests, frequently breeding in mixed conifer-deciduous forest, on edges of bogs, in riparian corridors, deciduous forests, orchards, and other areas with scattered conifers and shrubs (Csuti *et al.* 1997).	A continuous overstory and lack of deciduous tree and plant species would preclude the species from using the habitat within the proposed units.	• Harvest treatments, particularly in areas of heavy thinning or VRH, would create additional nesting and foraging habitat as canopy layers and hardwoods develop in the areas with lower residual tree densities.
Rufous Hummingbird *Selasphorus rufus*	*Forest Stage: Unique Forest Habitat* *Habitat Attribute: Nectar-Producing Plants* Primarily associated with forest edges and openings with a diversity of flowering plants for feeding and open space. Frequently occurs in open habitats that are shrub-dominated, and late-successional forest with a highly developed and diverse understory of herbaceous plants and shrubs, particularly within large openings. Need flowering plants and shrubs. Also listed as a *Focal Avian Species*.	Suitable habitat conditions would continue to be absent until suppression mortality created gaps where flowering plants and shrubs developed.	• Harvest treatments, particularly in areas of heavy thinning, gap creation, or VRH, would create additional nesting and foraging habitat as flowering plants and shrubs important would develop. These conditions would persist until canopy cover increased, shading out flowering plants and shrubs.

SPECIES	GENERAL HABITAT REQUIREMENTS[1]	IMPACTS TO SPECIES	
		NO ACTION ALTERNATIVE	PROPOSED ACTION ALTERNATIVE
Willow Flycatcher *(Empidonax traillii)*	Found in willows at the edges of streams flowing through meadows and marshes, but also breeds in thickets along the edges of forest clearings and, generally, in tall, brushy vegetation in the vicinity of water (Csuti *et al.* 1997).	A continuous overstory and lack of deciduous tree and plant species would preclude the species from using the habitat within the proposed units.	• VRH would create additional nesting and foraging habitat, where occurring in the vicinity of water, as the development of early-successional plant communities that support greater insect populations which would increase insect populations to prey upon. These conditions would persist until canopy cover increased, shading out flowering plants and shrubs.
FOCAL AVIAN SPECIES[1]			
Band-tailed Pigeon ***Columba fasciata***	*Forest Stage: Unique Forest Habitat* *Habitat Attribute: Mineral Springs and Seeps* Generally associated with high canopy cover and hardwood stands (Bottorff 2007). In Oregon, they nest primarily in closed Douglas-fir stands with canopy cover above 70 percent (Leonard 1998). Used mineral sites appear to be scarce in western Oregon, and are seemingly essential resources for this species (Sanders and Jarvis 2000). Sanders and Jarvis (2003) indicate availability of food sources may be directly related to the declining band-tailed pigeon population in Oregon. There are no mineral springs associated with the proposed units; however, the stands may provide foraging opportunities where an understory of shrubs and forbs exists. The band-tailed pigeon is also identified on the "Game Birds Below Desired Condition" list.	Continuous canopy within the harvest units would continue to preclude the development of forage for the species. However, high canopy cover would provide nesting habitat.	•Thinning would create potential foraging habitat in the short-term until canopy cover increases to existing levels. Decreased canopy cover in more heavily thinned areas (e.g. Riparian Reserve) may allow establishment of shrubs such as red elderberry (*Sambucus racemosa*), cascara (*Rhamnus purshiana*), and other forage species (i.e. berries from Pacific madrone (*Arbutus menziesii*), salal (*Gaultheria shallon*), salmonberry (*Rubus spectabilis)*) for at least 30 years while the tree canopy in these areas remains open. In areas where canopy cover remains above 70 percent would maintain nesting habitat. • Gap creation will open canopy providing for opportunity for shrub establishment and an increase of forage within the previously thinned stand. The remaining forest habitat surrounding the gaps would continue to remain unsuitable for nesting until the canopy cover reaches at least70 percent.• VRH units will open canopy even further providing for opportunity for shrub establishment and an increase of forage. However, VRH would remove and preclude nesting habitat until canopy cover reaches at least 70 percent.
Brown Creeper *Certhia americana*	*Forest Stage: Old Growth/Mature Forest* *Habitat Attribute: Large Trees* Optimal habitat appears to be mature and old-growth unmanaged forests where large trees and snags for foraging and nesting are relatively abundant due to natural processes (Altman 1999).	Stands would remain unsuitable. May forage away from adjacent suitable habitat in managed stands where large remnant Douglas-fir trees and snags are present.	• Benefits most from long-term effects of thinning treatments resulting in lower tree densities, which would best create conditions fostering the development of suitable habitat, including large conifers with deep furrowed bark. Also would benefit from retention of large remnant trees and snags. • With the exception of aggregate tree patches and skips, VRH units would be unsuitable habitat post-treatment, precluding nesting or foraging for another 60-80 years.

SPECIES	GENERAL HABITAT REQUIREMENTS[1]	IMPACTS TO SPECIES	
		NO ACTION ALTERNATIVE	PROPOSED ACTION ALTERNATIVE
Black-throated Gray Warbler *(Setophaga nigrescens)*	*Forest Stage: Young/Pole Forest* *Habitat Attribute: Deciduous Canopy Trees* This neo-tropical migrant warbler uses a wide range of forests, woodlands, and brushy areas at forest edges, including the brushy regeneration in recent clearcuts. Can be found in deciduous and mixed deciduous – coniferous forests, but dense moist coniferous forests are avoided (Csuti et al. 1997). Altman 1999 states the black-throated gray warbler is strongly associated in low to moderate elevation (1,070-4,192 feet) unmanaged forest through the Oregon Cascades, and is most abundant in young (40-80 years) stands with broadleaf trees. This species are active in both canopy and woody understory.	Expected to continue use of the dense forested stands for nesting and foraging within the harvest units.	• Thinning would modify and partially remove stand overstory, reducing foraging and nesting opportunities over the short term, particularly within the heavily thinned areas. However, the development of understory deciduous shrubs and trees would increase habitat suitability within 5-10 years. • Gap creation would remove stand overstory, reducing foraging and nesting habitat for this warbler species. After the development of a shrub layer, the black-throated gray warbler would be expected to use the gaps for nesting and foraging. • Abundance within the VRH units would be expected to decline due to removal of suitable habitat. VRH would remove stand overstory, reducing foraging and nesting habitat for this warbler species. After the development of a shrub layer, the black-throated gray warbler would be expected to use the stands for nesting and foraging within 30 years.
Hammond's Flycatcher *Empidonax hammondii*	*Forest Stage: Mature/Young Forest* *Habitat Attribute: Open-Mid Story* An aerial insectivore that uses open space beneath the overstory canopy and between trees. Strongly associated with late-successional stands in low to moderate elevation (1,050-3,182 feet) managed forest through the Central Oregon Cascades (Altman 1999). It occupies all forest types on the west slope of the Cascade Mountains (Csuti *et al.* 1997)	Stands would remain unsuitable until stand differentiation and late-successional characteristics developed.	• Would benefit from variable thinning which would foster understory development of deciduous shrubs and trees. VRH would modify canopy overstory to preclude nesting or foraging for another 40 or more years before canopy closure recovers.
Hermit / Townsend's Warbler ***Dendroica occidentalis/*** *townsendii*	*Forest Stage: Mature/Young Forest* *Habitat Attribute: Closed Canopy* Canopy dwelling neo-tropical migrant associated with young (35-79 years old) and mature (80-200 years old) conifer forests and is common in Douglas-fir dominated stands, where dense canopy provides foraging and nesting habitat (Pearson 1997, Altman 1999). All of the proposed units are characterized by closed canopy, and hermit warblers are known to be present in many of them.	Expected to continue use of the dense forested stands for nesting and foraging within the harvest units.	• Thinning would modify and partially remove stand overstory, reducing foraging and nesting opportunities over the short term, particularly within the heavily thinned areas until forest canopy closes in 10 to 20 years. • Gap creation would remove stand overstory, reducing foraging and nesting habitat for this warbler species. After the development of a shrub layer, the hermit warbler would be expected to use the gaps for foraging. • Abundance within the VRH units would be expected to decline due to removal of suitable habitat. Dispersed retention harvest would modify canopy overstory precluding nesting or foraging within these areas for approximately 30-40 years before canopy closure recovers.
Hutton's Vireo ***Vireo huttoni***	*Forest Stage: Old Growth/Mature Forest* *Habitat Attribute: Large Trees* Strongly associated (i.e., preferentially selected) with pole forest conditions among younger and older forested stands in all elevations of managed forests of the west of the Western Cascades in Oregon.	Where present, would continue to persist in stands where a deciduous component is present in harvest units.	• Would benefit from variable light and moderate thinning which would foster understory development of deciduous shrubs and trees. Light thinning would be most beneficial because in providing suitable habitat because it allows for understory development of deciduous and broadleaf species, but retains a relatively dense overstory (Altman 1999).

SPECIES	GENERAL HABITAT REQUIREMENTS[1]	IMPACTS TO SPECIES	
		NO ACTION ALTERNATIVE	PROPOSED ACTION ALTERNATIVE
			• Gap creation would preclude the Hutton's vireo from using the gaps due to reduced canopy below moderate thinning levels. The remaining forest habitat surrounding the gaps would continue to provide suitable habitat where a deciduous shrub layer is present. • Abundance of the Hutton's vireo within the VRH units would be expected to decline due to removal of suitable habitat. Dispersed retention harvest would modify canopy overstory precluding nesting or foraging within these areas for approximately 40 years before canopy closure recovers.
Northern Flicker ***(Colaptes auratus)***	*Forest Stage: Sapling/Seedling Forest (Early Successional)* *Habitat Attribute: Snags* Optimal habitat appears to early-successional habitats with the presence of snags.	Current habitat conditions would preclude the use of these stands by northern flickers.	• Would benefit from VRH treatment which would foster understory development of deciduous shrubs and trees
Olive-sided Flycatcher *Contopus cooperi*	*Also listed as a **BIRD OF CONSERVATION CONCERN**; refer to relevant section.*		
Orange-crowned Warbler *Oreothlypis celata*	*Forest Stage: Sapling/Seedling Forest (Early Successional)* *Habitat Attribute: Deciduous Shrub Layer* A foliage-gleaning insectivore associated with dense deciduous shrubs. Reaches peak abundance in early-seral forests once a shrub layer has developed (5-10 years) and before overstory canopy closure sets in (15-20 years). Also occurs in older multi-layered forest conditions where canopy openings have allowed development of a deciduous shrub understory (Altman 1999).	Where present, would continue to persist in stands where a deciduous shrub component is present in harvest units.	• Would benefit from both variable thinning and VRH treatment which would foster understory development of deciduous shrubs and trees. Species is expected to reach peak abundance in early-seral forests once a shrub layer has developed (5-10 years) and before overstory canopy closure sets in (15-20 years) (Altman 1999).
Pacific-sloped Flycatcher ***Empidonax difficilis***	*Forest Stage: Old Growth/Mature Forest* *Habitat Attribute: Deciduous Canopy/Subcanopy Trees* Optimal habitat appears to be low elevation (<3,000 feet) riparian forest in late-successional coniferous forest with a deciduous component and/or wet site coniferous trees such as western hemlock and western red cedar (Altman 1999). However, can also be found throughout coniferous forests with some open space beneath or in the canopy and deciduous trees for aerial foraging and nesting.	Where present, would continue to persist in portions of units where open space with a deciduous component is available.	• This species would respond negatively to heavy thinning with significantly decrease in abundance in the first three years post-thinning (Altman 1999). However, abundance within light and moderate treatments is not expected to change (Weikel 1997 in Altman 1999). Light and moderate treatments would create forest conditions with open space for the development of a deciduous understory that would benefit the Pacific-sloped flycatcher. • Gap creation would remove stand overstory, reducing foraging and nesting habitat for this warbler species. However, the development of an understory of herbs and forbs, shrubs, and trees, would increase insect production and thereby increasing foraging habitat along the gap edges for the Pacific-slope flycatcher. • VRH would remove nesting and foraging habitat where dispersed retention is applied, thereby reducing

