BLM

Grants Pass Resource Area

Environmental Assessment
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Cold Elk Forest Management Project

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Chapter 1 Introduction

1.1 Document Structure

The Grants Pass Resource Area (GPRA) has prepared an Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EA discloses the direct, indirect and cumulative impacts that may result from the action alternatives. The EA provides the decision maker, the Grants Pass Field Manager, with information to aid in the decision making process. The document is organized into four chapters and an appendix:

- Chapter 1: Purpose & Need: This section includes information on the location of the project, the purpose and need for the project, and the BLM's proposal for achieving the purpose and need. This section includes details on how the BLM informed the public of the proposal and provides a synopsis of the issues raised.

- Chapter 2: Alternatives: This section provides a description of the action alternatives for achieving the stated purpose and need. Alternatives were developed in light of substantive issues raised by the GPRA interdisciplinary team, the public, and other agencies. Incorporated in this section are project design features (PDFs) that avoid or reduce impacts to resources. Alternatives considered but not analyzed in detail are also presented in this section.

- Chapter 3: Affected Environment and Environmental Effects: This section describes the environmental effects of implementing any of the alternatives. A description of the existing conditions for resources is provided in sub-sections. Effects of the alternatives are then described based on what is disclosed in the No Action Alternative 1 and in the Proposed Action Alternative 2.

- Chapter 4: Consultation and Coordination: This section provides a list of the resource specialists that prepared the EA analysis, and information on consultation efforts with Tribal governments and regulatory agencies.

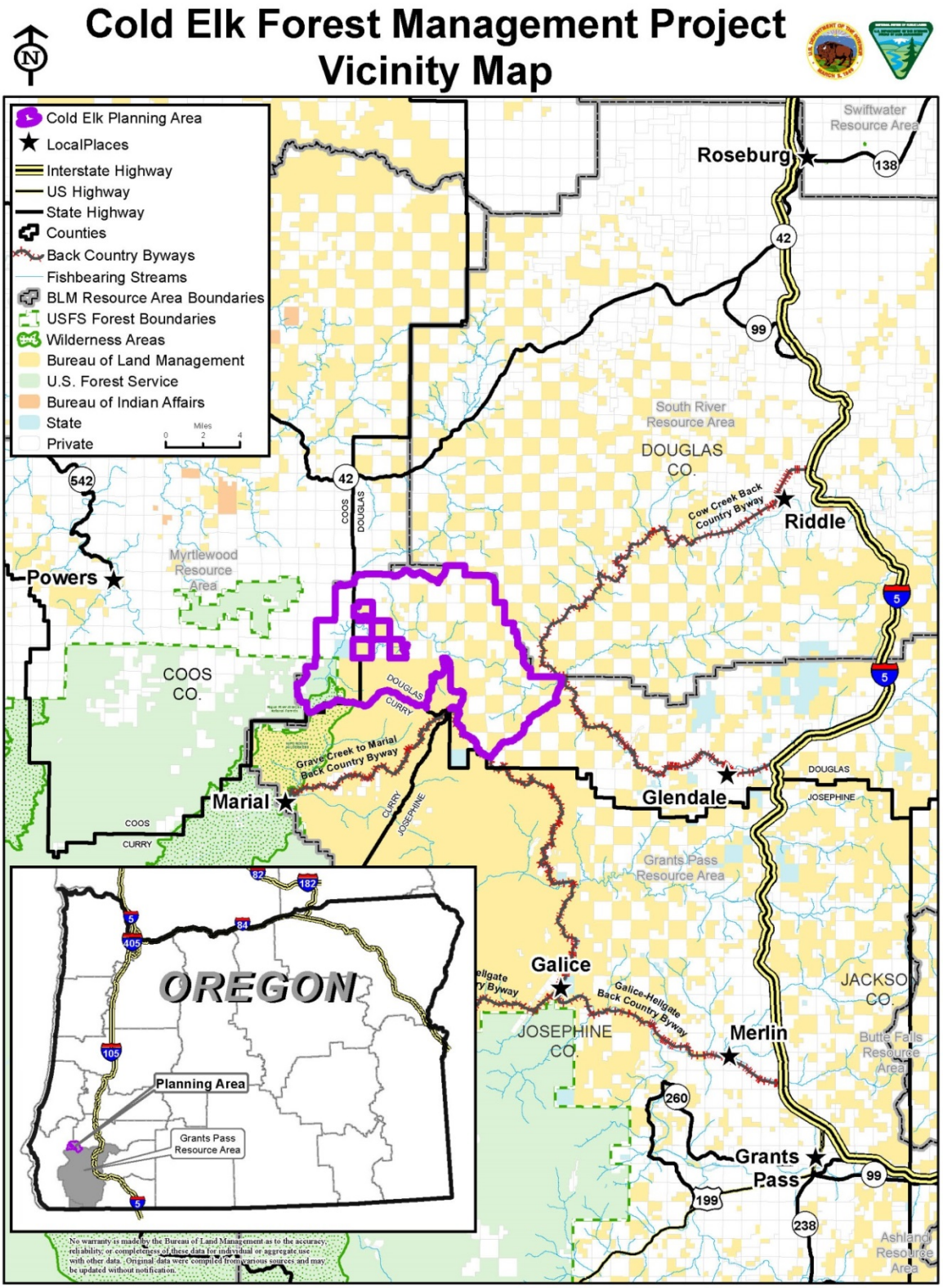
- Appendix: The appendix provides information in support of the analysis presented in this Environmental Assessment.

1.2 Project Area Vicinity

The proposed project area is located within Coos and Douglas Counties, and a small portion in Curry County of Oregon. See Figure 1, Vicinity Map. The Cold Elk Forest Management Project units are found within the following legal descriptions: Township 31 South, Range 8 West, Sections 7, 19, 20, 29, 31, 32, 33; Township 31 South, Range 9 West, Sections 11, 13, 15, 21, 23, 25, 27, 33, 35; Township 32 South, Range 8 West, Sections 3, 5, 9, 11; Township 32 South, Range 9 West, Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15, 16, 17, 18; Township 32 South, Range 10 West, Section 1, Willamette Meridian.

The project area is within the West Fork Cow Creek Hydrologic Unit Code (HUC) 10-digit watershed (5th field). West Fork Cow Creek drains into Cow Creek and then into the South Umpqua River. All proposed project units are located on the BLM managed land within the Matrix and Riparian Reserve (RR) Land Use Allocations (LUA). BLM lands are intermixed with private, state, and U.S. Forest Service lands, creating a mosaic of ownership patterns.

Figure 1: Cold Elk Project Vicinity Map



1.3 Background

Historical Conditions

The West Fork Cow Creek Watershed developed as both mixed conifer and Douglas-fir plant communities. Exceptions include Bear Creek drainage and serpentine soil areas in Wilson Creek, which both had relatively sparse tree cover. A small but distinct white oak savannah woodlands populated small valleys and rocky flat areas. A long history of fire activity maintained open conditions and limited understory regeneration. Fire suppression beginning in the early twentieth century has shifted the type and growth rate of vegetation on the landscape. Overall, fire suppression, recent catastrophic fires, timber harvest from the 1960s to the 1990s, and reforestation practices have decreased the acreage of mature and late seral forests (BLM 1997, p. 24).

Timber harvest on federal and private industrial forest lands are primary management activities that have formed the road infrastructure and forest stands. A limited amount of placer mining has occurred within the watershed primarily above Walker Creek in the upper basin.

Existing Conditions

The proposed units within the Planning Area (PA) consist of both dry and moist forest plant associations in the Douglas-fir Plant Series. Moist forest groups are generally characterized by a predominant conifer species, a mixture of understory hardwood species, even ages, and form mostly one or two layer stands. These stands lack structural complexity (i.e. vertical and horizontal variability) and low within-stand species diversity. Dry forest groups are generally composed of mixed conifer stands with few instances of ponderosa pine, white and black oak. Many sites frequently exhibit canyon live oak, are lower in elevation, and consist of fire dependent plant communities.

Fire suppression and forest management practices have affected the arrangement of the forest within the PA. Accumulations of surface and ladder fuels, increased fuel continuity, and the alteration of successional, climate conditions have created forests that are less structurally and biologically diverse and prone to larger, more frequent stand replacing fires. In addition to the ecological impacts of these changes, there is an increased risk to firefighters, public safety and private property due to these conditions. Forest pathogens have reduced forest health and productivity including the long-term production of large woody structure and cover.

The majority of the planning area is within Critical Habitat for the northern spotted owl. Current conditions exhibit high tree densities leading to increased competition and reduced tree vigor. This increases the potential risk of habitat loss through fire, insects, and disease. Previous drought years have predisposed trees within the critical habitat to these mortality agents.

West Fork Cow Creek is a Tier 1 Key Watershed (RMP, pp. 22-23) that serves as refugia crucial for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species. These refugia include areas of high quality habitat and areas of degraded habitat. Key watersheds overlay other land use allocations and place additional management requirements and/or priorities on these land use allocations.

1.4 Purpose and Need for Action

The BLM has a statutory obligation under the Federal Land Policy Management Act which 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 . . ." The Medford District's Record of Decision and Resource Management Plan (1995 ROD/RMP) guides and directs management of BLM lands.

One of the primary objectives identified in the RMP is implementing the O&C Lands Act which requires the Secretary of the Interior to manage O&C lands for permanent forest production in accordance with sustained yield principles.

The purpose and need for proposed treatments in the Cold Elk Forest Management Project is to produce wood volume at the present time, increase conifer growth rates for wood volume production in the future, and maintain/improve tree vigor of retained conifers and other vegetation while managing northern spotted owl habitat.

Any action alternative to be given serious consideration as a reasonable alternative must meet the objectives provided in the RMP for projects to be implemented in the Planning Area. The RMP and statutes specify the following objectives to be accomplished in managing the lands in the Planning Area:

- Produce a sustainable supply of timber and other forest commodities to provide jobs and contribute to economic sustainability in the Matrix LUA (RMP, p. 38);

- Contribute to local, state, national, and international economies through sustainable use of BLM-managed lands and resources and use of innovative contracting and other implementation strategies (RMP, p. 80)

- Improve the health of the forest and associated habitats, to reduce tree mortality, and to restore the vigor, resiliency and stability of forest stands that are necessary to meet land use allocation objectives (RMP, p. 62);

- Maintain or restore components of the Aquatic Conservation Strategy in Riparian Reserves (RMP, p. 22);

- Develop and maintain a transportation system that serves the needs of users in an environmentally sound manner (RMP, p. 84);

- Manage and design road systems that reduce hazards to public health and safety, fire risks, and vandalism to public and private property (RMP, p. 88); and

- Maintain haul roads to accommodate the safe movement of vehicles and machines (Oregon OSHA Chapter 437, Division 7, Section F).