SPECIES	GENERAL HABITAT REQUIREMENTS[1]	IMPACTS TO SPECIES	
		NO ACTION ALTERNATIVE	PROPOSED ACTION ALTERNATIVE
			the abundance of the Pacific-slope flycatcher within the area. Removal of canopy overstory due to dispersed retention harvest would preclude nesting or foraging for approximately 60 years until canopy closure recovers. Nesting and foraging habitat would continue to function where it is retained within aggregates.
Pacific Wren ***Troglodytes troglodytes***	*Forest Stage: Old Growth/Mature Forest* *Habitat Attribute: Forest Floor Complexity* The Pacific wren was previously named the "winter wren" and is a resident species associated with forests with complex vegetative structure on the forest floor and is frequently associated with streams (Altman and Hagar 2006, Hejl et al. 2002, Altman 1999, McGarigal and McComb 1992). Territory sizes range between 0.35 acres and 15 acres and are variable based on season, habitat conditions and region (Hejl et al. 2002). Pacific wren nests are located in concealed cavities in root wads, stumps and downed logs and foraging for insects occurs on the ground and in low understory vegetation. Generally absent in areas lacking complex understory vegetation and structure. Pacific wrens are a common species in the analysis area.	Where present in harvest units, would continue to persist in portions of stands where newly recruited or remnant down woody material and shrub habitat is present. Where stands are lacking large down wood and an understory component, habitat would continue to be unsuitable for wrens until such components develop within the stand.	• Would benefit from thinning in areas where there is existing large down wood and where canopies are reduced which would facilitate the development of an understory of herbs and forbs, shrubs, and trees. Thinning would increase the amount of suitable habitat after the understory layer has developed, particularly in those areas where large down wood is present. • Harvest activities may damage or modify existing forest floor complexity which may result in removing suitable habitat conditions for nesting, resting, and foraging. However, the Pacific wren would benefit from gaps after the development of an understory of herbs and forbs, shrubs, and trees, particularly if there is existing large down wood. The remaining stand around the gaps would maintain some complexity and continue to provide some habitat conditions for Pacific wrens to persist within the area. • VRH would remove or damage the existing forest floor complexity in areas where it exists. Abundance is expected to decline after harvest due to removal of habitat (Altman 1999). Skips within VRH units would maintain some complexity and continue to provide some habitat conditions for Pacific wrens to persist within the area.
Pileated Woodpecker *Dryocopus pileatus*	*Forest Stage: Old Growth/Mature Forest* *Habitat Attribute: Large Trees* Strongly associated with mature and old-growth stands (stands ≥ 80 years) with a multi-layered canopy. Nests in large snags and decadent live trees in mature and old-growth forests. Younger forests can be used for foraging if snags and/or down logs are present. Dependent on large snags and down wood.	Thinning stands would remain unsuitable for nesting and most foraging activities. May forage away from adjacent suitable habitat where large snags and down wood are present in managed stands.	• Benefits most from long-term effects of thinning treatments resulting in lower tree densities which would best create conditions fostering the development of suitable habitat, including large trees, and eventually large snags and down wood. Also would benefit from retention of remnant trees and snags. • VRH units would be unsuitable habitat post-treatment, precluding nesting or foraging for another 60-80 years.
Rufous Hummingbird *Selasphorus rufus*	*Also listed as a **BIRD OF CONSERVATION CONCERN**; refer to relevant section.*		
Sooty (Blue) Grouse *Dendragapus obscurus*	*Forest Stage: Unique Forest Habitat* *Habitat Attribute: Landscape Mosiac Forest* A landscape species associated with habitats that have an interspersion of tree cover, shrub cover, and herbaceous cover.	Sooty Grouse would continue to exist where present.	Treatment within the Calapooya Units would provide for a more diverse understory development.

SPECIES	GENERAL HABITAT REQUIREMENTS[1]	IMPACTS TO SPECIES	
		NO ACTION ALTERNATIVE	PROPOSED ACTION ALTERNATIVE
Varied Thrush *Ixoreus naevius*	*Forest Stage: Old Growth/Mature Forest* *Habitat Attribute: Midstory Tree Layers* Mature forests with high canopy closure, high-stem density, multiple tree layers, a deciduous tree component, and a relatively open low understory forest floor with much debris in patches. Fruit bearing shrub and tree species, and wet sites with deciduous vegetation.	Proposed harvest units would remain unsuitable until multiple tree layers and deciduous tree component develop.	• Light variable spaced thinning in the uplands may enhance development of tree layers, but moderate thinning would reduce too much canopy, and likely enhance development of understory shrubs more than mid-story trees. Because of need for high canopy closure, stem density, and tree layering, and indications that it may be area sensitive, this species may respond negatively to any type of timber harvest. • VRH units would reduce stem density and tree layering, precluding nesting or foraging for another 60-80 years.
Vaux's Swift *Chaetura vauxi*	*Forest Stage: Unique Forest Habitat* *Habitat Attribute: Large Hollow Snags* Associated with late-successional forests and large, hollow snags used as nest and roost trees. Availability of suitable large hollow snags and trees is a major limiting factor.	Proposed harvest units would remain unsuitable until late successional characteristics develop, including open, multi-layered canopy and the presence of large, hollow snags.	• Benefits most from long-term effects from variable thinning treatments and VRH resulting in lower tree densities (e.g. Riparian Reserves) which would best create conditions fostering the development of suitable habitat, including large trees, and eventually large snags, as well as a multi-layered canopy.
Wilson's Warbler *Wilsonia pusilla*	*Forest Stage: Mature/ Young Forest* *Habitat Attribute: Deciduous Understory* Nest in low deciduous vegetation in mature conifer forests, and forages in stands with a diverse deciduous shrub and/or mid-canopy layer.	Would not likely occupy the stands with high canopy cover which would preclude growth of herbs and forbs, shrubs, and trees in the understory.	• Nesting opportunities would be reduced by partial overstory removal. Secondary canopy layers and shrubs could be damaged and/or removed, decreasing foraging opportunities. Hagar *et al*. (2004) noted that thinning was relatively neutral in impact to the Wilson's warbler. Additional habitat would become available for nesting as understory vegetation develops in treated areas. • Within the VRH units, foraging opportunities would increase after the development of diverse deciduous shrubs and/or a mid-canopy layer.
GAME BIRDS			
Band-tailed Pigeon ***Columba fasciata***	*Also listed as a **Partner's In Flight FOCAL SPECIES**; refer to relevant section.*		
Mourning Dove *Zeneida macroura*	Forests, woodland edges, savannas, grasslands, deserts, suburban and urban areas, and agricultural lands. Frequently seen on the Roseburg District along roadsides and forest openings. Nesting may occur on the ground, on ledges, in bushes and in trees (Otis *et al*. 2008), in edge-habitats between woodlands/shrubs and open areas (Csuti et al. 1997). Generally avoid extensive forests and wetlands.	Continuous canopy would preclude nesting except along habitat edges (e.g. roads).	• Creation of gaps due to roads and landings may create edge habitat suitable for nesting within thinning units. In addition, VRH would provide for additional nesting and foraging habitat in areas where VRH would occur.
Wood Duck *Aix sponsa*	Nest in tree cavities (Lewis and Kraege 1999) in the vicinity of wooded swamps, flooded forest, marsh, or ponds (Ehrlich *et.al.*1988). At least 10 acres of wetland or other aquatic habitat in a contiguous unit or in isolated parcels separated by no more than 100 feet	No Effect	

SPECIES	GENERAL HABITAT REQUIREMENTS[1]	IMPACTS TO SPECIES	
		NO ACTION ALTERNATIVE	PROPOSED ACTION ALTERNATIVE
	of upland is needed in close proximity to nesting habitat is needed. Open water makes up 25 percent of brood-rearing area with the remainder a mixture of shrubs and herbaceous emergent plants and trees (Hepp and Bellrose 2013). Nearest presence of Wood Ducks is expected to occur along Gassey Creek. Suitable habitat is not present in the harvest units.		

1. Forest conditions and the primary habitat attributes required are provided for each Focal Species as referenced from *Habitat Conservation for Landbirds in the Coniferous Forests of Western Oregon and Washington (Version 2)* (Altman and Alexander 2012).

a. Successional stages as described by Altman and Alexander (2012):

- Seedling/sapling: grass-forb; stand initiation; regenerating (0 to 15-20 years)
- Pole forest: stem exclusion (15-20 to 30-40 years)
- Young forest: understory reinitiating (30-40 to 60-80 years)
- Mature forest: multilayered (80-150 years)
- Old-growth (>150 years)

b. Successional stages are characterized by three general stages:

- Early-successional refers to the seedling/sapling stage
- Mid-successional refers to the pole and young forest stages
- Late-successional refers to the mature and old-growth stages.

Appendix D. Aquatic Conservation Strategy Assessment

Calapooya Creek Harvest Plan

The Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands. The ACS must strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats. This approach seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds. (Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl, page B-9).

The Calapooya Creek Harvest Plan spans three 10 digit hydrologic unit code (HUC) watersheds. Approximately 88 percent of the project is within the Calapooya Creek Watershed. Approximately 6 percent of the project with within the Lower North Umpqua Watershed, and 6 percent is within the Elk Creek Watershed. All of the treated acres within the Elk Creek and Lower North Umpqua Watersheds are located on ridge tops of these watershed divides with the Calapooya Creek Watershed.

This assessment of the Aquatic Conservation Strategy will focus on affects to the Calapooya Creek Watershed. Ridge top thinning of approximately 80 acres in the Elk Creek Watershed and approximately 70 acres in the Lower North Umpqua Watershed would have no measurable affect to any indicator of watershed health or function. Therefore, these two watersheds will not be discussed in detail.

ACS Components:

(1) *Riparian Reserves (ACS Component #1)*

Riparian Reserves were established. The ROD/RMP (p. 24) specifies Riparian Reserve widths equal to the height of two site potential trees on each side of fish-bearing streams and one site-potential tree on each side of perennial or intermittent non-fish bearing streams, wetlands greater than an acre, and constructed ponds and reservoirs. The site-potential tree height for the Calapooya Creek and Lower North Umpqua River Watershed is 180 feet. The site-potential tree height for the Elk Creek Watershed is 200 feet. Objectives of this project include managing for the development of late seral characteristics and to control stocking, manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives (p. 4).

(2) *Key Watersheds (ACS Component #2)*

Key Watersheds were established "as refugia . . . for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species [ROD/RMP, p. 20]." None of the watersheds within the Calapooya Creek Harvest Plan have been identified by the BLM as a Key Watershed in the 1994 FEIS (ch. 2-5).

(3) *Watershed Analysis (ACS Component #3) and other pertinent information:*

In developing the project, the Calapooya Creek Watershed Analysis (1999) was used to evaluate existing conditions, establish desired future conditions, and assist in the formulation of appropriate alternatives. The Calapooya Creek Watershed Analysis is available for public review at the Roseburg District office or can be viewed under "Plans & Projects" on the Roseburg District website at www.blm.gov/or/districts/roseburg/index.php.

In 2003, the Partnership for the Umpqua Rivers watershed council completed a watershed assessment for Calapooya Creek. That assessment is available at http://www.umpquarivers.org/watershed-assessments/.

Existing watershed conditions are described in the *Hydrology,Aquatic Habitat & Fisheries* (p. 102-112) sections of the EA and also in the Calapooya Creek Watershed Analysis. The short and long term effects to aquatic resources are also described in these sections of the EA.

(4) *Watershed Restoration (ACS Component #4)*

One purpose of the proposed project is to reduce stand densities to acquire desired vegetation characteristics and improve habitat for special status species (EA, p. 4). A component of the project design is to apply thinning prescriptions for the development of large trees to provide an eventual source of large woody debris to stream channels and to create diversity in the riparian stands. Therefore, the proposed action functions as a watershed restoration project.

BLM has very limited ownership within the Calapooya Creek Watershed (11,946 acres out of 157,470 (7.5%). Therefore, watershed restoration opportunities have also been limited. Since 1994, numerous stream enhancement projects have been implemented in the Umpqua Basin. This includes placing instream structures (e.g. logs, boulders, root wads, etc…) to improve aquatic habitat, replacing culverts identified as barriers to fish passage to open up access to additional habitat, or improving or decommissioning roads to reduce road sediment impacts to aquatic systems. This work has been done in a collaborative effort with private timber companies, Partnership for the Umpqua Rivers Watershed Council, and the Oregon Department of Fish and Wildlife. Future opportunities for restoration are discussed in the Calapooya Creek Watershed Analysis. This work would be implemented as budgets allow.

Range of Natural Variability within the Watershed:

Based on the dynamic, disturbance-based nature of aquatic systems in the Pacific Northwest, the range of natural variability at the site scale would range from 0-100 percent of potential for any given aquatic habitat parameter over time. Therefore, a more meaningful measure of natural variability is assessed at scales equal to or greater than the fifth-field watershed scale. At this scale, spatial and temporal trends in aquatic habitat condition can be observed and evaluated over larger areas, and important cause/effect relationships can be more accurately determined.

Natural disturbance events to aquatic systems in the Pacific Northwest include wildfires, floods, windstorms, and landslides. Average fire return intervals at the drainage scale for similar watersheds were calculated between 50 and 75 years (prior to the advent of fire suppression). The more destructive stand replacement fires probably occurred irregularly at intervals from 150 to 350 years as this is the recurrence intervals found in the adjacent Elk Creek Watershed (Elk Creek Watershed Analysis, p. 9). The Calapooya Creek Watershed Analysis (1999) used an estimate based on data from the HJ Andrews Experimental Forest to determine a mean fire return interval for stand replacement fires of 130-150 years. Lightning caused fires occur every year in the Cascades and Coast Range. If not for fire suppression, lightning caused fires would kill trees and create openings in stands every summer.