Existing forest stand conditions demonstrate there is a need to treat in the West Fork Cow Creek watershed to meet multiple objectives under the Medford District RMP and other regulatory directives. The proposed treatments are designed to provide a sustainable supply of timber,

improve forest resiliency and enhance or maintain northern spotted owl habitat. There is a need to apply silvicultural treatments that reduce the long-term risk of disturbances such as disease outbreaks or potential catastrophic wildfire.

The inability to proceed with a given sale in the Medford District Sale plan for any particular fiscal year has the potential to prevent the district from meeting Annual Sale Quantity targets, as directed in the O&C Act and the 1995 ROD/RMP.

1.5 Decisions Framework

The Grants Pass Field Manager is the responsible official for deciding whether or not, and in what manner, to implement any of the action alternatives analyzed in this EA.

Actions in this decision would include:

- Acres to apply silvicultural treatments
- Temporary route construction to accommodate harvest operations
- The combination of logging systems to accommodate harvest operations
- Use of Project Design Features to avoid or minimize impacts to resources

The decision will be based on a consideration of the environmental effects of implementing any of the action alternatives. The Field Manager may select any alternative analyzed in detail, a modified alternative, or no action. If the Field Manager determines that the proposal would result in significant effects, additional analysis may occur through the development of an Environmental Impact Statement.

1.6 Conformance with Law, Regulation & Policy

1.6.1 Land Use Management Plans

This EA tiers to the following land use planning documents:

- Final Supplemental Environmental Impact Statement and Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (Northwest Forest Plan FSEIS, 1994 and ROD, 1994)
- Final Medford District Proposed Resource Management Plan/Environmental Impact Statement, and Record of Decision and Resource Management Plan (EIS, 1994 and RMP/ROD, 1995)
- Final Supplemental Environmental Impact Statement: Management of Port-Orford-Cedar in Southwest Oregon (FSEIS 2004) and ROD (2004)

- Medford District Integrated Weed Management Plan Environmental Assessment (1998) and tiered to the Northwest Area Noxious Weed Control Program (BLM 1985)

- Final Supplemental Environmental Impact Statement and Record of Decision and Standards and Guidelines for Amendment to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (FEIS, 2000 and ROD, 2001)

1.6.2 Relevant Statutes/Authorities

This section is a summary of the relevant statutes/authorities that apply to this project. The Action Alternative is designed in conformance with the direction given for the management of public lands in the Medford District and the following:

- Oregon and California Lands Act of 1937 (O&C Act). Requires the BLM to manage O&C lands for permanent forest production. Timber shall be sold, cut, and removed in accordance with sustained-yield principles for the purpose of providing for a permanent source of timber supply, protecting watersheds, regulating stream flow, contributing to the economic stability of local communities and industries, and providing recreational opportunities.

- Federal Land Policy and Management Act of 1976 (FLPMA). Defines the BLM's organization and provides the basic policy guidance for the BLM's management of public lands.

- National Environmental Policy Act of 1969 (NEPA). Ensures that information on the environmental impacts of any Federal action is available to public officials and citizens before decisions are made and actions are taken.

- Endangered Species Act of 1973 (ESA). Directs Federal agencies to ensure their actions do not jeopardize species listed as "threatened and endangered" or adversely modify designated critical habitat for these listed species.

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

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

- Safe Drinking Water Act (SDWA) of 1974 (as amended in 1986 and 1996). Protects public health by regulating the nation's public drinking water supply.

- Clean Water Act (CWA) of 1972 as amended in 1985. Establishes objectives to restore and maintain the chemical, physical, and biological integrity of the nation's water.

- Oregon BLM signed a Memorandum of Understanding (MOU) with the State of Oregon Department of Environmental Quality (BLM, 2011) that specified BLM responsibilities during project planning for managing lands to protect water quality.

- Executive Order 11988 and 11990 require Federal agencies to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of flood plain development wherever there is a practicable alternative.

- National Historic Preservation Act (NHPA), 1966 as amended. NHPA establishes procedures for compliance processes to identify eligible cultural properties and the avoidance, minimization, or mitigation of impacts to eligible properties.

- Native American Graves Protection and Repatriation Act (NAGPRA) of 1990. NAGPRA establishes procedures for inadvertent discoveries of cultural items on Federal or Tribal lands and a repatriation process to return NAGPRA items to lineal descendants and cultural affiliated Tribes.

1.7 Public Involvement

Internal Scoping

An interdisciplinary team (IDT) of BLM resource specialists conducted internal scoping, including record searches, field surveys, reviews of current literature and discussion. In the planning process the IDT considered elements of the environment that are specific to this project.

External Scoping

The BLM initiated external scoping for this project on December 29, 2015. A scoping letter and a map describing potential project activities were sent to approximately 95 recipients, including federal, state, county and municipal government agencies, tribal governments, adjacent landowners, and interested parties on the GPRA mailing lists. The scoping letter along with a map of areas being considered and a scoping guide was also posted to the BLM's ePlanning website at http://tinyurl.com/BLMePlanning-ColdElk. Scoping guides were provided at the Grants Pass Interagency Office, Josephine County Library, Riddle Branch Library, and Douglas County Library. Notice of project planning was also available in the Medford BLM's *Medford's Messenger* beginning in April of 2015. A total of 3 comment letters were received and considered during the scoping period. Responses to the comments are found in the Appendix E of the EA.

Public Meetings

The GPRA sent post cards to approximately 95 recipients, including federal, state, county and municipal government agencies, federally recognized Tribes, adjacent landowners, and interested parties on the GPRA mailing lists informing them of the public meeting. Public meeting fliers and project information was provided at the Grants Pass Interagency Office, Roseburg BLM office, Wolf Creek Library, Glendale Library, Josephine County Library, Riddle Branch Library,

and Douglas County Library. On the evening of April 26, a public meeting was held at the Grants Pass Interagency Office. A total of five members of the public attended the meeting. No comments were submitted.

EA 30-day Public Comment Period

A legal notice will be published in the *Grants Pass Daily Courier* and the *Roseburg News Review* on July 5, 2016 that will initiate the 30-day public comment period. The GPRA is requesting comments on the EA to be submitted by August 5, 2016 for consideration during the decision making process. A public meeting is scheduled for July 11, 2016, at the Grants Pass Interagency Office from 3:00 pm to 5:00 pm. The purpose of the meeting is to provide an opportunity for the public to get information about the project. Comments received will be considered in the final decision making process. A field trip may be scheduled following the public meeting if there is interest among the public.

1.8 Issues

Substantive issues are directly or indirectly related to the development of the project proposal. Substantive issues assisted the IDT in shaping the alternatives, identifying PDFs, and providing considerations for analysis. Non-substantive issues are: 1) outside the scope of the action; 2) already decided by law, regulation or policy; 3) irrelevant to the decision to be made; and 4) conjectural and not supported by scientific or factual evidence. The Council for Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review."

1.8.1 Issues analyzed in detail

The IDT considered in detail the following substantive issues into the design of the action alternative, project design features (PDFs), and analysis of the environmental effects found in Chapter 3.0:

- Impacts of temporary route construction on watershed values.
- Wildlife: Effects of project activities on Northern Spotted Owls (NSO), NSO habitat, NSO prey species, Barred owls, and red tree voles.
- Soil compaction and site productivity: Effects to soil and site recovery, nutrient cycling and accelerated erosion. Potential impacts to fragile soils.
- Hydrology/Aquatics: Protection of water quality and quantity, fish and aquatic habitat. Aquatic Conservation Strategy (ACS) objectives address the physical integrity of the aquatic system, as well as sediment and in-stream flow including the timing, volume, rate, input, storage, transport, and spatial distribution of peak, high and low flows as identified in the NWFP (USFS/BLM 1994a, p. B-9).

- Fuels/Fire: Risk reduction from large scale wildfires through the reduction of crown bulk density, crown base height, and the treatment of project created activity slash. The proposed treatments intend to create fire resilient stands by reducing surface fuels, ladder fuels, and crown density. Forest thinning followed by treatment of surface fuels can reduce potential crown fire activity and increase stand resiliency to unplanned events.

- Silviculture: Ecological benefits of maintaining and enhancing stand variability and species composition.

- Invasive species: Spread of invasive species

1.9 Alternative options considered but not analyzed in detail

This Environmental Assessment explored and objectively evaluated a range of reasonable alternatives within law, regulations, and policy. Through the planning process several alternatives where explored but eliminated from detailed analysis for various reasons. Alternative 2 analyzes for an economically viable proposal with consideration to environmental effects that meets the purpose and need of the project. An alternative would not be considered if it:

- does not meet the purpose and need;

- Is technically or economically infeasible; or

- Is inconsistent with the basic policy or objectives for the management of the area

The following alternatives were considered by the interdisciplinary team, but not analyzed in detail or were deferred from the proposed action. A combination of ground reconnaissance, stand data, aerial photography and LiDAR were used to evaluate forest stands.

1.9.1 NWFP Known Spotted Owl Activity Centers (KOAC) 1,049 acres

The actions for management in these KOACs are guided by direction under the Late Successional Reserve (LSR) LUA. Projects in this LUA are to encourage or improve the late successional habitat for northern spotted owl and late successional associated species. Approximately 100 acres of the best available habitat around the nest or core area of known sites as of January 1, 1994, were designated Reserve areas specifically for NSOs and also benefitting other late-successional related species. Also coinciding with NSO critical habitat in the PA, these areas are currently considered to be functioning as NSO habitat and late-successional forest benefitting other species, and therefore deferred from needing treatment. Deferral also meets the NSO Revised Recovery Plan recovery actions #RA-10 and #RA-32 to preserve high-quality NSO habitat, and address negative effects from completion with the barred owl. Late-successional reserve guidelines recommend treating stands adjacent to KOACs to address fire resiliency or stand development. Approximately 1,049 acres were considered but not analyzed in detail.

1.9.2 Timber Productivity Capability Classification (TPCC) Nonsuitable Woodland areas - 569

569 acres were identified within TPCC withdrawn areas of fragile gradient interfering condition nonsuitable woodland (FGNW) and fragile excessive groundwater interfering condition nonsuitable woodland (FWNW). Nonsuitable woodlands, which include all landslide prone areas and other unstable soils, are identified as not suitable for timber harvest. Fragile Nonsuitable is a TPCC indicating forest land having fragile conditions, which, if harvested, would result in reduced future productivity; even if special harvest or restrictive measures are applied. Approximately 569 acres were considered but not analyzed in detail.