The Calapooya watershed is situated in the Coast Range Geographic Province (western three quarters) and the Western Cascade Province (eastern one quarter). The topography is highly variable ranging from rugged, highly dissected mountain slopes along the western margins of the watershed and on the east side to typically low lying hills and broad flood plains and terraces in between. The Tyee Mountain-Yellow Creek Mountain scarp on the western fringe of the Calapooya Watershed (The Tyee Formation and the similar Flournoy Formation) and the scarps and stream canyons of the Western Cascades (Fisher-Colestin and Little Butte Formations) have high densities of very steep , highly dissected slopes. These locations probably have the highest concentration of moderate to high landslide potentials, mainly of the shallow, rapid variety and debris flow variety (Calapooya WA (1999 p. 6-7).

Timber harvesting and road construction over the past 50 years have substantially increased the frequency and distribution of landslides above natural levels in the Calapooya Creek Watershed. However, there is a downward trend in landslide incidence over the last 50 years that is associated with improved management practices. On BLM-managed land, future landslides, occurring mostly during large storm events, are expected to deliver large wood and rock fragments to lower-gradient streams. This is intentional, and is a direct result of Riparian Reserve protection and the recognition of their role as critical source areas for large wood and sediment to downstream habitats. As a result, these events would more closely resemble landslides within relatively unmanaged forests. These disturbance events are the major natural sources of sediment and wood to a stream system and are very episodic in nature.

Due to the dynamic nature of these disturbance events, stream channel conditions vary based on the time since the last disturbance event. This results in a wide range of aquatic habitat conditions at the site level. Site level habitat conditions can be summarized by Oregon Department of Fish and Wildlife (ODFW) habitat surveys. Surveys have been conducted throughout the Calapooya Creek Watershed, mostly in the third through sixth-order streams. The 2002 Upper Umpqua Watershed Analysis identified approximately 20 stream reference reaches in the Coast Range of the Umpqua Basin to compare against all other surveyed streams. These relatively unmanaged reaches represent the variability of conditions within natural stream systems as well as characteristics desirable for a variety of fish species (including salmonid habitat). When compared to these "reference streams", aquatic habitat survey data from the Calapooya Creek Watershed indicates that most of the tributaries are lacking large woody debris. While this condition is considered typical at any given site scale, it is considered atypical for most streams to be devoid of wood at the larger fifth-field scale. Therefore, at this larger scale, aquatic habitat conditions are considered to be outside the range of natural variability.

Stream temperatures vary naturally in this watershed as a result of variation in geographic location, elevation, climate, precipitation, and distance from the source. Stream temperatures also naturally vary as a response to the natural disturbance events mentioned in the previous paragraphs, as well as current practices on private forest, agricultural, and residential properties. Due to the large amount of riparian clearing that has occurred over the last 150 years (converting forest into farmland), coupled with management-induced channel widening, irrigation withdrawals, and loss of gravels, it is likely that stream temperature increases have been greater over larger spatial and temporal scales than observed naturally. One of BLM's objectives for managing Riparian Reserves is to maintain and enhance shade providing vegetation along streams.

Changes in stream flow can result from consumptive withdrawals and effects of land use activities on storm water runoff, infiltration, storage and delivery. Agricultural and domestic withdrawals are common along Calapooya Creek. Many tributaries within the Calapooya Creek Watershed have also been cleaned (had large wood removed) or salvage logged. BLM forest management in the Calapooya Creek Watershed would be designed to reduce or prevent watershed impacts.

Table D-1. Individual Aquatic Conservation Strategy Objective Assessment.

ACS Objective	Site/Project Scale Assessment	Watershed Scale Assessment
	Scale Description: Units identified in this project are located in seven drainages. The BLM manages approximately 10,300 acres in these drainages (25 percent). Units proposed for treatment represent from 0.3 to 7 percent of the total area of the drainages and from one to 22 percent of the BLM-administered lands in the drainages.	Scale Description: The project is located in the Calapooya Creek Watershed. This watershed is approximately 157,500 acres in size. The BLM manages approximately 11,900 acres in this watershed (8 percent). Units proposed for treatment represent approximately 0.7 percent of the watershed, and approximately 10 percent of the BLM-administered lands in the watershed.
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.	Approximately 257 acres of Riparian Reserves would be thinned. Trees within these treated stands would attain more diversity and complexity in a shorter amount of time than if left untreated. No-harvest buffers established along streams would maintain primary shade zones and stream temperature regimes. No-harvest buffers established along streams would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing sediment transported by overland flow to be filtered out before reaching active waterways (EA, p. 103) and would prevent impacts to aquatic resources. This treatment would speed attainment of this objective.	This treatment would speed attainment of this objective.
2. Maintain and restore spatial and temporal connectivity within and between watersheds.	The proposed project would not influence aquatic connectivity. Therefore, this treatment would maintain the existing connectivity condition.	The proposed project would not influence aquatic connectivity. Therefore, this treatment would maintain the existing connectivity condition.
3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.	Canopy closure would not be reduced to an extent that stream flows would be influenced (EA, p. 100). In addition, no-harvest buffers along streams would prevent disturbance to stream channels and stream banks (EA, p. 103). Therefore, these treatments would maintain the physical integrity of the aquatic system.	This treatment would maintain the physical integrity of the aquatic system.

ACS Objective	Site/Project Scale Assessment	Watershed Scale Assessment
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.	Project design features (PDF), such as no-harvest buffers established along streams, would retain shading and maintain water temperature to ensure water quality would not be adversely impacted by the proposed action. No-harvest buffers along streams would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing sediment transported by overland flow to be filtered out before reaching active waterways (EA, p. 103). Therefore, this treatment would maintain the existing water quality.	Based on the information discussed at the site scale, this project would maintain water quality.
5. Maintain and restore the sediment regime under which aquatic ecosystems evolved.	No-harvest buffers along streams would prevent disturbance to stream channels and stream banks and intercept surface run-off allowing sediment transported by overland flow to settle out before reaching active waterways (EA, pp. 103-104). Therefore, this project would maintain the existing sediment regime.	This project would maintain the existing sediment regime.
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.	Canopy closure would not be reduced to an extent that stream flows would be influenced (EA, p. 104). Road construction would not extend the drainage network or contribute to a potential increase in peak flow because the new roads would be located on ridge tops or stable side slopes with adequate cross drains. Decommissioning roads would decrease the amount of roads and the potential for peak flow effects and sediment routing. Therefore, this treatment would maintain stream flows within the range of natural variability.	Thinning treatments would not reduce canopy closure to an extent that would influence stream flows. Therefore, this treatment would maintain stream flows within the range of natural variability.
7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and woodlands.	As discussed in #6 above, this project would maintain stream flows within the range of natural variability. Therefore, it would also maintain stream interactions with the floodplain and respective water tables.	This project would maintain stream interactions with the floodplain and respective water tables within the range of natural variability.

ACS Objective	Site/Project Scale Assessment	Watershed Scale Assessment
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.	The proposed treatment is designed to return riparian stands to a more natural density and growth trajectory. Therefore, this treatment would restore plant species composition and structural diversity.	The proposed treatment is designed to return riparian stands to a more natural density and growth trajectory. Therefore, this treatment would restore plant species composition and structural diversity.
9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.	One objective of this project is to restore riparian stand conditions in the proposed treatment areas. Implementation of riparian restoration projects would produce adequate habitat to support riparian-dependent species.	One objective of this project is to restore riparian stand conditions in the proposed treatment areas. Implementation of riparian restoration projects would produce adequate habitat to support riparian-dependent species.

Detailed scale description of the drainages:

1) The **Coon Creek** drainage is roughly 8055 acres in size. The BLM manages approximately 990 acres in this drainage (12 percent). Units proposed for treatment represent 3 percent of the total drainage area, and 22 percent of the BLM-managed lands in the drainage.
2) The **Oldham Creek** drainage is roughly 13,117 acres in size. The BLM manages approximately 2,943 acres in this drainage (22 percent). Units proposed for treatment represent 4 percent of the total drainage area, and 16 percent of the BLM-managed lands in the drainage.
3) The **Cantell-Gilbreath** drainage is roughly 3,750 acres in size; the BLM manages approximately 709 acres in this drainage (19 percent). Units proposed for treatment represent 1 percent of the total drainage area, and 6 percent of the BLM-managed lands in the drainage.
4) The **Gassy Creek** drainage is roughly 6,039 acres in size. The BLM manages approximately 2,000 acres in this drainage (33 percent). Units proposed for treatment represent 7 percent of the total drainage area, and 21 percent of the BLM-managed lands in the drainage.
5) The **French Creek** drainage is roughly 2,988acres in size. The BLM manages approximately 1,048 acres in this drainage (35 percent). Units proposed for treatment represent 0.3 percent of the total drainage area, and 1 percent of the BLM-managed lands in the drainage.
6) The **Idleyld Park** drainage is roughly 4,017 acres in size. The BLM manages approximately 974 acres in this drainage (24 percent). Units proposed for treatment represent 2 percent of the total drainage area, and 7 percent of the BLM-managed lands in the drainage.
7) The **Headwaters Elk Creek** drainage is roughly 3,835 acres in size. The BLM manages approximately 1,683 acres in this drainage (44 percent). Units proposed for treatment represent 2 percent of the total drainage area, and 5 percent of the BLM-managed lands in the drainage.

ACS Summary:

Based upon the information presented above, the proposed action would meet ACS objectives at the site and watershed scale. In addition, based upon the restorative nature of the action, this project would not retard or prevent attainment of ACS objectives; it would speed attainment of these objectives. Therefore, this action is consistent with the ACS and its objectives at both the site and watershed scales.

Appendix E. Botany Summary

SSSP List Date: December 1, 2011 (IM-OR-2012-018)

Those Bureau Sensitive or Bureau Strategic species which are suspected or documented to occur within the Roseburg District BLM area are detailed below.

Bureau Sensitive Species. BLM Districts are responsible to assess and review the effects of a proposed action on *Bureau Sensitive* species. To comply with Bureau policy, Districts may use the following techniques:

a. Evaluation of species-habitat associations and presence of potential habitat.
b. Application of conservation strategies, plans, and other formalized conservation mechanisms.
c. Review of existing survey records, inventories, and spatial data.
d. Utilization of professional research and literature and other technology transfer methods.
e. Use of expertise, both internal and external, that is based on documented, substantiated professional rationale.
f. Complete pre-project survey, monitoring, and inventory for species that are based on technically sound and logistically feasible methods while considering staffing and funding constraints.

When Districts determine that additional conservation measures are necessary, options for conservation include, but are not limited to: modifying a project (e.g. timing, placement, and intensity), using buffers to protect sites, or implementing habitat restoration activities (IM-OR-2003-054).

Strategic Species. If sites are located, collect occurrence data and record in the corporate database.

Table E-1. Federally Listed & Bureau Sensitive Botanical Species.

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Threatened & Endangered Species						
Lupinus sulphureus var. *kincaidii* Kincaid's lupine (T)	**Yes**	**Yes**	No	Surveys performed, not detected.	September, 2014	N/A
Plagiobothrys hirtus Rough popcorn flower (E)	**Yes**	No	No	No habitat present.	N/A	N/A
Sensitive Species						
Bryum calobryoides Beautiful bryum	**Yes**	**Yes**	No	Surveys performed, not detected	September, 2014	N/A
Campylopus schmidii Golden sand moss	**Yes**	No	No	No habitat present.	N/A	N/A
Cephaloziella spinigera Spiny threadwort	**Yes**	No	No	No habitat present	N/A	N/A
Codriophorus depressus Racomitrium moss	**Yes**	No	No	No habitat present.	N/A	N/A
Entosthodon fascicularis Banded cord -moss	**Yes**	**Yes**	No	Surveys performed, not detected.	September, 2014	N/A
Gymnomitrion concinnatum Braided frostwort	**Yes**	No	No	No habitat present.	N/A	N/A
Helodium blandowii Wetland plume moss	**Yes**	No	No	No habitat present.	N/A	N/A
Meesia uliginosa	**Yes**	No	No	No habitat present	N/A	N/A

Species	Within species range?	Habitat Present?	Species Present?	Reason for concern or no concern	Surveys Completed	Mitigation Measures
Meesia moss						
Phymatoceros phymatodes Tuberous hornwort	**Yes**	No	No	No habitat present.	N/A	N/A
Porella bolanderi Bolanders's scalemoss	**Yes**	**Yes**	No	Surveys performed, not detected.	September, 2014	N/A
Schistostega pennata Moss	**Yes**	No	No	No habitat present	N/A	N/A
Tetraphis geniculata Moss	**Yes**	No	No	No habitat present	N/A	N/A
Tomentypnum nitens Tomentypnum moss	**Yes**	No	No	No habitat present	N/A	N/A
Tortula mucronifolia Mucronleaf tortula moss	**Yes**	No	No	No habitat present	N/A	N/A
Trematodon asanoi Moss	**Yes**	No	No	No habitat present.	N/A	N/A
Boletus pulcherrimus Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Bridgeoporus nobilissimus Giant polypore fungus	**Yes**	No	No	No habitat present.	N/A	N/A
Dermocybe humboldtensis Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Helvella crassitunicata Fungus	**Yes**	No	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia californica Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia gregaria Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Phaeocollybia oregonensis Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Pseudorhizina californica Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria amyloidea Fungus	**Yes**	No	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria rubella var. blanda Fungus	**Yes**	No	N/A	Surveys Not Practical. [1]	N/A	N/A
Ramaria spinulosa var. *diminutiva* Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Rhizopogon chamalelotinus Fungus	**Yes**	**Yes**	N/A	Surveys Not Practical. [1]	N/A	N/A
Rhizopogon exiguus Fungus	**Yes**	No	N/A	Surveys Not Practical. [1]	N/A	N/A
Bryoria subcana Lichen	**Yes**	No	No	No habitat present.	N/A	N/A

Calicium adspersum Lichen	**Yes**	No	No	No habitat present.	N/A	N/A
Lobaria linita Lichen	**Yes**	No	No	No habitat present.	N/A	N/A
Pilophorus nigricaulis Lichen	**Yes**	No	No	No habitat present.	N/A	N/A
Stereocaulon spathuliferum Lichen	**Yes**	No	No	No habitat present.	N/A	N/A
Adiantum jordanii California maiden-hair	**Yes**	No	No	No habitat present.	N/A	N/A
Arabis koehleri var. *koehleri* Koehler's rockcress	**Yes**	No	No	No habitat present.	N/A	N/A
Arctostaphylos hispidula Hairy manzanita	**Yes**	No	No	No habitat present.	N/A	N/A
Asplenium septentrionale Grass-fern	**Yes**	No	No	No habitat present.	N/A	N/A
Bensoniella oregana Bensonia	**Yes**	No	No	No habitat present.	N/A	N/A
Calochortus coxii Crinite mariposa-lily	**Yes**	No	No	No habitat present.	N/A	N/A
Calochortus umpquaensis Umpqua mariposa-lily	**Yes**	No	No	No habitat present.	N/A	N/A
Camassia howellii Howell’s camas	**Yes**	No	No	No habitat present.	N/A	N/A
Carex brevicaulis Bristly sedge	**Yes**	No	No	No habitat present.	N/A	N/A
Carex comosa Bristly sedge	**Yes**	No	No	No habitat present.	N/A	N/A
Cicendia quadrangularis Timwort	**Yes**	No	No	No habitat present.	N/A	N/A
Cypripedium fasciculatum Clustered lady slipper	**Yes**	No	No	No habitat present.	N/A	N/A
Delphinium nudicaule Red larkspur	**Yes**	No	No	No habitat present.	N/A	N/A
Epilobium oreganum Oregon willow-herb	**Yes**	No	No	No habitat present.	N/A	N/A
Eschscholzia caespitosa Gold poppy	**Yes**	No	No	No habitat present.	N/A	N/A
Eucephalus vialis Wayside aster	**Yes**	No	No	No habitat present.	N/A	N/A
Frasera umpquaensis *Umpqua swertia*	**Yes**	No	No	No habitat present.	N/A	N/A
Horkelia congesta ssp. *congesta* Shaggy horkelia	**Yes**	No	No	No habitat present.	N/A	N/A
Horkelia tridentata ssp. *tridentate* Three-toothed horkelia	**Yes**	No	No	No habitat present.	N/A	N/A
Iliamna latibracteata California globe-mallow	**Yes**	No	No	No habitat present.	N/A	N/A
Kalmiopsis fragrans Fragrant kalmiopsis	**Yes**	No	No	No habitat present.	N/A	N/A

Lathyrus holochlorus Thin-leaved peavine	**Yes**	No	No	No habitat present.	N/A	N/A
Lewisia leeana Lee's lewisia	**Yes**	No	No	No habitat present.	N/A	N/A
Limnanthes gracilis var. *gracilis* Slender meadow-foam	**Yes**	No	No	No habitat present.	N/A	N/A
Lotus stipularis Stipuled trefoil	**Yes**	No	No	No habitat present.	N/A	N/A
Meconella oregana White fairypoppy	**Yes**	No	No	No habitat present.	N/A	N/A
Pellaea andromedifolia Coffee fern	**Yes**	**Yes**	No	Surveys performed, not detected.	September, 2014	N/A
Perideridia erythrorhiza Red-rooted yampah	**Yes**	No	No	No habitat present.	N/A	N/A
Polystichum californicum California sword-fern	**Yes**	No	No	No habitat present.	N/A	N/A
Romanzoffia thompsonii Thompson's mistmaiden	**Yes**	**Yes**	No	Surveys performed, not detected.	September, 2014	N/A
Schoenoplectus subterminalis Water clubrush	**Yes**	No	No	No habitat present.	N/A	N/A
Scirpus pendulus Drooping rush	**Yes**	No	No	No habitat present.	N/A	N/A
Sisyrinchium hitchcockii Hitchcock's blue-eyed grass	**Yes**	No	No	No habitat present.	N/A	N/A
Utricularia gibba Humped bladderwort	**Yes**	No	No	No habitat present.	N/A	N/A
Utricularia minor Lesser bladderwort	**Yes**	No	No	No habitat present.	N/A	N/A
Wolffia borealis Dotted water-meal	**Yes**	No	No	No habitat present.	N/A	N/A
Wolffia columbiana Columbia water-meal	**Yes**	No	No	No habitat present.	N/A	N/A

[1] Surveys are considered not practical for these species based on the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guideline (Standards and Guidelines, pg. 9).

Table E-2. Bureau Strategic Botanical Species.

Scientific Name	Roseburg Occurrence?	Occurrence in the Project Area?
Bryophytes		
Campylopus subulatus	Documented	None Observed
Diplophyllum plicatum	Suspected	None Observed
Grimmia anomala	Suspected	None Observed
Orthotrichum bolanderi	Suspected	None Observed
Scouleria marginata	Documented	None Observed
Fungi		
Cazia flexiascus	Suspected	Surveys Not Practical. [1]
Choiromyces alveolatus	Suspected	Surveys Not Practical. [1]
Clavariadelphus subfastigiatus	Documented	Surveys Not Practical. [1]
Endogone oregonensis	Documented	Surveys Not Practical. [1]
Glomus pubescens	Suspected	Surveys Not Practical. [1]
Gomphus kauffmanii	Documented	Surveys Not Practical [1]
Gymnomyces monosporus	Documented	Surveys Not Practical. [1]
Hygrophorus albicarneus	Suspected	Surveys Not Practical. [1]
Mycena quinaultensis	Suspected	Surveys Not Practical. [1]
Nolanea verna var. *isodiametrica*	Suspected	Surveys Not Practical. [1]
Otidea smithii	Documented	Surveys Not Practical. [1]
Phaeocollybia dissiliens	Suspected	Surveys Not Practical. [1]
Phaeocollybia pseudofestiva	Suspected	Surveys Not Practical. [1]
Psathyrella quercicola	Suspected	Surveys Not Practical. [1]
Ramaria abietina	Documented	Surveys Not Practical. [1]
Ramaria botrytis var. aurantiiramosa	Suspected	Surveys Not Practical. [1]
Ramaria concolor f. tsugina	Suspected	Surveys Not Practical. [1]
Ramaria conjunctipes var. sparsiramosa	Documented	Surveys Not Practical. [1]
Ramaria coulterae	Suspected	Surveys Not Practical. [1]
Ramaria gelatiniaurantia	Suspected	Surveys Not Practical. [1]
Ramaria largentii	Documented	Surveys Not Practical. [1]

Scientific Name	Roseburg Occurrence?	Occurrence in the Project Area?
Ramaria rubribrunnescens	Suspected	Surveys Not Practical. [1]
Ramaria suecica	Documented	Surveys Not Practical. [1]
Ramaria thiersii	Suspected	Surveys Not Practical. [1]
Rhizopogon brunneiniger	Suspected	Surveys Not Practical. [1]
Rhizopogon clavitisporus	Suspected	Surveys Not Practical. [1]
Rhizopogon flavofibrillosus	Documented	Surveys Not Practical. [1]
Rhizopogon semireticulatus	Documented	Surveys Not Practical. [1]
Rhizopogon variabilisporus	Suspected	Surveys Not Practical. [1]
Sarcodon fuscoindicus	Documented	Surveys Not Practical. [1]
Lichens		
Buellia oidalea	Suspected	None Observed
Calicium quercinum	Suspected	None Observed
Chaenotheca subroscida	Documented	None Observed
Collema undulatum var. granulosum	Suspected	None Observed
Hypogymnia duplicata	Suspected	None Observed
Lecanora pringlei	Suspected	None Observed
Schaereria dolodes (Lecidea dolodes)	Documented	None Observed
Leptogium platynum	Documented	None Observed
Leptogium teretiusculum	Documented	None Observed
Peltula euploca	Suspected	None Observed
Schaereria dolodes	Documented	None Observed
Sclerophora peronella	Documented	None Observed
Umbilicaria hirsute	Suspected	None Observed
Vezdaea stipitata	Documented	None Observed

[1] Surveys are considered not practical for these species based on the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guideline (Standards and Guidelines, pg. 9).

Appendix F. Live Vegetation Development Analytical Methodology

Analytical Question:
How would treatments alter stand dynamics and what effects would they have on the stand structure and composition of selected live vegetation components (i.e. trees and shrubs)?

Analytical Assumptions:
The BLM made some analytical assumptions to complete its analysis. Key assumptions made are:

- Stand exam data adequately represents the current unit conditions or can be updated by simulation to current conditions.
- Computer simulations beyond the range of the base data on which the Organon model was built are considered adequate for characterizing differences between alternatives.
- Simulations for 100 years into the future are adequate to distinguish between alternative outcomes.
- Unmerchantable trees (<6 inches diameter breast height) are killed or severely damaged as a result of harvest in proportion to the amount of timber volume removed (Newton and Cole 2006).
- Stand development outcomes are based on a single harvest entry.
- One average thinning stand per land use allocation is adequate to evaluate 100-year outcome for thinnings. (GFMA – Unit17B and C/D – Unit 9C) An average stand was determined by the stand that fit the simple average in trees per acre, basal area, volume and relative density.

Live Tree Analytical Methodology:
The BLM analyzes impacts to live vegetation by examining site-specific data, scientific literature, and the outputs from computer simulations.

The methodology used data from site-specific stand inventories and the Organon growth simulator model to depict current stand conditions (e.g. trees per acre, diameters, volumes, species, and canopy cover).

- **Stand Age**:
  Stand boundaries were determined from the Forest Operation Inventory (FOI). Stand ages were derived from stand exam information collected within the FOI boundaries. Breast height ages were sampled on dominant trees. Typically, one tree per four acres was sampled. Total age was calculated by ORGANON using the breast height age and adjusting it to calculate how long that tree took to get to breast height (4.5 feet from the ground) based on site productivity class. A simple average of the sample trees determined the stand age.

  Older remnant trees may be present but are not the numerically predominant stand components and would generally be targeted for retention. Since thinning would focus on removal of intermediate and suppressed canopy layers, it is possible that suppressed trees designated for cutting may be older than the prevailing stand age.

- **Organon Model Description**:

  Organon is an individual-tree, distance-independent model developed by Oregon State University from data collected in western Oregon forest stands (Hann 2009). The architecture of the model makes it applicable for simulations of traditional and non-traditional silviculture (Hann 1998).

  The southwest Oregon variant (SWO-Organon) was selected as the most appropriate for modeling the Calapooya stand types, based on the stands' geographic location, species composition, and site productivity.

  Simulations of stand growth extend beyond the Organon model's range of data but are within the range considered reasonable for evaluation of stand development trajectories (Tappeiner *et al.* 1997, Andrews *et al.* 2005). The timing of harvests and other silvicultural treatments occur well within the range of the model's validated growth projection capabilities.

  Organon can adequately simulate *regular* tree mortality caused by inter-tree competition. However, it underestimates tree mortality from causes other than inter-tree competition, such as insects, disease, windthrow, and stem breakage (Tappeiner *et al.* 1997). This type of mortality is *irregular*, or episodic in nature, and it is inherently difficult to predict the exact time period it will occur (Franklin *et al.* 1987). The Organon mortality equations predict that the risk of dying is very low for trees larger than 20 inches in diameter or with crown ratios greater than 70 percent (Hann and Wang 1990). For mature stands, mortality from inter-tree competition becomes less significant as stands age and mortality from other factors becomes more substantial (Franklin *et al.* 2002).

Snags and Down Wood Analytical Methodology

Analytical Question:
How would treatments alter stand dynamics and what effects would that have on the production of dead wood (i.e. snags and down wood)?

Analytical Assumptions:
The BLM made some analytical assumptions to complete its analysis. Key assumptions made are:

- Stand exam data adequately represents the current unit conditions or can be updated by simulation to current conditions.
- Computer growth model simulations beyond the range of the base data on which the model was built are considered adequate for characterizing differences between alternatives.
- Simulations for 100 years into the future are adequate to distinguish between alternative outcomes.
- An example stand is adequate to describe current conditions when limited data is available. Only one stand has coarse wood debris data available to evaluate (33A). This one stand is adequate to show current dead tree data in the form of snags and coarse woody debris.
- One average VDT stand per land use allocation is adequate to evaluate 100-year outcome for the mortality analysis. . (GFMA – Unit17B and C/D – Unit 9C)

Appendix G – Calculation Assumptions for Carbon Sequestration and Release

This appendix describes the analytical methodology used for calculating carbon storage and release associated with timber management, provides the assumptions used, and describes how calculations were made as displayed in table C-1.