1.9.3 Economic viability (small dbh, low volume/acre, uneconomical access) - 5,378 acres

5,378 acres were identified within the Matrix LUA and determined not to be economical for harvest. This acreage represents young plantations, small diameter trees, uneconomical access and low volume per acre stands. For these reasons, these acres would not contribute to an economically viable timber sale, and would not meet the purpose and need of the project. Approximately 5,378 acres were considered but not analyzed in detail.

1.9.4 Northern Spotted Owl Recovery Action 32 (RA32) - 1,188 acres

Approximately 1,188 acres considered but not analyzed for treatment in detail.

The NSO Recovery Plan contains specific “Recovery Actions” which are near-term recommendations to guide the activities needed to accomplish recovery objectives. The Revised Recovery Plan presents 33 actions that address overall recovery through maintenance and restoration of NSO habitat, monitoring of avian disease, development and implementation of a delisting monitoring plan, and management of barred owls.

Recovery Action 32 aims to retain high-quality NSO habitat stands 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. Stands that were considered high-quality NSO habitat were deferred from treatment to reduce effects to owls because they require well-distributed, older, and more structurally complex multi-layered conifer forests. See Chapter 3.3 Wildlife, for further consistency with NSO Recovery Plan Recommendations, especially Recovery Actions 10 and 32.

Figure 2: Photo typical of RA 32 stand characteristics. Large Douglas-fir, white fir, large ponderosa pines and encroaching fir

1.9.5 Northern Spotted Owl Recovery Action 10 (RA10) and Critical Habitat 2,154 acres (Includes acres dropped where Regeneration Harvests was the only viable option for harvest, NSO nest patches, acres dropped during RA10 process, and acres with no botany surveys in 180+ year old stands).

Approximately 2,154 acres were considered but not analyzed in detail. These acres were deferred from treatment to reduce effects to NSOs and their habitat.

To the extent practicable, the Relative Habitat Suitability (MaxEnt) model described in the 2011 Revised Recovery Plan for the Northern Spotted Owl (USFWS 2011), the Medford District known owl site information, NSO habitat information, and recent spotted owl survey data were used to determine high priority and low priority owl sites, and treatment options in order to reduce effects to NSO sites and to preserve or enhance habitat.

The IDT followed principles in the Recovery Plan Implementation Guidance: Interim Recovery Action10 Medford Bureau of Land Management/Rogue River-Siskiyou National Forest/U.S. Fish and Wildlife Service Roseburg Field Office (USFS/BLM/USFWS 2013) while designing the proposed treatments. NSO sites within the PA were analyzed using historic pair occupancy and reproductive success derived from protocol surveys.

Table 11 in Chapter 3 includes a summary of all the NSO sites in the PA and the category each site was assigned for this exercise.

Treatments were designed to have minimal impacts to high value sites by: 1) limiting the overall amount of treatments, especially within the 0.5 mile core areas of these sites, and 2) only proposing treatments that would have minimal short-term impacts on NSO habitat (treat and maintain) within these high value sites. Conversely, the majority of the proposed treatments were focused in low value NSO sites or outside of NSO home ranges. All proposed treatments were designed and are expected to increase the quality of habitat in the long-term (>30 years). See Chapter 3.3 Wildlife for further consistency with NSO Recovery Plan Recommendations, especially Recovery Actions 10 and 32.

The total acres of treat and maintain prescriptions within the 0.5 mile core area of high priority owl sites were reduced and in some cases eliminated in order to reduce the effects to NSOs at those sites. Silvicultural prescriptions that would have adverse impacts to NSO habitat were considered in areas outside of high value owl sites. The IDT focused on reducing the amount of timber harvest within the 0.5-mile core area because it is the area that provides the important habitat elements of nest sites, roost sites, and access to pray that benefit NSO survival and reproduction (Bingham and Noon 1997).

No downgrade of NRF habitat was proposed within high value sites, with the exception of small removal associated with logging systems. Since these stands were already functioning as NRF habitat, the team determined that treatments were not necessary to improve the habitat.

In limited cases, where road construction was necessary to access the proposed treatment and no other road was available, small amounts of roosting/foraging and dispersal removal would occur. The removal of small amounts of habitat from road and landing construction were considered in areas that would allow access to treatments that would have long-term benefits to NSO habitat.

The 2012 Final Critical Habitat Rule and recommendations in the 2011 Recovery Plan were used to inform specific prescriptions and where treatment units are located within the 2012 designated critical habitat.

The PA is densely covered with NSO owl sites, most which are near or below threshold habitat levels, and regeneration harvest would negatively affect occupation, reproduction, and survival. The PA is 100% CHU, and regeneration harvest would negatively impact CHU by removing NRF habitat PCE where NSO are also negatively affected by competition from barred owls. RH in the PA would not be consistent with the NSO Revised Recovery Plan.

1.9.6 Road Management

All of the system and non-system roads in the Planning Area on BLM administered lands provide access to public or private industrial forest lands and are encumbered under the BLM Reciprocal Right-of-Way program.

Road 31-9-25.3 was considered for decommissioning. The road provides access for BLM management of public lands for continued forest management under the 1995 RMP. This segment of road is also encumbered under the BLM Reciprocal ROW program; and is the only access for the RROW holder to access their isolated parcel. The BLM is charged with providing RROW holders long term management and removal of forest products from their private land

under the BLM Reciprocal ROW program. Decommissioning of this road was considered but not analyzed in detail.

All temporary roads constructed or reconstructed/renovated for timber harvest on BLM land would be fully decommissioned after use. No permanent road is proposed in the Cold Elk Forest Management project.

1.9.7 Riparian Reserve Ecological Protection Zones (EPZs) – 1805 acres

EPZs were identified within the Riparian Reserve LUA during initial unit reconnaissance and determined either not to be feasible for harvest once Ecological Protection Zone buffers were applied or the stands already met Aquatic Conservation Strategy objectives. For these reasons, these acres would not contribute to an economically viable timber sale, and would not meet the purpose and need of the project. Approximately 900 acres were considered but not analyzed in detail.

All proposed units and roadside treatments in this project have been assigned site-specific EPZs for streams, springs, seeps and wetlands that may be 25 to 120 feet wide, depending on the characteristics and values of feature to be protected. Additionally, 905 acres within EPZs will not be proposed for commercial harvest. No timber yarding except in units 13-9, 19-3, and 25-1 on existing skid trails and except landings for units 3-2, 3-4, 3-8, 9-13, 13-2, 19-3, 25-1 on existing roads would occur within this protection buffer and only trees in the understory less than 8 inches diameter at breast height (DBH) may be treated. For an initial protection distance determination the Ecological Protection Width Needs chart (USFS/BLM 1994a, p. B-15) was used and buffer distances are illustrated in Figure 4.

1.9.8 Red tree vole buffers - 729 acres

Approximately 729 acres were deferred from treatment following completion of red tree vole surveys and implementation of the Survey and Manage red tree vole Management Recommendations to protect known sites. Prescriptions that would modify overstory and midstory trees were deferred. For further discussion of red tree voles and their habitat, see the Wildlife Chapter 3.3.

1.9.9 Marbled Murrelet habitat deferral - 127 acres

Approximately 127 acres were deferred from treatment as suitable habitat in old-growth stands for the threatened marbled murrelet in survey zones A&B. Additional acres deferred for other resources (1.8.1- 1-8.10) which included old-growth stands in zones A&B reduced potential adverse effects to the marbled murrelet. For further discussion of red tree voles and their habitat, see the Wildlife Chapter 3.3

1.9.10 Congressionally Reserved Land Use Allocation - 75acres

75 acres were identified within the Congressionally Reserved LUA and according to the RMP (p. 38) are not available for harvest. For this reason, these acres would not contribute to an economically viable timber sale, and would not meet the purpose and need of the project. Approximately 75 acres were considered but not analyzed in detail.

1.9.11 Treated under a recent timber sale – 370 acres

370 acres were identified within the Matrix and Riparian Reserve LUAs and determined not to be economical for harvest. This acreage represents recently thinned stands from the Anaktuvuk Thin and Farout timber sales. Harvest was completed in December 2011 and November 2014 respectively. Accordingly, these acres would not contribute to an economically viable timber sale, and would not meet the purpose and need of the project. Approximately 370 acres were considered but not analyzed in detail.

Chapter 2 Alternatives

This chapter describes and compares the alternatives for Cold Elk Forest Management Project. Alternative 1 is the No Action Alternative. The No Action Alternative serves as a baseline to compare effects of actions of Alternatives. Alternative 2 is proposed to meet the Purpose and Need of the project within the multiple use objectives and resource protection measures established by the 1994 NWFP and 1995 RMP/ROD. Environmental Effects to Alternatives 1 and 2 are disclosed in Chapter 3.

2.1 Alternative 1 No Action

Under the No Action Alternative, silvicultural treatments would not be applied to 3,702 acres. No variable density thinning, understory reduction, activity fuels treatments or roadside management activities would be implemented to accomplish project goals in the foreseeable future. The No Action Alternative would not meet the purpose and need of the project.

2.2 Alternative 2 – Proposed Action

Alternative 2 proposes forest management activities on approximately 3,702 acres, which includes 2,116 acres within the Matrix LUA and 1,586 acres within the Riparian Reserve LUA. Table 1 below summarizes the proposed action and associated harvest operations. A detailed table of units in the Proposed Action is found in Appendix I.