Analysis of Carbon Storage

The BLM did not analyze carbon storage or emissions specifically for the variable density thinning portion of this project because there is sufficient information from analysis of our recent commercial thinning projects[1] in the Swiftwater Field Office for the Decision Maker to make an informed decision between alternatives. Analysis of quantitative carbon storage and emissions for the thinning portion of the Calapooya project would not provide any additional information needed for a reasoned choice among alternatives for this project.

The following is a summary of information from the four recent analyses[2].

- Range of treated acres analyzed in the projects: 244 to 1504 acres.
- Range analyzed for carbon storage in harvested wood: 47,448 to 113,827 tonnes. (Current condition, standing live trees)
- Range analyzed for total carbon emissions in the 50 year period following harvest: 2,479 to 6,079 tonnes.
- Range of carbon storage in the untreated project areas at 50 years: 171,696 to 528,760 tonnes.
- Range of carbon storage in treated project areas plus carbon in landfills and wood products at 50 years: 148,902 – 408,834 tonnes.

The analysis of each of these four projects shows that:

- The carbon emissions attributable to the projects, both individually and cumulatively, are of such small magnitude that it is unlikely to be detectable at any scale (global, continental or regional) and thus would not affect the results of any models now being used to predict climate change.
- Total carbon storage for the *No Action Alternative* of each project is higher than the total carbon storage for all *Action Alternatives* throughout the 50 year analysis period which is consistent with modeling by Clark *et al.* (2011, p. 50).

[1] Little River MMX EA, Elk Wings EA, Mud Den EA and Johnson Cleghorn EA.

[2] For each of the four projects, carbon analysis was based on more area than was actually treated and more wood volume than was actually harvested. Harvested wood volume is reported here as tonnes of carbon. Carbon emitted is the sum of carbon in harvested wood that would be released in the 50-year analysis period, plus the carbon in diesel fuel used for harvest operations and carbon released by burning piles of logging slash and debris.

The thinning portion of the Calapooya project falls within the range covered by the projects analyzed in the aforementioned carbon analyses in all particulars. Therefore, analysis of effects on carbon for the Calapooya project would be expected to have similar results resulting in a negligible impact on carbon emissions and storage at the regional, continental and global scales.

The result of these analyses was used in combination with the VRH portion of the project. Proposed VRH units were modeled separately using site specific conditions. Modeled results for the VRH treatment are displayed in Table C-1.

A variety of scientific literature is available describing quantitative measures (e.g. decay rates of slash, fire consumption of slash, fuel use and efficiency, haul distances, etc.) and other factors that may be used in calculating carbon storage with the potential to influence the outcome of an analysis. The methodology described here provides a consistent means for comparison of the relative effects of alternatives considered. It is not intended to express the absolute amount of carbon that would be stored or released. The analysis models carbon stored in the forest and wood products, and carbon released into the atmosphere in association with timber harvest. The analysis divides carbon storage/release into six pools:

- Standing, Live Trees
- Other Than Live Trees
- Wood Products
- Slash Burning
- Logging Slash
- Fossil Fuels

The total estimated carbon in each of the six pools was summed for analytical interval to derive the Net Carbon Balance by alternative over time.

Carbon Storage in Standing, Live Trees

1. Current and future standing, live tree carbon was derived using the outputs from the ORGANON model (Hann *et al.*, 2005) for standing tree volume for each alternative. VRH analysis includes the growth of trees established by natural and artificial regeneration.

2. Standing tree volumes measured in board feet per acre were converted to cubic feet using a conversion factor of 6.00 board feet/cubic foot (2008 FEIS Appendices-28).

3. Cubic foot tree volumes per acre were converted to pounds of biomass, assumed to be Douglas-fir in this analysis, using a factor of 35 pounds of biomass/cubic foot (2008 FEIS Appendices-28, Table C-1).

4. Pounds of biomass per acre for entire trees (including branches, bark, and roots) were derived from tree volumes using an expansion factor of 1.85 (2008 FEIS Appendices-28).

5. The expanded biomass value was converted to pounds of carbon per acre by multiplying by 0.50 (USDI/BLM 2008A, Appendices-28).

6. Pounds of carbon per acre in whole trees were converted to tonnes of carbon by dividing by 2,200 (2008 FEIS Appendices-28).

7. Total carbon within individual units was determined by multiplying tonnes of carbon per acre in whole trees by unit acres.

8. Tonnes of carbon in whole trees for the entire project were derived by summing the tonnes of carbon in whole trees for each unit, and represented as "Standing, Live Trees".

Carbon Storage in Forests Other than Live Trees

"Other than Live Trees" is the portion of the carbon pool consisting of shrubs, brush, snags, woody debris, and organic carbon in the soil.

1. Carbon in "other than live trees" was derived by multiplying unit acreage by tonnes of carbon per acre by structural stage, as expressed in Table G-1 (adapted from Table C-2, 2008 FEIS Appendices-29). Stands were aged based on time intervals used in the analysis (i.e. 10, 20, and 50 years after the current condition) and the corresponding tonnes of carbon per acre used to calculate "other than live tree carbon." A weighted average age was used for portions of stands retained in aggregates in the VRH prescription. Stand age for harvested areas with dispersed retention was reset to 0 at the time of harvest.

2. The total tonnes of carbon, represented as "Other Than Live Trees", were derived by summing the tonnes of carbon within each unit.

Table G-1. Forest Ecosystem Carbon (Excluding Live Trees) By Structural Stage*

Age of Stand(s)	**Structural Stage**	**Tonnes of Carbon per Acre**
5-34 years	Stand Establishment	67.8
35-94 years	Young	70.3
95-124 years	Mature	88.2
$\geq$ 125 years	Developed Structurally Complex	94.8

* adapted from USDI/BLM 2008AA, Appendices-29.

Carbon Storage in Wood Products

"Wood Products" represents the portion of the carbon pool converted from standing, live trees into saw logs or pulpwood. There would be no carbon pool of wood products under No Action.

1. Tonnes of carbon in whole trees were derived in Steps 1-7 under "Standing, Live Trees" for each time interval expressed in this analysis. The difference between the "current condition" and "at harvest time" would be the tonnes of carbon in whole trees harvested.

2. Tonnes of carbon in whole trees harvested per unit were summed to provide the project total.

3. Tonnes of carbon in whole trees harvested were converted to tonnes of carbon in saw logs by dividing by 1.85 (2008 FEIS Appendices-28). *Note:* this reversed the calculation that expanded biomass of harvested logs into the biomass of whole trees performed previously (Step 4 of "Standing, Live Trees").

4. At harvest, 13.5 percent of saw log carbon would immediately be released (Smith *et al.* 2006). Remaining tonnes of carbon held in saw logs were then decayed over time using the values in Table F-2 (adapted from the 2008 FEIS Appendices-30, and Smith *et al.* 2006).

5. Tonnes of carbon held in pulpwood (e.g. chips) were derived by multiplying tonnes of carbon in saw logs (derived in Step 3 above) by five percent (2008 FEIS Appendices-30). *Note*: Pulpwood tonnage is five percent *in addition to* the saw logs not five percent *of* the saw logs.

6. At harvest, 14.8 percent of pulpwood carbon would immediately be released (Smith *et al.* 2006). Tonnes of carbon held in pulpwood were then decayed over time using the values in Table F-2 (adapted from the 2008 FEIS Appendices-30, and Smith *et al.* 2006).

7. The sum of tonnes of carbon immediately released from saw logs (Step 4 above) and pulpwood (Step 6 above) represents the total amount of carbon released by "Wood Products" at harvest time. The sum of tonnes of carbon held in saw logs (Step 4 above) and pulpwood (Step 6 above) at each time interval represents carbon stored in "Wood Products".

Table G-2. Fraction of Carbon Remaining or Captured as an Alternative Energy Source*.

Time Interval	Saw Logs	Pulpwood
Harvest Time (0 years)	0.865	0.852
+10 years	0.796	0.730
+20 years	0.761	0.691
+50 years	0.702	0.655

*These fractions include; wood products in use, wood products in the landfill, and wood products emitted as energy in lieu of fossil fuels (adapted from USDI/BLM 2008A, Appendices-30 and Smith *et al*. 2006)

Carbon Release in Slash Burning

"Slash Burning" represents the pool of carbon released by prescribed burning. There would be no carbon pool of slash burning under No Action.

1. The amount of slash burned in landing piles for uniform thinning was calculated as two tonnes of biomass per acre, derived by averaging slash burned under similar conditions in recently implemented sales. Total tonnes to be burned was calculated by multiplying the number of acres to be treated by two.

2. A consumption rate of 90 percent was assumed for pile burning would be consumed (K.Kosel, pers. comm., 2009). Tonnes consumed were derived by multiplying the tonnes per acre by 0.90.

3. Tonnes consumed were converted to tonnes of carbon released using a conversion factor of 0.50 tonnes of biomass/tonne of carbon. An average of 0.9 tonnes of carbon would be released per acre of thinning unit scheduled for piling and burning.

4. The release of carbon from pile burning in areas treated by regeneration harvest was calculated the same as areas treated by thinning except that 4.0 tonnes per acre was used as a constant. Total carbon released per acre of regeneration treatment was 1.8 tonnes.

5. The amount of slash burned by broadcast burning was calculated by averaging the estimate amount slash loading and consumption by using the Photo Series Post-harvest (Maxwell and Ward 1976). The average used was 15.2 tonnes of slash. These averages were multiplied by the treatment acres proposed for broadcast burning to calculate the total amount of carbon released from broadcast burning

6. The total amount of carbon released from prescribe burning was calculated by adding up the total amount of carbon released from pile burning in regeneration treatment areas, pile burning in thinning treatment areas, and broadcast burning of regeneration treatment areas proposed for broadcast burning.

Carbon Storage in Logging Slash

"Logging Slash" is the portion of the carbon pool held in leaves and needles, twigs and branches, limbs, stumps, and roots of harvested trees that would remain on site post-harvest, not consumed by prescribed burning. There would be no "logging slash" carbon pool under No Action.

1. Tonnes of logging slash remaining on-site was calculated by subtracting tonnes of carbon immediately released from wood products (derived in Step 7 of "Wood Products"), stored in wood products at harvest time (derived in Step 7 of "Wood Products"), and released from slash burning from the total tonnes of carbon in whole trees that would be harvested (derived in Step 2 under "Wood Products").

2. The tonnes of logging slash on-site were then multiplied by the fraction of Douglas-fir slash remaining at each time step as shown in Table F-3 (based on Janisch *et al.* 2005). This represents the amount of carbon stored in "Logging Slash" as it decayed and released carbon over time.

Table G-3. Decay Rates of Carbon from Douglas-fir Slash*.

Time Interval	Fraction of Carbon Remaining in Douglas-fir Slash
Harvest Time (0 years)	1.000
+10 years	0.852
+20 years	0.726
+50 years	0.449

* based on Janisch *et al.* 2005.

Carbon Release in Fossil Fuels

The carbon pool of "Fossil Fuels" represents the amount of carbon that would be released by consumption of gasoline and diesel fuel used by; road construction and renovation, timber felling, timber yarding, and log hauling. There would be no "fossil Fuels" carbon pool under No Action.

1. Fuel consumption associated with harvest operations (i.e. timber felling and yarding) was estimated based on production rates and fuel efficiencies from Table F-4, and an 8.5 hour work day.

2. This analysis assumed an average log-truck load of 4,500 BF (based on experience of BLM Contract Administrators and Cruiser/Appraisers), a fuel efficiency of 6 miles per gallon, and 60-mile round trip.

3. It was assumed that 588 gallons of diesel would be consumed per mile of road constructed, and 73 gallons per mile of road renovated (Loeffler *et al*., 2009)

4. It was assumed that for every station (100 ft.) of surfaced road constructed, 57.5 yards of rock would be used (USDI/BLM 1970). It was also assumed that a truck would hold 10 yards and the average miles per load would be 60. Fuel consumption was assumed to be one gallon for every six miles travelled.

5. Gallons of fuel consumed by harvest operations (derived in Step 1), log hauling (derived in Step 2), road construction and renovation (derived in Step 3), and road rocking (derived in step 4) were summed to provide the total fuel consumption for the project.

6. Total gallons of fuel consumed were converted to tonnes of carbon released using the following conversion factors; 1 gallon of gasoline is equal to 19.4 pounds of CO_2, 1 gallon of diesel is equal to 22.2 pounds of CO_2, 1 pound of carbon is equivalent to 3.67 pounds of CO_2 (U.S. EPA, 2005). The total amount of carbon that would be released by fuel consumption is shown as "Fossil Fuels".

Table G-4. Fossil Fuel Consumption during Harvest Operations.

Equipment	Production Rate[a] (acres/day)	Fuel Efficiency[b] (gallons/hour)
Chainsaw (gasoline)	0.4	.2
Motorized Carriage (gasoline)	1	.4
Cable/Skyline Yarder (diesel)	1	6.1
Loader (diesel)	1	4.5
rubber tire skidder (diesel)	2	4.8
tracked tire skidder (diesel)	2	3.6
Harvester (diesel)	3	4.7
Forwarder (diesel)	3	4.3

[a] based on experience of BLM Contract Administrators and Crusier/Appraisers.
[b] based on World Forestry Institute (1997).

Appendix H. Map Packet

List of Maps:

Figure 1. Calapooya Creek Harvest Plan Vicinity Map

Legend

- Calapooya Creek - Good Boyd Units
- Calapooya Creek - Green Gas Units
- Major Streams
- BLM Administered Lands
- Watershed Boundary - HUC10
- Roads

Date: 3/10/2015

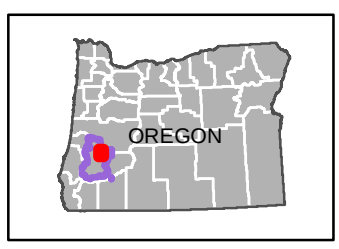


Figure 2. Green Gas

Proposed Units and Roads

R04W

R03W

T25S

T26S

25-3-7H

25-3-17B

25-3-17D

25-3-19B

25-3-29H

25-3-29G

25-3-33A

25-4-23A

25-4-25A

DC39

Spur GG a

Spur GG b

Spur GG c

Spur GG d

Spur GG e

Spur GG f

Spur GG g

Spur GG h

Pellant Creek

Pine Tree Creek

Pike Creek

Bloome Creek

Style Creek

Nomis Creek

Markham Creek

Gassy Creek

Kelly Creek

McConnah Creek

Hunting Creek

Bradley Creek

Cooper Creek

French Creek

Legend

Green Gas Units

- Cable Yarding
- Ground-based Yarding
- BLM Administered Lands
- Green Gas Riparian Reserve
- Road Construction
- Road Renovation
- Haul Route
- Roads
- Streams

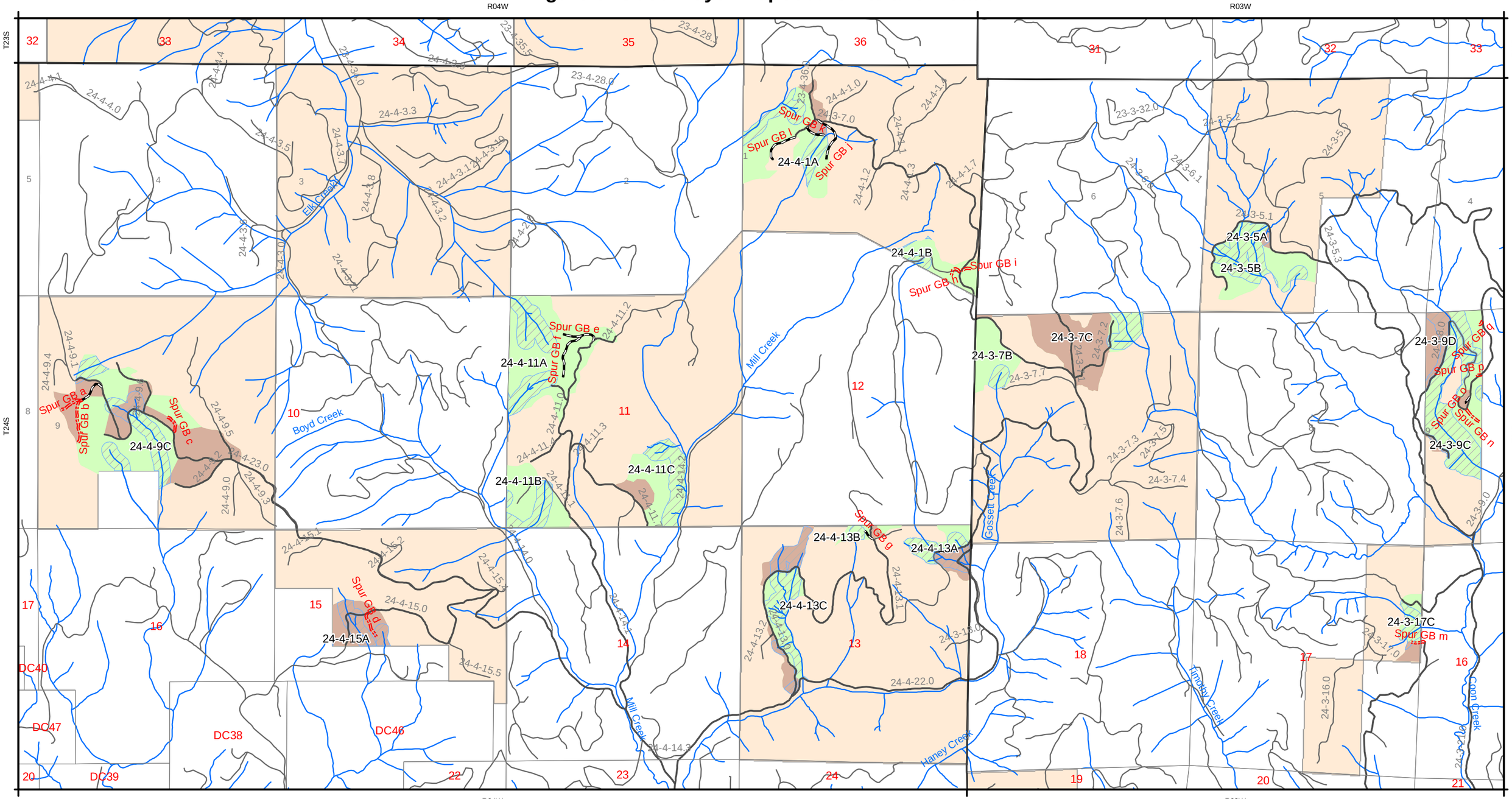
0 0.4 0.8 1.2 1.6 Miles

N W E S

Date: 3/10/2015

OREGON

Figure 3. Good Boyd Proposed Units and Roads



Legend

Good Boyd Units

- Cable Yarding
- Ground-based Yarding
- BLM Administered Lands
- Good Boyd Riparian Reserve
- Road Construction
- Road Renovation
- Haul Route
- Roads
- Streams

0 0.75 1.5 2.25 3 Miles

N W E S

Date: 3/10/2015

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

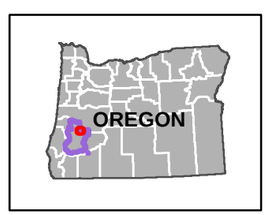
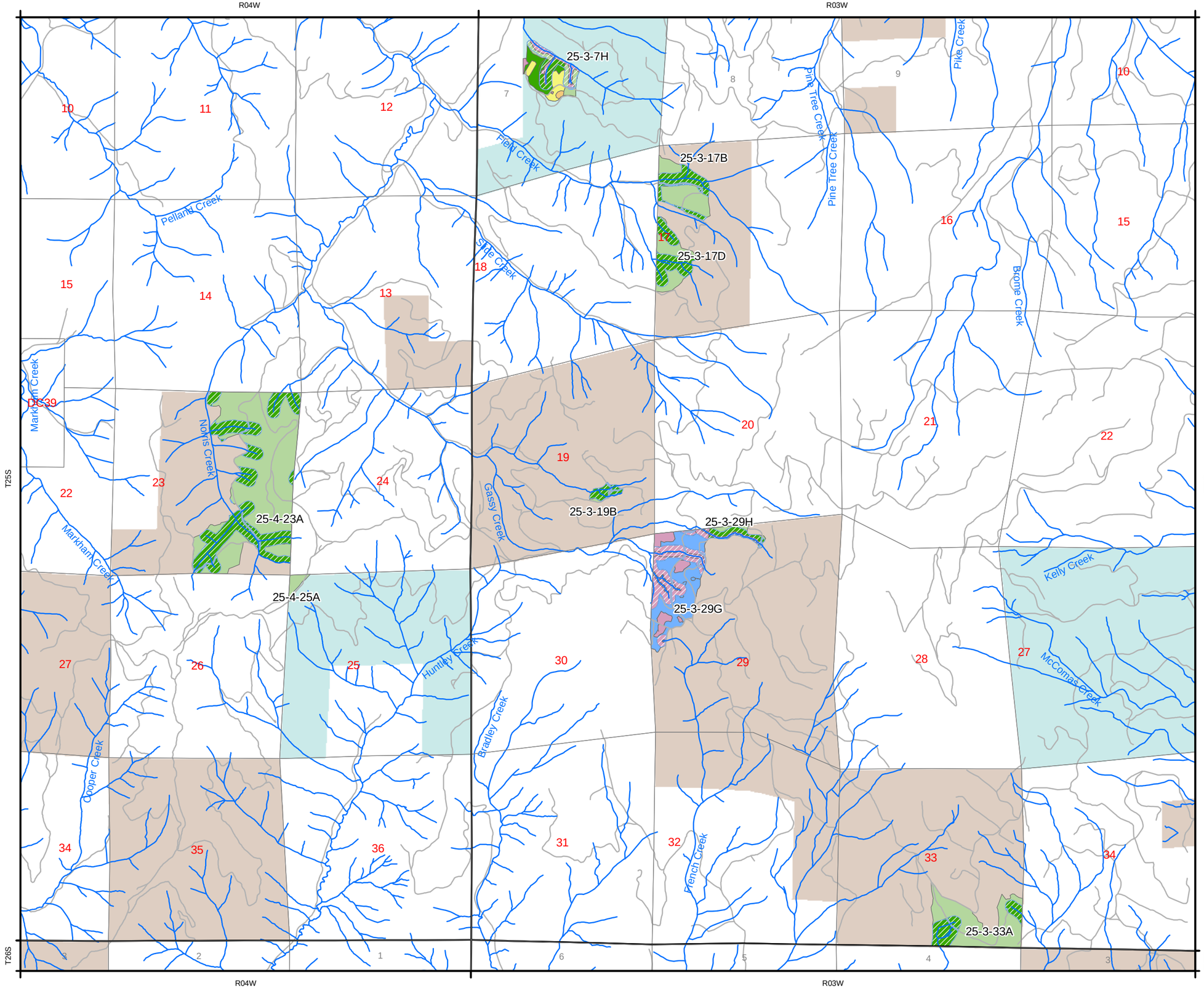


Figure 4. Green Gas

Proposed Silvicultural Prescription



Legend

Silvicultural Prescription

- Gaps
- Heavy Thinning
- Light Thinning
- Medium Thinning
- Dispersed Retention
- Aggregate Retention/Skips
- Streams
- Riparian Reserve
- Roads

Land Use Allocations

- Connectivity
- General Forest Management Area

0 0.4 0.8 1.2 1.6 Miles

N W E S

Date: 3/10/2015

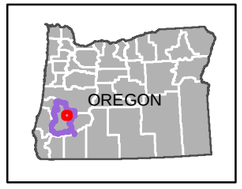
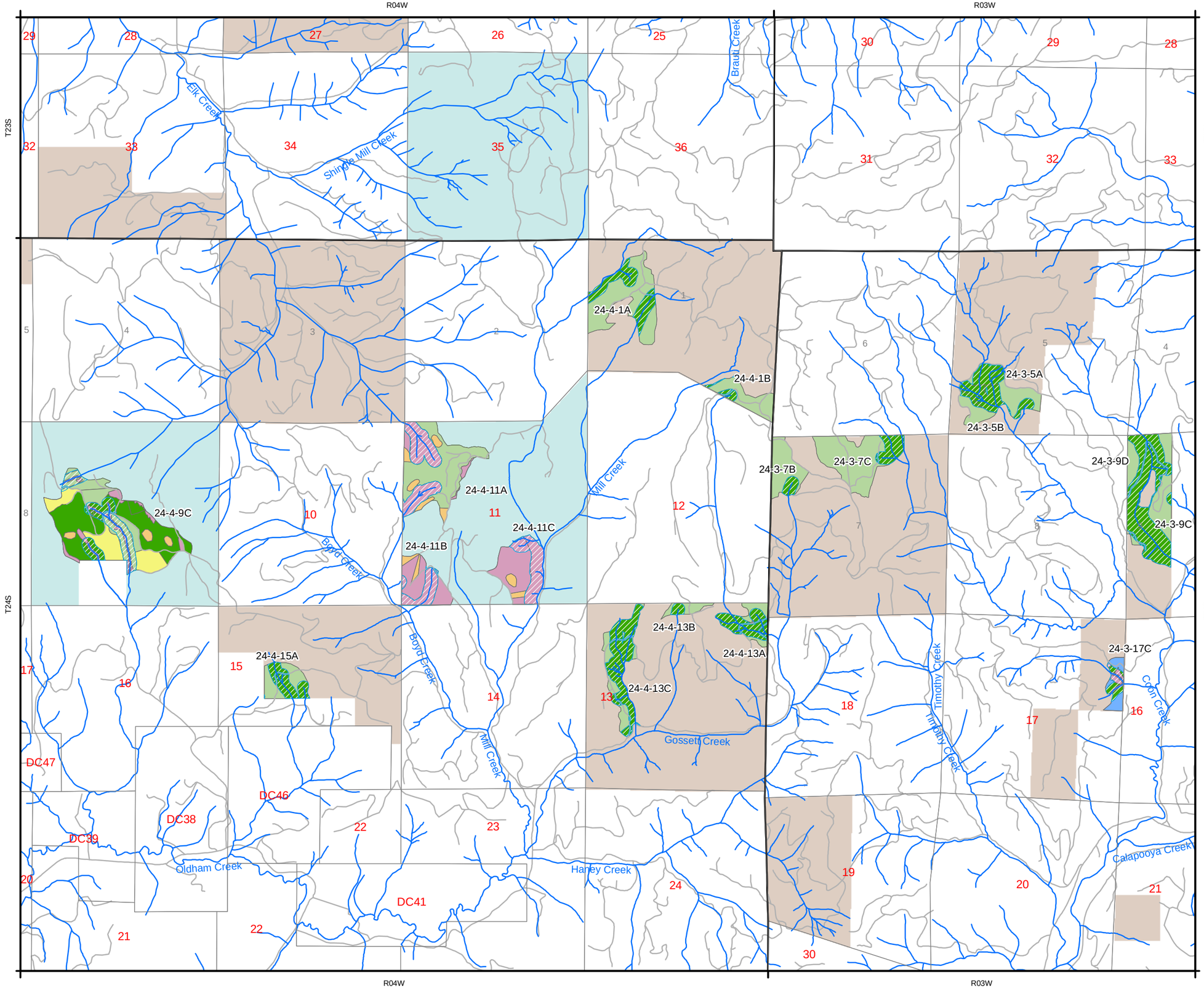