Table 1: Alternative 2 Proposed Action Summary

Alternative 2 Proposed Activities		**Matrix LUA**	**Riparian Reserve LUA**
Harvest Summary	Understory Reduction (UR)	214 acres	117 acres
	Variable Density Thinning (VDT)	1,810 acres	1,400 acres
	VDT/UR	91 acres	66 acres
	Disease Management	1 acre	3 acres
Operations Summary	Ground Based	655 acres	649 acres
	Cable/Skyline	1,099 acres	731 acres
	Helicopter	149 acres	88 acres
Temporary Route Construction Summary	Temporary Route Construction	5.19 miles	0.45 miles
	Temporary Route Reconstruction	1.63 miles	0.29 miles

2.2.1 Variable Density Thinning (VDT) 3,210 acres

Variable density thinning is proposed to maintain forest structure and/or improve stand conditions. This type of thinning reduces stand densities and may include treatments that create

small openings, including opening around large legacy trees and less prominent species. It may also retain untreated areas. This prescription is proposed in Douglas-fir stands in NSO critical habitat because it would promote vertical and horizontal heterogeneity in generally homogenous stands while promoting the persistence of minor tree species and understory vegetation. The treatment proposes a thin from below strategy to maintain the largest tree structure and composition for both marbled murrelet (MAMU) and NSO habitats. In NSO dispersal habitat, treatments are designed to treat and maintain while promoting the development of future NRF habitat. Residual trees would be configured in less uniform spacing with tree clustering to avoid homogenous structure. VDT objectives include:

- Increasing stand resiliency to wildfire by reducing stand and crown bulk density
- Favoring the retention of more fire and drought tolerant trees
- Enhancing structural and biological diversity
- Maintain or improving NSO habitat.
- NSO habitat sideboards of the prescription include:
    - In foraging only habitat – maintain a minimum 60% canopy cover.
    - In nesting/foraging – maintain a minimum 60% canopy cover and additional structure (such as large diameter trees or increased basal area)
    - In dispersal – maintain a minimum 40% canopy cover
    - Minimize adverse impacts to NSO Critical Habitat

2.2.2 Understory Reduction (UR) 331 acres

Understory reduction treatment is designed to reduce tree and brush densities in overstocked units. This treatment would improve stand-level residual tree growth and vigor, and reduce the existing fire hazard (reduction in surface fuels and ladder fuels), potentially decreasing the risk of crown fire initiation. Leaving these units untreated would compromise the goal of sustaining conifer productivity, as well as stand resiliency to fire, vegetation competition, and climate extremes. Understory reduction treatments are proposed on managed and naturally developed stands with overstocked understory densities.

Treatments could include slashing, hand piling, pile burning, chipping, lop and scatter, biomass removal, and/or under burning. Conifers would likely be spaced 16-18 feet apart while hardwoods would be spaced 40-45 feet apart. No trees greater than eight inches DBH would be cut unless joined with a VDT prescription where harvesting reduces densities greater than eight inches DBH. Within the Riparian Reserve, hand piling slash would be limited to six inches on the large end of the log to provide for soil protection and small wood recruitment. This treatment is designed to enhance tree growth and vigor and may increase fire resiliency.

2.2.3 VDT and UR 157 acres

This treatment combines VDT and UR together, as described above, on approximating 157 acres. Combined overstory and understory densities warrant a need for management intervention to reduce stocking and improve growth, vigor, and resiliency. Mortality in all stand layers is imminent due to the effects of inter-tree competition.

2.2.4 Disease Management 4 acres

A laminated root rot infection center is currently reducing site productivity and potential to develop future spotted owl habitat. The primary hosts most severely affected include Douglas-fir and white fir. Because this disease is long-lived and continues infecting susceptible species, this treatment would remove Douglas-fir and white fir, followed by a subsequent planting of conifer species resistant to infection damage. Road number 31-8-31.0 is adjacent to this four acre infection center. Roadside safety remains at risk where this disease is found as trees readily fail with no supporting root structure. If left untreated, the anticipated natural regeneration of Douglas-fir would continue to occupy the growing space, thereby perpetuating infection on productive forestland and compromising road safety.

Figure 3: Forest stand condition in need of Understory Reduction Treatment

2.2.5 Riparian Thinning Treatments 1586 acres

RR widths are determined based on a typical site potential tree height 205 feet in the West Fork Cow Creek Watershed. Based on this site potential tree height, streams are assigned a 205 foot buffer on either side of the channel for the RR. Perennial fish bearing streams are assigned a 410 foot RR buffer. Wetlands, seeps, springs, and unstable soils are also considered part of RRs

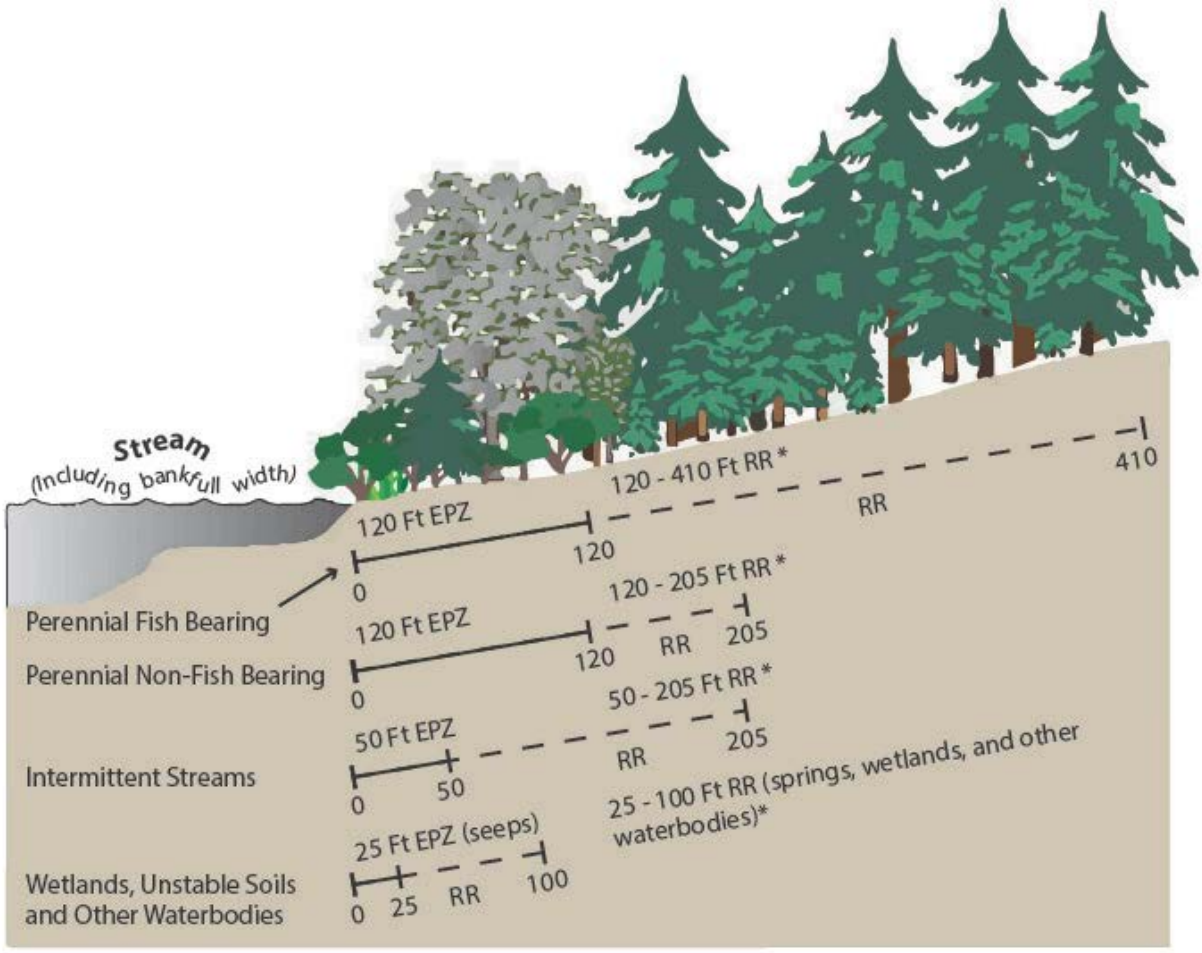
(BLM 1995, 26-27). Springs, seeps and wetlands were assigned a 100 foot buffer to protect these features.

The proposed treatments in the RR are based on field surveys and silvicultural review.

Stands that exhibit conditions such as overstocking, minimal canopy layers, low species diversity, or low conifer and hardwood vigor were selected for potential treatment. Riparian thinning treatments are designed to enhance resiliency and sustainability to promote species diversity and forest health objectives (BLM 1995, p. 26). The assumption is that a healthy resilient treated riparian timber stand would better recover from or withstand disturbances, would be more diverse and would therefore meet ACS objectives. Within these stands riparian thinning is expected to benefit perennial and intermittent streams, fish habitat, and habitat for other aquatic species by promoting species diversity and resiliency to disturbance in the riparian forest stands.

Ecological protection zones (EPZs) or “no-cut buffers” have been applied in all riparian zones to protect aquatic resources. Canopy cover in the RR would remain above 40% or 60% depending on the silvicultural prescription, therefore species diversity and forest health would be maintained. Activities in the RR would be designed to improve habitat conditions for the wildlife and plant species that use this zone in the long-term. Figure 4 provides an illustration of stream buffers distances per stream type.

Figure 4: Riparian Reserve and Ecological Protection Zone Distances



2.2.6 Proposed Road Work

Tree harvest would be accomplished using ground based, skyline, and helicopter logging systems. To facilitate harvest operations, road construction activities would include the following:

Temporary Route Construction

Approximately 5.64 miles of temporary route construction would occur. Temporary routes are not intended to be part of the permanent or designated transportation network system. Temporary routes on BLM lands would be fully decommissioned after use, which includes subsoiling, installing water bars (where needed), applying seed, mulching, and blocking routes.

Temporary Route Reconstruction

Approximately 1.92 miles of temporary route reconstruction would occur. Reconstruction restores an existing route to its original or modified condition. Reconstructed routes on BLM

lands would be fully decommissioned after harvest, which includes subsoiling, installing water bars (where needed), applying seed, mulch and blocking routes.

Road Maintenance

Maintenance activities would occur on approximately 214 miles of existing roads to keep the road at its original design standard. Typical maintenance may include, but is not limited to: road blading and reshaping; spot rocking & surface replacement; ditch cleaning; cut-bank sluff removal; culvert inlet and outlet clearing; catch basin cleaning; culvert replacement; and removing vegetation along roadsides to improve sight distance for travel.

PDFs identified by the interdisciplinary team to avoid or reduce potential resource effects of Alternative 2 are identified in the EA Section 2.3.

Roadside Management 13.5 miles

A subset of road maintenance work, referred to as roadside management would occur within the Cold Elk Project Area where vegetation (including trees) currently inhibits road maintenance along approximately 13.5 miles of existing haul roads. The roads identified for this treatment were constructed in the 1950s to the 1970s and are generally rocked or paved. The original road right-of-way clearing widths were a minimum of 60-100 feet to allow for roadway construction. The following table discloses the location and distance of proposed roadside management activities.

Table 2: Roadside Management Proposal

Road #			
32-9-10.2	0.30	32-9-7.4	0.70
32-9-16.1	2.30	32-9-8.0	0.30
32-9-16.2	2.70	32-9-8.1	0.10
32-9-2.1	0.10	32-9-8.2	0.20
32-9-3.0	2.60	32-9-8.3	0.10
32-9-7.1	1.00		

Outside of EPZs, roadside management activities would remove vegetation 15 feet slope distance from the center line of the ditch up the cut-bank and 15 feet slope distance from the road shoulder, down the fill slope. All vegetation greater than 12 inches in height and less than 25 inches DBH within this roadside management area would be mechanically cut and merchantable logs would be removed. Approximately one overstory tree would be left every 75-100 feet within the roadside management treatment distance to help shade out and suppress brush in-growth. These scattered overstory trees would be pruned up to 14 feet in height. Intact roots and re-sprouting vegetation would continue to stabilize slopes and retard erosion. Slash created by this operation could be treated by a combination of utilization at a biomass facility, chipped and scattered (not exceeding 4 inch chip depth) or removed to landings to be piled and burned at least 50 feet away from streams.

Within EPZs, a road engineer, hydrologist, and/or fish biologist for this project would make on-site evaluations for specific tree removal. Part of this determination would be for the hydrologist or fish biologist to identify which trees could be safely removed without having any measurable direct, indirect, or cumulative impact to water quality or aquatic habitat. Understory removal in the EPZ would be limited to standard road maintenance (4 feet of brushing off both sides of the road).

All remaining brush and stumps that interfere with road grading operations would be flush cut. All mechanized equipment for roadside management would be limited to operating on the road surface.

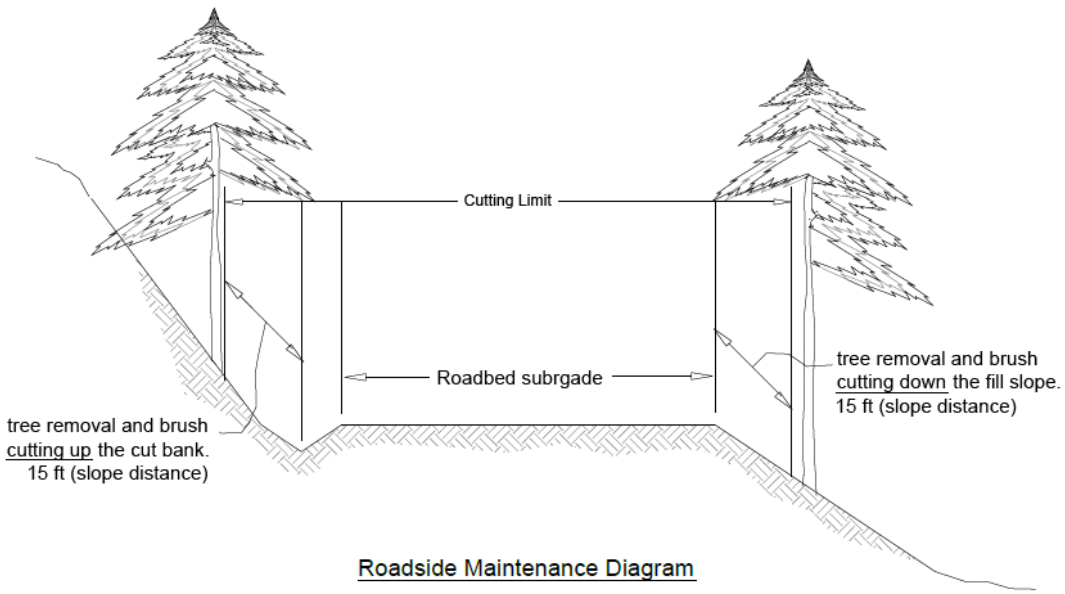
Figure 5: Post roadside management treatment

Completing roadside management activities would improve the following conditions:

- Motorist safety. Trees and other brush species are currently shading roadways or inhibiting adequate sight distance around corners. The Medford District RMP identified the need to remove trees along rights-of-way if they are a hazard to public safety (RMP, p. 34).

- Removal of trees with roadside management would increase air flow and direct sunlight on road surfaces, thereby allowing the roadbed to dry faster and stay drier for longer periods of time.
- Reduce future road maintenance cost by allowing mechanical maintenance of road side vegetation and retain the strength and integrity of road surfacing longer by reducing the amount of leaves, needles, and other vegetative material that drop and decompose onto the road surface.
- Improve fuel breaks to improve defensibility to decrease a potential wildfire spread.
- Allow for road maintenance to recover side cast rock that has been overgrown with vegetation.

Figure 6: Roadside Management Proposal Diagram



2.3 Best Management Practices and Project Design Features

Best Management Practices (BMPs) are methods, measures, or practices incorporated into the project to meet the requirements of the Clean Water Act of 1967 to reduce nonpoint source pollution to the maximum extent practicable. The BMPs reduce sediment delivery from BLM roads incorporated into the 1995 Resource Management Plan (RMP) through an RMP plan maintenance action in July of 2012. Project Design Features (PDFs) are measures incorporated into the site-specific design of the project to eliminate or minimize adverse impacts on the human environment.

Best Management Practices (BMPs)

A BMP is a practice or combination of practices that are effective and practicable in preventing or reducing the amount of pollution generated by diffuse sources to a level compatible with water quality goals (40 CFR 130.2 (m)).

The Action Alternatives assume the proper application of BMPs for logging roads to protect soil and water resources. Proper application of these BMPs constitute BLM's compliance with the CWA of 1972, as amended to reduce nonpoint source pollution, state of Oregon water quality legislation (chapter 340), and the O&C Act which sets land ownership boundaries for the Revested Oregon and California Railroad and Reconveyed Coos Bay Wagon Road grant lands.

The strategy for managing and controlling nonpoint source water pollution from BLM-managed lands in the State of Oregon is outlined in the 2011 Memorandum of Understanding (MOU) between the State of Oregon DEQ and BLM (BLM 2012). The MOU specifies that the BLM would implement site-specific BMPs as specified in Management Objectives, standards, guidelines, design features, and mitigation developed in either: RMPs, RMP amendments, project level plans, and Water Quality Restoration Plans (WQRP) to meet applicable water quality standards.

The incorporation of BMPs happens during project planning as the Action Alternatives are developed; BMPs are refined through the planning process, included as stipulations in the timber project, and are guidance when actions occur on public land. The BMPs selected from the MOU are relevant to this project, in some cases have been modified to only include actions described in the proposed alternatives, and would be implemented in this project level plan and resulting Decision Record.

1. Locate temporary roads and landings on stable locations, e.g., ridge tops, stable benches or flats, and gentle-to-moderate side slopes. Minimize construction on steep slopes, slide areas and high landslide hazard locations. [R001 modified, no new permanent roads are proposed]

2. Locate temporary road construction and permanent road improvement to minimize the number of stream crossings. [R002 modified, no new permanent roads or stream crossings are proposed]

3. Avoid locating landings in areas that can contribute to dry draws and swales. [R003 modified, no landings are proposed in wetlands, floodplains and waters of the state]

4. Locate roads and landings to minimize total transportation system mileage. Renovate or improve existing roads or landings when it would cause less adverse environmental impact. Where roads traverse land in another ownership, investigate options for using those roads before constructing new roads. [R004, modified]

5. Minimize fill volumes at permanent and temporary stream crossings by restricting width and height of fill to amounts needed for safe travel and adequate cover for culverts. [R012 modified]

6. On new construction, install culverts at the natural stream grade. [R014]

7. When installing temporary culverts, use washed rock as a backfill material. Use geotextile fabric as necessary where washed rock will spread with traffic and cannot be practicably retrieved. [R018, modified]

8. Design roads crossing low-lying areas so that water does not pond on the upslope side of the road. Provide cross drains at short intervals to ensure free drainage. [R020]

9. Install underdrain structures when roads cross or expose springs, seeps, or wet areas rather than allowing intercepted water to flow downgradient in ditchlines. [R022]

10. Effectively drain the road surface by using crowning, insloping or outsloping, grade reversals (rolling dips) and waterbars or a combination of these methods. Avoid concentrated discharge onto fill slopes unless the fill slopes are stable and erosion proofed. [R023]

11. Construct variable road grades and alignments (e.g., roll the grade, grade breaks) which limit water concentration, velocity, flow distance and associated stream power. [R027]

12. Divert road and landing runoff water away from headwalls, slide areas, high landslide hazard locations or steep erodible fill slopes. Design landings to disperse surface water to vegetated stable areas. Design stream crossings to prevent diversion of water from streams into downgrade road ditches or down road surfaces. [R028-30]

13. Skew cross drain culverts 45 to 60 degrees from the ditchline as referenced in BLM Road Design Handbook 9113-1 and provide pipe gradient slightly greater than ditch gradient to reduce erosion at cross drain inlet. [R039]

14. Clean ditch lines to provide for unobstructed flow at culvert inlets and within ditch lines during and upon completion of road construction prior to the wet season. [R044]

15. Locate equipment washing sites in areas with no potential for runoff into wetlands, riparian management areas, floodplains and waters of the state. Do not use solvents or detergents to clean equipment on site. [R053]

16. During roadside brushing remove vegetation by cutting rather than uprooting. [R060]

17. Limit road and landing construction, reconstruction, or renovation activities to the dry season or dry conditions in the wet season. Keep erosion control measures concurrent with ground disturbance to allow immediate stormproofing. [R061]

18. Apply water or approved road surface stabilizers/dust control additives during timber hauling when there is a visible dust trail behind vehicles to reduce surfacing material loss and buildup of fine sediment that can enter into wetlands, floodplains and waters of the state. Prevent entry of road surface stabilizers/dust control additives into waters of the state during application. [R070 modified]

19. Prior to the wet season, provide effective road surface drainage through practices such as machine cleaning of ditches, surface blading including berm removal, cleaning inlets and outlets. [R071 modified]

20. Remove and dispose of slide material when it is obstructing road surface and ditchline drainage. Place material on stable ground outside of wetlands, riparian management areas, floodplains and waters of the state. [R073]

21. Do not sidecast loose ditch or surface material where it can enter wetlands, riparian management areas, floodplains and waters of the state. [R074]

22. Blade and shape roads to conserve existing aggregate surface material retain or restore the original cross section, remove berms and other irregularities that impede effective runoff or cause erosion, and ensure that surface runoff is directed into vegetated, stable areas. [R077]

23. Stormproof temporary roads to reduce road erosion and reduce the risk of washouts by concentrated water flows immediately after use. [R080 modified]

24. Fully decommission or obliterate temporary roads upon completion of use. [R083]

25. Prevent use of vehicular traffic using existing gates to reduce or eliminate erosion and sedimentation due to traffic on roads. [R085 modified]

26. Convert existing drainage structures such as ditches and cross drain culverts to a long-term maintenance free drainage configuration such as outsloped road surface and waterbars for roads that are administratively closed or decommissioned. [R086 modified]

27. Implement decompaction measures, including ripping or subsoiling to an effective depth. Treat compacted areas including the roadbed, landings, construction areas, and spoils sites. [R092]

28. On active haul roads, during the wet season, use durable rock surfacing and sufficient surface depth to resist rutting or development of sediment on road surfaces that drain directly to wetlands, floodplains and waters of the state. [R094]

29. Suspend commercial use where the road surface is deeply rutted or covered by a layer of mud or when runoff from the road surface is causing a visible increase in stream turbidity in the receiving stream. [R096]

30. Remove snow on haul roads in a manner that will protect roads and adjacent resources. Retain a minimum layer (2-4 inches) of compacted snow on the road surface. Provide drainage through the snow bank at periodic intervals to allow for snow melt to drain off the road surface. [R097]

Project Design Features (PDFs)

2.3.1 Soil Productivity, Soil Compaction, Residual Trees, and Coarse Woody Debris

Harvest Operations

- Existing skid trails would be utilized whenever practical. New skid trails would be placed approximately 150 feet apart and be pre-designated and approved by the Authorized Officer.