Figure 5. Good Boyd

Proposed Silvicultural Prescription



Legend

Silvicultural Prescription

- Gaps
- Heavy Thinning
- Light Thinning
- Medium Thinning
- Dispersed Retention
- Aggregate Retention/Skips
- Streams
- Riparian Reserve
- Roads

Land Use Allocations

- Connectivity
- General Forest Management Area

0 0.4 0.8 1.2 1.6 Miles

N W E S

Date: 3/10/2015

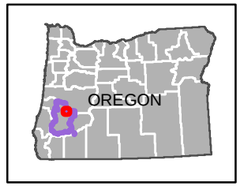
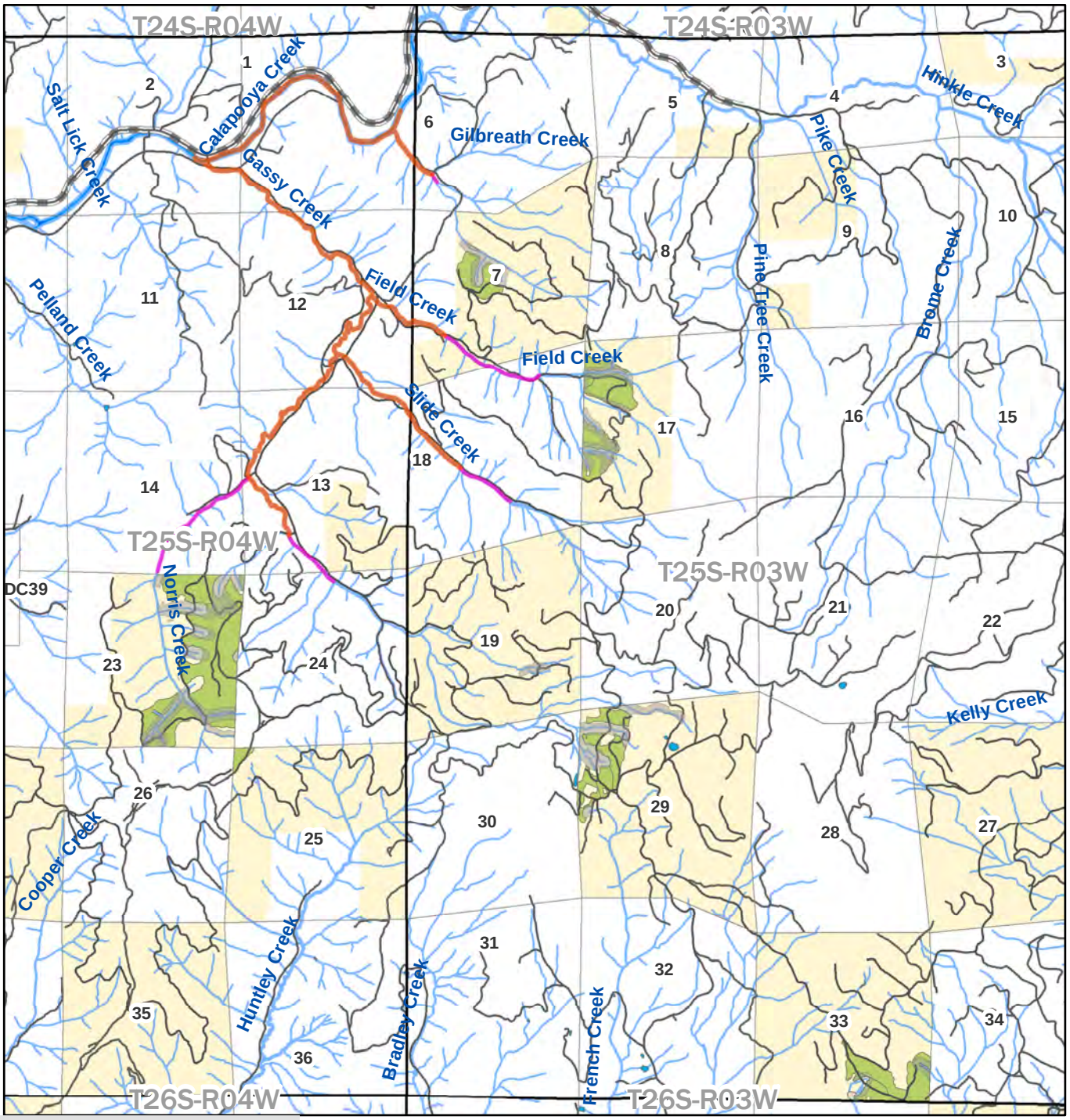


Figure 6: Green Gas
Aquatic Habitat Analysis Area and Fish Presence Map



Legend

- Coho Critifcal Habitat
- Steelhead & Cutthroat Trout
- Riparian Reserves
- Green Gas Units
- BLM Ownership

N
W E
S

0 0.5 1 1.5 2
Miles

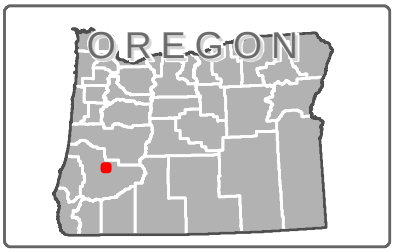


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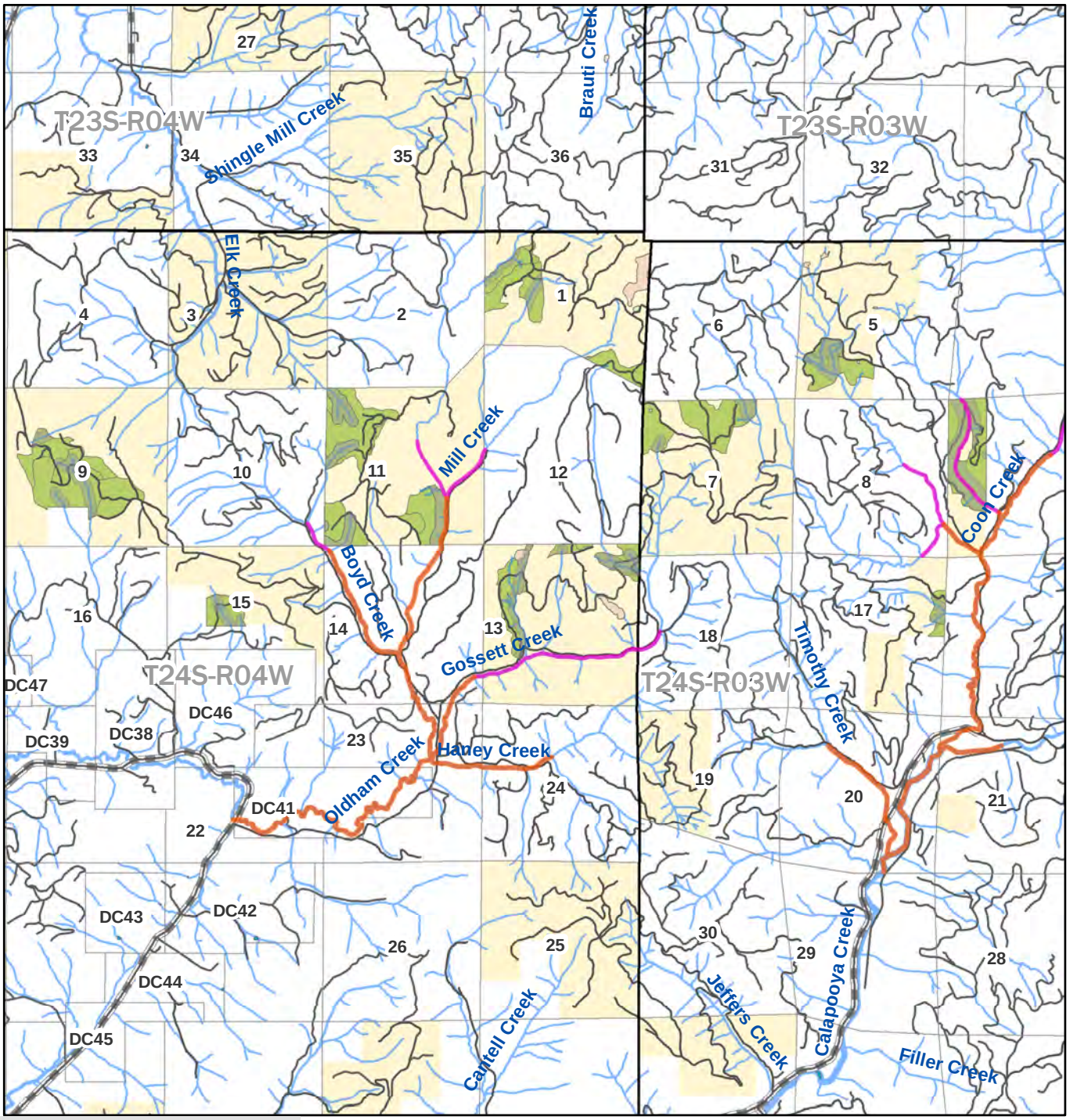
Figure 7: Good Boyd
Aquatic Habitat Analysis Area and Fish Presence Map



Legend

- Coho Critifcal Habitat
- Steelhead & Cutthroat Trout
- Riparian Reserves
- Good Boyd units
- BLM Ownership