- Ground based yarding and harvesting would generally be limited to slopes of less than 35%. Use of existing skid trails generally with a grade of 35% slope or less may be utilized.

- Ground-based logging would not occur when soil moisture at a depth of 4-6 inches is wet enough to maintain form when compressed, or when soil at the surface would readily displace, causing ribbons and ruts along equipment tracks. These conditions are generally found when soil moisture at a depth of 4-10 inches is between 15-25%, depending on soil type.

- Tractors would be equipped with an integral arch to minimize soils disturbance and compaction.

- Skid trails including turning points would be 12 feet wide on average unless the Purchaser proposes an alternate harvest plan that limits soil compaction to 12% and soil productivity loss to 5%.

- To minimize soil disturbance and to keep soil organics on site, the use of blades while tractor yarding would not occur. Equipment would walk over as much ground litter as possible to reduce compaction.

- Harvest equipment used off of designated skid trails would operate on existing skid trails and/or ground less than 35% slope, have an arm capable of reaching at least 20 feet and minimize turning. When practical, the harvest equipment must walk on a mat of existing or created slash. Equipment use may be restricted depending on soil type, soil moisture, ground pressure of the equipment, and presences of slash to operate on.

- Whole tree yarding with tops attached is the preferred harvest method as long as the contractor can operate without causing bark slippage, girdling, broken tops, or damage to live crowns. If it is determined by the Authorized Officer that unacceptable amounts of damage is occurring, tree bucking and limbing would be required as directed by the Authorized Officer. Delivered log length would not exceed 41 feet.

- Lateral yarding would be required on all units to protect residual leave trees and existing conifer regeneration. Yarding carriages would be required to maintain a fixed position during lateral yarding to reduce damage to the residual stand.

- The number of cable yarding corridors would be minimized to reduce soil compaction and displacement. Cable yarding corridors would be located approximately 150 feet apart at the tail end.

- At a minimum, partial suspension would be required on all units to minimize soil disturbance.

- Prior to October 15 of the same operating season, winterization would occur on landings, skid trails, and hydrologically-connected cable yarding corridors.

Roadside Management

- Machinery will operate from existing roads.

Activity Fuels and Prescribed Fire

- Landing piles and hand piles located on temporary routes, skid trails, roadside management areas or landings would be burned, chipped, or otherwise removed from these sites within 18 months of unit harvest completion.

- Merchantable sawlogs (including pole decks) would be removed from yarded material, and may be hauled off site for processing. Debris at the landing sites would be piled and burned on the immediate downhill side of existing roads, chipped, or removed for biomass utilization.

- Activity slash remaining in units would be lopped-and-scattered, chipped, or hand piled and burned to prevent an increase in fire hazard.

- Firelines would be constructed by hand.

- Pile all activity slash within twenty (20) feet of each finished landing pile. Construct a fireline approximately eighteen (18) inches wide and down to mineral soil within twenty (20) feet of each finished landing pile to prevent escaped fire. Each landing pile would be covered with a large enough piece of four millimeter thick black plastic to ensure a dry ignition spot (generally 10 feet x 10 feet or large enough to cover 80% of the pile).

- Landing piles would not be placed adjacent to or within 15 feet of leave trees to minimize scorch and mortality. Landing piles would be as free of dirt as reasonably possible to facilitate desired consumption.

- Hand piles would not be allowed on roadways, turnouts, shoulders, or on the cut bank, unless authorized by the Authorized Officer.

- Landing and hand piles would be burned in the fall to spring season after 1 or more inches of precipitation have occurred. Patrol and mop-up of burning piles would occur when needed to prevent treated areas from re-burning or becoming an escaped fire.

- Prescribed fire burn plans would be completed before ignition, as would smoke clearance to minimize impacts on air quality.

- Each hand pile would be covered with a large enough piece of 4 millimeter thick black plastic to ensure a dry ignition spot (generally 5 feet x 5 feet or large enough to cover 80% of the pile). Hand piles would not be placed adjacent to or within 10 feet of leave trees or large woody debris to minimize scorch and mortality.

Temporary Route Construction and Re-Construction

- Temporary routes would not be located on or above a headwall or on slopes in excess of 70%.

- Routes would be located on the upper slope or ridge, and would not cross through any EPZ's.

- All temporary routes constructed or reconstructed/renovated on BLM would be fully decommissioned after use. Routes would be ripped, water bared sub-soiled (or tilled), seeded, mulched, physically blocked, and/or planted to reestablish vegetation within 18 months after landing and hand pile burning is complete.

- Temporary route construction and temporary route re-construction (including associated decommissioning) would not occur when soil moisture, at a depth of 4-6 inches, is wet enough to maintain form when compressed; or when soil moisture at the surface would readily displace, causing ribbons and ruts along equipment tracks. These conditions are generally found when soil moisture at a depth of 4-10 inches is between 15-25% depending on soil type.

2.3.2 Stream Protection

Harvest Operations

- Landings and landing piles would be placed outside of Ecological Protection Zones with the exception of units 3-2, 3-4, 3-8, 9-13, 13-2, 13-9, 19-3, and 25-1.

- Any project related activities would be suspended if conditions develop that cause a potential for sediment laden runoff to enter a wetland, floodplain or waters of the state. Sediment trapping devices would be properly installed to hydrologically disconnect sites. Operations resume when sediment control devices are in place and conditions allow turbidity standards to be met.

- In general, cable and ground based landings size shall not exceed 1/4 acre; helicopter landings shall not exceed 1 acre and all landings shall be located along existing roads, temporary routes, and/or cable-tractor swing routes or within unit boundaries where possible. Landing locations would be approved by the Authorized Officer.

- Landings used during dry conditions within the wet season (generally Oct 15 - May 15) that have the potential to release sedimentation into a stream or wet area via ditchlines or other means, would have silt fencing or other sediment control measures in place during periods of non-use if they are hydrologically connected to streams in units 01-11, 02-01B, 03-05, 03-08, 03-14, 05-06, 07-03, 07-07, 07-28, 08-03, 08-04, 08-05, 08-07, 09-05, 10-05,13-02, 13-09, 15-19, 16-02, 18-01, 18-07, 19-03, 19-06, 19-08, 19-09, 20-04, 20-05, 23-04, 29-04, 29-05

- Prior to winter rains, cable yarding corridors that are above or nearly perpendicular (approximately 60-90 degrees) to stream channels within Riparian Reserves, or hydrologically connected to ditchlines, would be water-barred and have slash placed over them to protect water quality and minimize soil erosion.

Road Maintenance and Haul

- Haul would not occur on hydrologically connected roads (31-08-30, 31-08-31.0, 31-08-31.1, 31-09-25.3, 31-09-12. 31-09-35.1, 32-08-04.2, 32-08-10.2, 32-09-02.0, 31-09-04, 31-09-09.1, 31-09-10.1, 31-09-12, 31-09-26, 31-09-35.0, 32-09-07.0, 32-09-07.1, 32-09-07.2, 32-09-10, and 32-09-16.1) when water is flowing in the ditchlines due to precipitation or during any conditions that would result in any of the following: surface displacement such as rutting or ribbons, continuous mud splash or tire slide, fines being pumped through road surfacing from the subgrade, resulting in a layer of surface sludge.

- Hauling on natural surface or rocked roads would not resume for a minimum of 48 hours following any storm event that results in ½ inch or more precipitation within a 24 hour period, and until road surface is sufficiently dry to prevent any of the above conditions from occurring, and as approved by the Authorized Officer.

- Non-emergency road maintenance work would occur during the dry season (generally between May 15 and Oct 15). Certain activities (blading of aggregate roads, rocking, cross drain installation) would be permitted during the wet season (generally between Oct 15 - May 15) when conditions are dry. If these activities occur within 200 feet of streams, sediment control devices would be placed and maintained as necessary to prevent action-related stream sedimentation.

- No ditch maintenance would occur during the wet season unless for safety or resource protection. Work would be suspended during precipitation events or when observations indicate that saturated soils exist that includes visible runoff or might cause elevated stream turbidity and sedimentation.

- Blading and vegetation removal would be avoided unless deemed necessary to remove drainage impediments when maintaining inboard ditches. Sediment control measures would be evaluated and implemented if necessary where ditchline blading is required within 200 feet of streams.

- Waste material from road maintenance activities would be placed in stable disposal areas a minimum of 200 feet from any stream and in a location where sediment laden runoff

can be confined. Where necessary, erosion control measures would be installed to minimize sediment delivery to streams.

- Dewater streams during culvert removal, replacement, and installation to minimize the movement of sediment downstream.

- Install downspout structures and/or energy dissipaters (e.g., rock material) at newly installed cross drain outlets or drain dips where water is discharged on unprotected fill-slopes to reduce potential for soil erosion.

- All soil disturbances associated with road drainage improvement and culvert installation / replacement shall be within the existing road Rights-of-Way except for splash pads at the end of downspouts.

- All ground disturbance, other than ditchline cleaning, within 200 feet of any stream shall be mulched with weed free straw or native materials. A minimum of 80% ground cover shall be maintained following such activities. Native seed and mulch would be applied to all soils that are disturbed or exposed during stream culvert removal, replacement, and installation in the same operational season the work is completed.

- If appropriate gradation of aggregate and suitable particle hardness to protect road surfaces cannot be achieved to protect water quality, haul would be limited to the dry conditions and/or install and maintain sediment control devices.

- Blade and shape roads to conserve existing aggregate surface material, retain or restore the original cross section, remove berms and other irregularities that impede effective runoff or cause erosion, and ensure that surface runoff is directed into vegetated, stable areas.

- When cleaning ditchlines, undercutting cut-slopes would be avoided. This includes cleaning ditchlines hydrologically connected to stream channels. Routine machine cleaning of ditches and blading during the wet season would be avoided, generally October through May of the next calendar year.

- Retain low-growing vegetation on cut-and-fill slopes.

- Prior to winter hauling activities, implement any of the following structural road treatments as needed: examples include increasing the frequency of cross drains, installing sediment barriers or catch basins, applying gravel lifts or maintaining current asphalt road surfacing at stream crossing approaches, and cleaning ditchlines.

- Inspect and maintain culvert inlets and outlets, drainage structures, and ditches before and during the wet season to diminish the likelihood of plugged culverts.

- Flowing water would be diverted around each culvert or cross drain installation site whenever sufficient water volume exists. Diverted water would be returned to the channel immediately downstream of the work site. Effective erosion control measures

would be in place at all times during installation, and would be removed from the channel prior to October 15th of the same calendar year. Seepage water from the de-watered work area would be pumped to a temporary storage and treatment site or into upland areas and allowed to filter through vegetation prior to reentering the stream channel.

- Sediment reduction techniques would be implemented to reduce sedimentation into Oregon Coast Coho critical habitat. Sediment reduction techniques such as settling basins, brush filters, sediment fences and/or check dams to prevent or minimize sediment conveyance to streams. Specifically these sediment barriers at perennial stream crossings on BLM roads (31-08-30, 31-08-31.0, 31-08-31.1, 31-09-25.3, 31-09-12. 31-09-35.1, 32-08-04.2, 32-08-10.2, 32-09-02.0, 31-09-04, 31-09-09.1, 31-09-10.1, 31-09-12, 31-09-26, 31-09-35.0, 32-09-07.0, 32-09-07.1, 32-09-07.2, 32-09-10, and 32-09-16.1).

- Stored sediment behind erosion control devices would be removed from ditchlines and disposed of in a stable location outside the Riparian Reserve.

- Prior to the onslaught of a precipitation event, sediment barriers would be placed by the purchaser according to specifications and locations outlined by the BLM fish biologist, hydrologist, engineer, and contract administrator. These barriers would be maintained and monitored (in accordance with the Oregon Department of Environmental Quality (ODEQ) Erosion and Sediment Control Manual, 2005) by the purchaser and contract administrator during haul route usage.

- During roadside brushing, vegetation could be removed from the site, lopped and scattered or hand pile and hand pile burned. If uprooting is necessary to remove undesirable species from the ditchline or roadsides within 200 feet of stream crossings on hydrologically connected roads, it would be ensured that sediment control devices are installed and properly maintained, and removed when the site stabilizes.

- Where necessary, downspouts and/or energy dissipaters would be utilized for drainage outlets.

- BMP number 18 that addresses dust control activities would be applied to the locations described in Table 32 as needed.

- To caution forest road users of potential hauling and operational activities, warning signs would be placed where appropriate to satisfy Oregon Safety and Health Administration (OSHA) standards. The proper use and maintenance of the signs will be monitored using Oregon OSHA regulations.

<u>Temporary Route Construction</u>

- During construction, rehabilitation, and winterization of roads, temporary routes, skid trails, and landings, runoff water would be diverted away from headwalls, slide areas, high landslide hazard locations or steep erodible fill slopes.

2.3.3 Fragile Soils

Fragile Suitable Nutrient Restricted (FWR)

(Portions of units: *07-03, 07-09, 13-02, and 21-09****)***

- Ground-based logging operations would occur during dry conditions.

- Lop and scatter activity slash over yarding corridors and across remaining FWR soils in the unit. Where slash quantity is such that lop and scatter treatment alone would result in an increase in the fire hazard classification, hand pile and burn high concentration areas outside yarding corridors.

Fragile Gradient Restricted (FGR)

(Portions of units: *01-05, 01-11, 02-02, 02-15, 03-01, 03-02, 04-12, 05-06, 05-19, 07-05, 07-28, 09-03, 09-08, 11-19, 02-01B, 05-06B, 11-19B, 15-11A, 15-11B, 15-19, 23-03, 23-04, 23-34, 23-43, 25-11, 31-05, 03-08, 04-07, 07-07, 09-01, 10-04, 10-07, 11-03, 09-01B, 11-19B, 15-04, 15-18, 20-04, 21-04, 25-04, 33-01, 33-03, 33-07, 33-08, 33-18, 35-08****)***

- Hand construct waterbars and lop and scatter activity slash within the FGR to control erosion. Where slash quantity is such that lop and scatter treatment alone would result in an increase in the fire hazard classification, hand pile and burn high concentration areas outside yarding corridors.

2.3.4 Riparian Zones

<u>Harvest Operations</u>

- On all units with Understory Reduction, a minimum 25 feet from bankfull width no-treatment buffer would be used for intermittent and 50 feet for perennial streams to protect streambank stability and riparian vegetation within the protection zone. Ignition of pile burning could occur in this area as long as the ignition source is outside the 25 or 50 foot buffer.

- On all units, a minimum 50 feet from bankfull width Ecological Protection Zone (EPZ) buffer for commercial extraction shall be used on all intermittent streams.

- On all units, a minimum 120 feet from bankfull width EPZ buffer for commercial extraction shall be used on all fish-bearing and perennial streams.

- Springs and perennial wet areas would receive a radial buffer to prohibit any overstory canopy removal or ground disturbance. This buffer would extend outwards from the edge of the riparian vegetation for a distance equal to the EPZ width designated for that unit, or 100 feet (whichever is smaller) in order to protect the ecology of these sites.

- Slumps, intermittent seeps, wetlands, and other unstable areas would be buffered (no

treatment) by leaving one row of overstory trees or a 25 foot diameter (whichever is greatest), from the outer edge of instability, around these areas for soil stabilization.

- Unless unsafe, trees within Riparian Reserve boundaries (one or two site potential trees) would be directionally felled away from the stream. Upslope trees would not be felled into Riparian Reserves.

- Trees in no-harvest portions of Riparian Reserves accidentally knocked over during falling and yarding would be retained on site for fish/wildlife habitat.

- Cleaning culvert inlets in stream channels would occur during the low flow period (generally July 1 to September 15) in accordance with Oregon Department of Fish and Wildlife (ODFW) in-stream work period guidelines.

- Upon completion of harvest, all existing skid trails and landings utilized during this harvest activity within Riparian Reserves would be discontinuously sub-soiled (scarified), seeded, water-barred, mulched, and blocked, (as described above for upland skid trails).

- When utilizing existing landings that have the potential to release eroded fines into a stream or wet area directly or via draws or ditchlines, silt fencing or other sediment control measures would be properly placed and maintained during use and periods of non-use, to keep eroded material onsite. Silt fencing and/or other sediment control measures would be removed after rehabilitation activities are accomplished.

<u>Hazmat</u>

- Contractors must prepare a Spill Prevention, Control, and Countermeasure Plan for all hazardous substances to be used in the contract area, as directed by the Authorized Officer. Such a plan would include identification of the Purchaser's representatives responsible for supervising initial containment action for releases and subsequent cleanup.

- Such plans must comply with the State of Oregon DEQ OAR 340-142, Oil and Hazardous Materials Emergency Response Requirements.

- Hydraulic fluid and fuel lines on heavy mechanized equipment would be in proper working condition to minimize potential for leakage into streams. No re-fueling of heavy equipment would occur within 150 feet of streams or stream crossings. Absorbent materials would be required onsite to allow for immediate containment of accidental spills.

- Refueling of chainsaws and heavy equipment would be done no closer than 150 feet from any stream or wet area. Spilled fuel and oil would be cleaned-up and disposed of at an approved disposal site.

- Fire suppression foam would not be used within 150 feet of streams or wetlands.

2.3.5 Bureau Special Status and Survey and Manage Plant Species

Harvest Operations

- For Bureau Sensitive and Survey and Manage plant species within final units, no harvest activity would occur within a minimum of 25 feet from the population boundary (a site, or the outer edge of a polygon encompassing the population).

- No tree falling or yarding would occur in buffered sites.

- Anchor trees would not be located within known sites.

- Construction of new landings would be at least 100 feet from known sites. Use of an existing landing could occur if the location of the plant(s) is more than 100 feet away. Use of existing landings within 100 feet of a plant would not occur unless approved by the botanist.

- Proposed logging road locations, including temporary routes, would be surveyed. A minimum 100 feet buffer would protect populations, unless otherwise approved by the project botanist. Use of existing roads within 100 feet of a plant could occur.

Activity Fuels and Prescribed Fire

- Buffer sizes for understory reduction would be a minimum of 5 feet from the occurrence boundary.

- Manual slashing (chainsaws) and brushing through buffered sites could occur during the dormancy period (July through January). No mechanical equipment in buffers.

- Cut material would be lopped and scattered or piled and burned outside of buffers where beneficial to species in coordination with project botanist.

- Mechanical thinning/brushing (e.g. tracked vehicles) would occur 100 feet from buffers and no vehicles or heavy equipment would occur within buffers. Hand treatment could occur within buffers, as previously described.

- Bureau Sensitive and Survey and Manage botanical species would be protected by the no treatment buffers to minimize adverse impacts from project activities. Site management requirements are provided in the Botany Species Survey and Site Management section. Minimum buffer size is determined by habitat requirements and existing habitat conditions on a case-by-case basis.

- Trees would be directionally felled away from all no disturbance buffers.

- Prescribed burns would only occur during cool, moist weather conditions in units that contain Special Status Species (See Table 33 for specific units).

2.3.6 Noxious Weeds

Harvest Operations

- To prevent the potential spread of noxious weeds into the Medford District BLM, the operator would be required to clean all logging, construction, chipping, grinding, shredding, rock crushing, and transportation equipment prior to entry on BLM lands. Cleaning shall be defined as removal of dirt, grease, plant parts, and material that may carry noxious weed seeds into BLM lands. Cleaning prior to entry onto BLM lands may be accomplished by using a pressure hose.

- Only equipment inspected by the BLM would be allowed to operate within BLM lands. All subsequent move-ins of equipment as described above shall be treated the same as the initial move-in.

- Prior to initial move-in of any equipment, and all subsequent move-ins, the operator would make the equipment available for BLM inspection at an agreed upon location off federal lands.

All Project Actions

- To prevent the further spread of noxious weeds and reduce soil erosion, native seed and certified weed-free straw would be used for post-treatment restoration where project activities such as temp road decommissioning, landing construction, and other such activities result in bare soil.

2.3.7 Wildlife

All Project Actions

- All existing snags would be reserved from cutting unless they pose a safety hazard, in which case they would be left on the ground in the unit.