N
W E
S

0 0.5 1 1.5 2
Miles

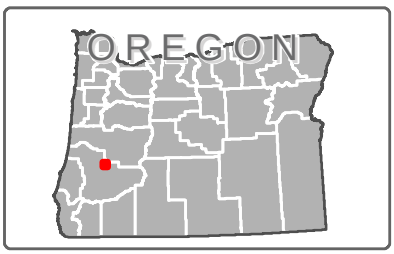


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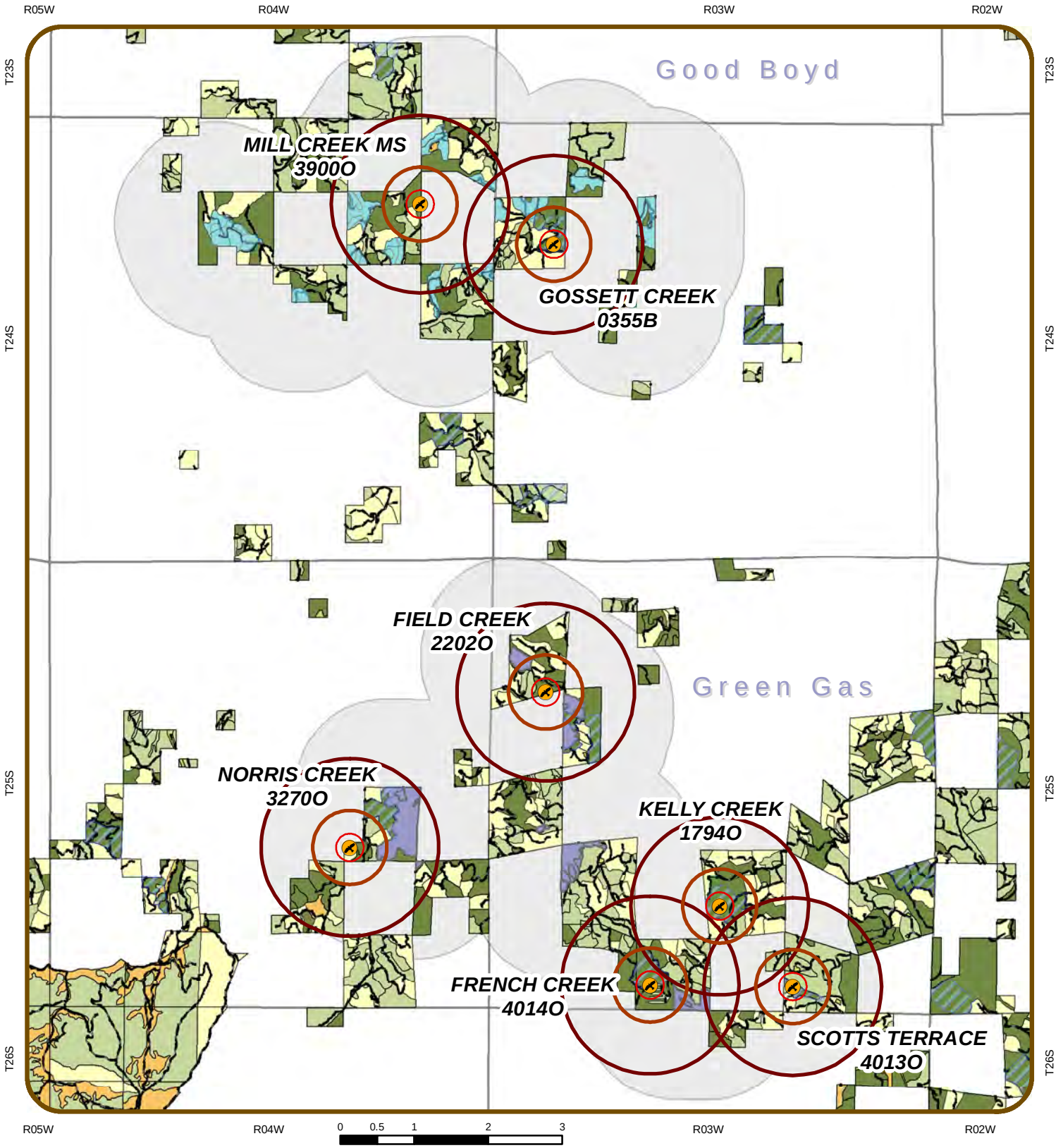
Figure 8. NORTHERN SPOTTED OWL
Activity Centers, Analytical Spatial Scales, and Habitat



Legend

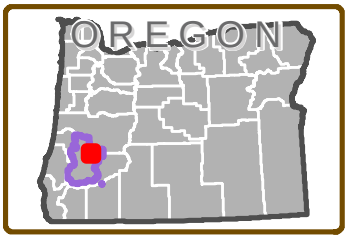
- NSO Activity Center
- NSO Nest Patch (300 meters)
- NSO Core Area (0.5 miles)
- NSO Home Range (1.2 miles)
- NSO Known Owl Activity Center (KOAC)
- NSO Analysis Area

Roseburg District Habitat

NSO Habitat

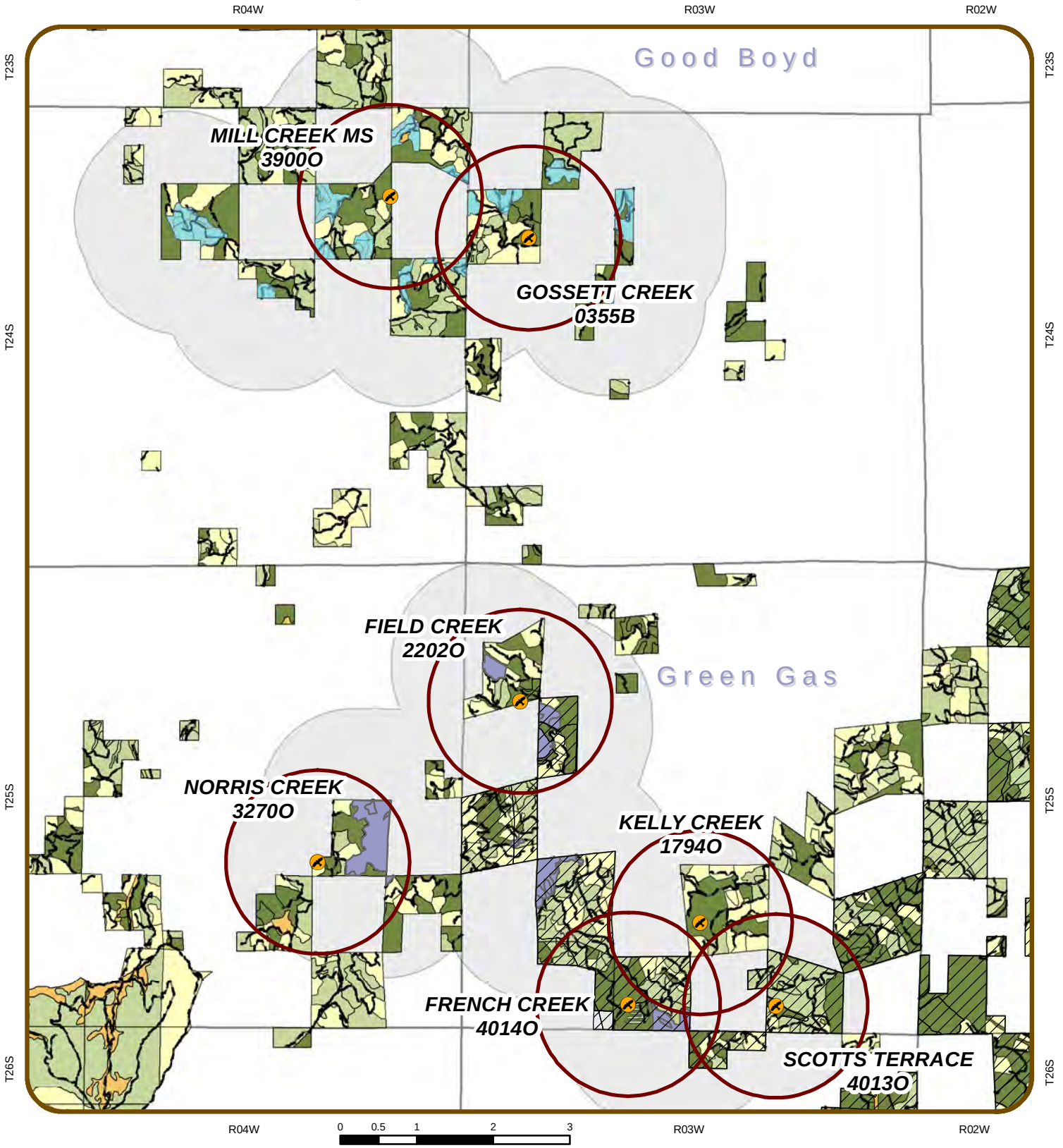
- Non-capable - Road
- Non-capable
- Capable
- Dispersal
- NRF

- Green Gas Units
- Good Boyd Units
- Township/Range



Date: 3/3/2015

Figure 9. NORTHERN SPOTTED OWL Designated Critical Habitat



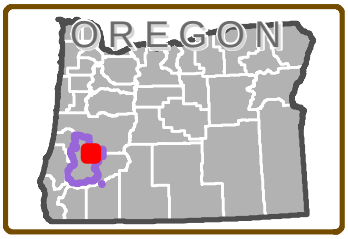
Legend

- NSO Activity Center
- NSO Home Range (1.2 miles)
- NSO Analysis Area
- NSO Critical Habitat (2012) Subunit WCS -6

Roseburg District Habitat

NSO Habitat

- Non-capable - Road
- Non-capable
- Capable
- Dispersal
- NRF
- Green Gas Units
- Good Boyd Units
- Township/Range



Date: 3/3/2015

Figure 10. NORTHERN SPOTTED OWL - Cumulative Effects
Gossett Creek & Mill Creek MS sites

R04W 0 0.15 0.3 0.6 0.9 Miles R03W

Legend

- NSO Activity Centers
- NSO Nest Patch (300 meters)
- NSO Core Area (0.5 miles)
- NSO Home Range (1.2 miles)
- Township/Range
- Section

Good Boyd Units - Harvest Type

- SKIP
- THIN
- VRH

Back In Black Units

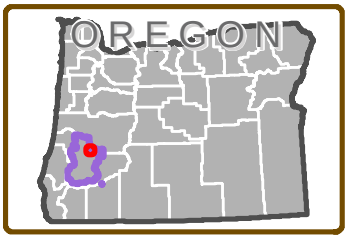
- Regeneration Harvest
- Riparian Reserve

Roseburg District Habitat

NSO Habitat

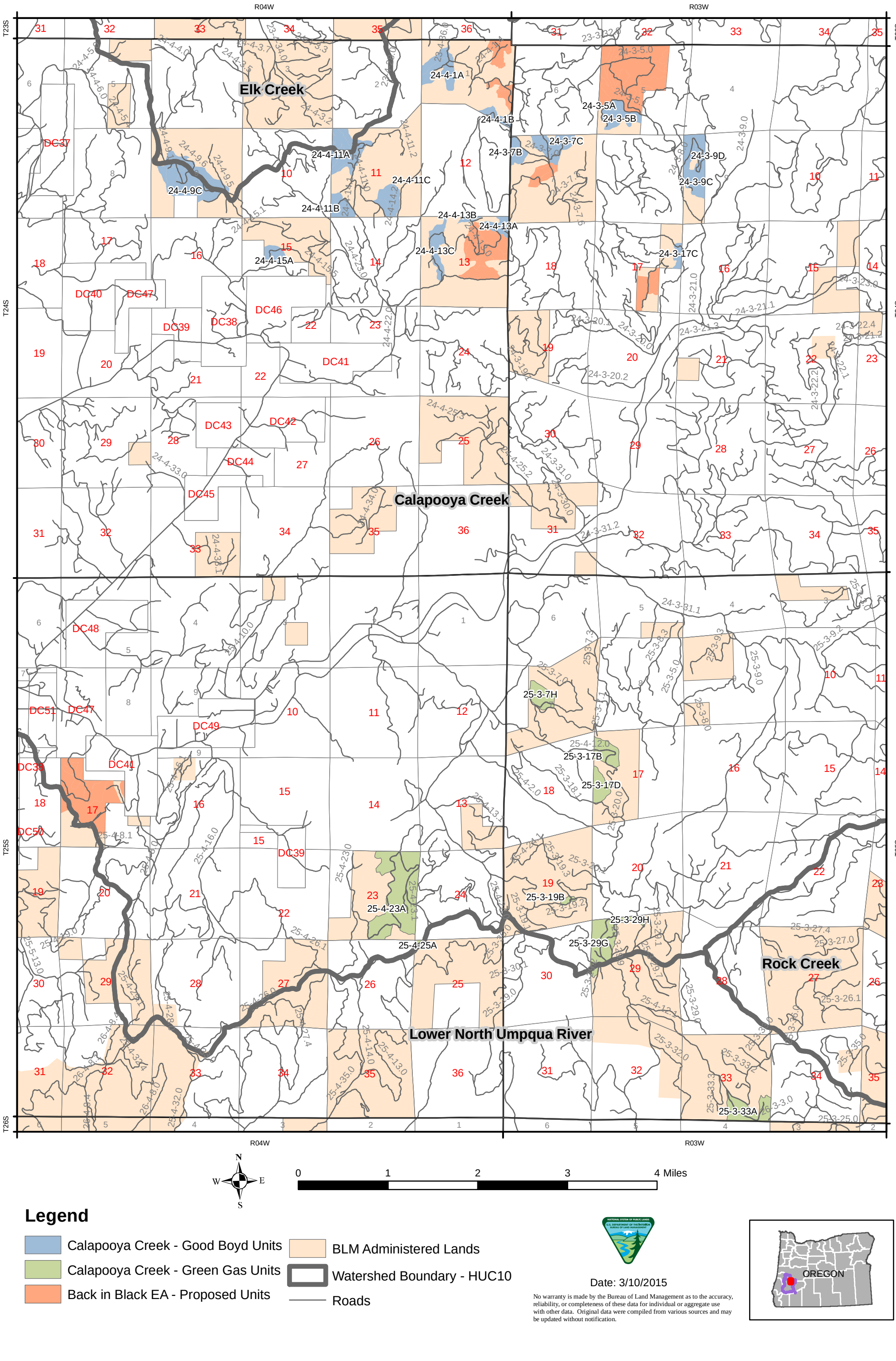
- Non-capable - Road
- Non-capable
- Capable
- Dispersal
- NRF

N W E S



Date: 3/3/2015

Figure 11. Calapooya Creek Harvest Plan and Back in Black Vicinity Map



Legend

- Calapooya Creek - Good Boyd Units
- Calapooya Creek - Green Gas Units
- Back in Black EA - Proposed Units
- BLM Administered Lands
- Watershed Boundary - HUC10
- Roads

Date: 3/10/2015