- Coarse woody debris (CWD) would be retained and protected from disturbance to the greatest extent possible during logging, burning, and other project activities.

Northern Spotted Owl (Threatened)

- Any of the following measures may be waived in a particular year if nesting or reproductive success surveys conducted according to the USFWS survey guidelines reveal that NSOs are non-nesting or that no young are present that year. Waivers are valid only until March 1 of the following year. Previously known well-established sites/activity centers are assumed occupied unless protocol surveys indicate otherwise.

All Project Actions

- Activities (such as tree felling, yarding, temporary route construction and re-construction, hauling on roads not generally used by the public, prescribed fire, and muffled blasting) that produce loud noises above ambient levels would not occur within specified distances (Table 3) of any documented or projected owl site between March 1 and June 30 (or until two weeks after the fledging period) – unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in their nesting attempt. The distances may be shortened if significant topographical breaks or blast blankets (or other devices) muffle sound traveling between the work location and nest sites.

- The action agency has the option to extend the restricted season until September 30 during the year of harvest, based on site-specific knowledge (such as a late or recycle nesting attempt) if the project would cause a nesting NSO to flush (See Table 2-5 for disturbance distance).

- The buffer distance to the prescribed area may be modified by the action agency biologist using topographic features or other site-specific information. Buffer distance for prescribed fire may be reduced if substantial smoke from prescribed fire would not enter the nest stand from March 1 to June 30. The restricted area is calculated as a radius from the assumed nest site (point).

- No burning would take place within 0.25 miles of NSO sites between March 1 and June 30 (or until two weeks after the fledging period) unless it is determined that substantial smoke would not drift into the nest stand.

Table 3: Disturbance Distances from Various Activities to Avoid Disturbance to NSOs

Activity	
Heavy Equipment (including non-blasting quarry operations)	105 feet
Chain saws	195 feet
Type 1 or Type 2 helicopter	0.25 miles (If below 1,500 feet above ground level)
Prescribed fire/Activity fuel burning	0.25 miles

Marbled Murrelet (Threatened)

- Work activities that produce noise above ambient levels in Survey Zones A and B would not occur within specified distances (see Table 4) of any occupied stand or unsurveyed suitable habitat from April 1 through August 5. Work activities would be confined to the time period between 2 hours after sunrise to 2 hours before sunset from August 6 through September 15.

- Clean up trash and food daily at all construction and logging sites.

- Prescribed fire would not take place within 0.25 mile of known occupied marbled murrelet sites, or un-surveyed marbled murrelet habitat between April 1 and August 6 unless it is determined that substantial smoke would not drift into the occupied site or suitable habitat.

- All burning operations would be completed in the period from two hours after sunrise to two hours before sunset.

Table 4: Noise Disturbance distances from various activities for Marbled Murrelet

Activity	
Helicopter Type 1 or 2	0.25 miles
Helicopter Type 3 or 4	120 yards
Heavy equipment	120 yards
Chainsaws (hazard trees, tree harvest, etc.)	120 yards
Impact pile driver, jackhammer, rock drill	120 yards
Burning (unless it is determined that substantial smoke would not drift into the occupied site)	0.25 miles

2.3.8 Port Orford Cedar Root Disease Management

All Activities

- The Proposed Action would be consistent with management direction in the Port-Orford-cedar EIS (*See POC Risk Key in Appendix F*).

- Restrict haul to dry conditions to substantially reduce the risk of spreading POC root disease from infested to uninfested areas (T31S-R09W-Sec.11, 21, 27, and 33; T32S-R10W-Sec.1; and T32S-R08W-Sec.5, 9, and 11).

- To substantially reduce the risk of spreading POC root disease from infested to uninfested areas, wash soil off all equipment and boots in units 1-5, 1-11, 9-1, 9-8, 11-8, 11-13, and 33-1 in an approved location after harvest before leaving the unit..

2.3.9 Air Quality / Smoke Management

<u>Activity Fuels and Prescribed Fire</u>

- Local residents would be advised of prescribed burning through news releases.

- Prescribed burning would occur under atmospheric conditions that allow for the mixing of air to lessen the impact on air quality. All prescribed burning would be managed in a manner consistent with the requirements of the Oregon Smoke Management Plan administered by the Oregon Department of Forestry and the regulations established by the Air Quality Division of the Oregon Department of Environmental Quality.

- Burning of slash piles would occur after a sufficient period of curing (generally over a year) and adequate seasonal moisture to ensure desired consumption of material and to

minimize risk of fire escape. Smoke clearance(s) would be obtained prior to ignition to minimize impacts on air quality.

2.3.10 Cultural Sites

All Project Actions

- If cultural resources are discovered during project implementation, the project would be redesigned to protect the cultural resource values present, or evaluation or mitigation procedures would be implemented based on recommendations from the Resource Area Archaeologist with input from federally recognized Tribes, approval from the Field Manager, and concurrence from the State Historic Preservation Office.

2.3.12 Off-Highway Vehicles

Harvest Operations

- If unauthorized OHV use is identified within harvest units, during active yarding operations, vegetation would be pulled back over skid trails upon project completion to minimize OHV use of the area.

2.4 Seasonal Restriction Table

Table 5: Summary of Seasonal Restrictions and Operational Periods

Restriction	Resource Concern	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Activities that produce loud noises above ambient levels within 0.25 miles of NSO site.	NSO critical nesting time March 1st through June 30th												
Activities that produce loud noises above ambient levels within 120 yards of marbled murrelet habitat	Critical MAMU nesting time April 1st through Aug 5th; partial restriction through Sept. 15th												
Road building, maintenance, or renovation including culverts	Water quality and sedimentation – dry condition only												
Landing construction & rehabilitation	Water quality and sedimentation – dry condition only												
Ground based yarding	Water quality and sedimentation – dry condition only												
Hauling	Water quality and sedimentation – dry condition only												
Logging operations	Fire season, ODF regulated use												

Key Operations generally allowed. Operations restricted, modified or allowed depending on conditions. Operations generally restricted

Chapter 3 Environmental Effects

Chapter 3 describes the environmental effects to resources of implementing any of the alternatives. Methodologies, assumptions, and scale of analysis for each resource are disclosed. A description of the resource existing conditions is provided. Effects of the alternatives are then described based on what is proposed in the No Action Alternative 1, Alternative 2, and Alternative 3. Projects considered for the cumulative effects analysis for each resource can be found in Appendix C.

3.1 Vegetation

Methodology

The initial coarse scale analysis for the Planning Area (PA) was conducted through searches of BLM databases such as MicroStorms, Geographic Information Systems (GIS), forest operational inventory (FOI), LiDAR, and aerial photography. Surveyors collected data during from 2015-2016 through formal stand exams that updated age classes, 10-year and annual growth patterns, relative densities, stocking, and species composition. Specialists performed field surveys to determine stand condition and developmental pathways. Specialists also combined this data with wildlife habitat analyses through a process that followed USFWS guidance and associated tools in evaluating where to enhance habitat and demographic conditions for NSOs, as well as where to maintain habitat and minimize effects to NSOs, where appropriate.

Assumptions

Collected data is a snapshot in time and projections of growth are subject to dynamic changes that influence forest development (e.g. annual precipitation, wind events, etc.). In addition, the risk of wildfire is ever-present where a single event can alter stand conditions along a new developmental pathway. Past and future treatments reduce fire risk by directly reducing fuels and by reducing the densities that contribute to fuel buildup. However, abiotic variables also influence fire behavior and its effect on vegetation. Variables that influence size, rate of spread, and severity include but are not limited to the time of year, point of ignition, accessibility by suppression forces, temperature, wind speed, terrain, aspect, slope, position on slope, etc. Treatments are subject to the degree that these abiotic variables factor into contributing to fire growth and severity.

3.1.1 Affected Environment

The PA is located in the West Fork Cow Creek 5th field watershed and within the mixed evergreen zone of vegetation (commonly referred to as mixed conifer and hardwood forest). This zone is generally characterized by an upper layer of conifers and a lower layer of hardwoods (Franklin and Dyrness 1973, p. 133). Factors affecting the vegetation patterns within the PA include non-living external influences (abiotic) as well as living ones (biotic).

Abiotic Conditions

Abiotic factors are those non-living components of the environment that, in this discussion, include those external factors influencing vegetation growth, productivity, and resilience to disturbances including climate extremes. Factors influencing vegetation patterns include, but are not limited to elevation, aspect, precipitation, temperature, and soils.

Elevations range from 1,000 feet to 4,000 feet above sea level. Lower elevations and south aspects can exhibit more cover in ponderosa pine, California black oak, and occasionally white oak; whereas higher elevations and more productive soil types display more tanoak, white fir, and golden chinquapin. Those elevations above 3,000 feet receive greater amounts of snowfall and longer periods of long duration, slow saturation in the form of snowmelt. Elevations below 3,000 feet receive precipitation mainly in the form of rainfall which provides shorter periods of soil saturation and are therefore relatively less productive in growth than higher elevations. North aspects are less exposed to the drying effects of sun exposure than South aspects. North aspects above 3,000 feet elevation remain the most productive areas.

The PA receives an average annual precipitation range from 60-90 inches and extended summer drought. Higher rainfall areas in the PA exhibited fire frequencies of at least 50-80 years, if not substantially longer. Overall, the forested areas in the watershed are slowly expanding and the competition from undergrowth (including conifers, shrubs, and hardwoods) is increasing. This translates to increased competition for water and nutrients resulting in reduced growth and escalated mortality in both the overstory and understory.

Climatic conditions affect vegetation growth, vigor, and its response to disturbances. It also affects larger scale ecological processes of forest communities as well as habitat for wildlife. The Revised Recover Plan for the Northern Spotted Owl (USFWS 2011, p. III-5) suggests that ongoing climate change is affecting spotted owl habitat conditions and landscape ecological processes, in turn affecting both the species' habitat and its distribution. According to the National Oceanic and Atmospheric Administration (NOAA 2015) southern Oregon is experiencing a persistent hydrologic drought with ecological impacts on forests and wildlife. From November 2013 to January 2014, Oregon was the third driest state in the 1895-2014 precipitation pattern record (NOAA 2014). Tappenier et al. (2007, p. 40) point out that "dense stands of trees often undergo moisture stress, especially during prolonged drought. Soil properties and competition largely determine the amount of water available to plants." These droughty conditions, especially on south facing slopes and lower productive sites, can have lasting effects on the landscape, causing widespread stress to individual trees and their ability to resist change, including drought stress, insects and diseases, and fire.

The Cold Elk PA is immediately adjacent to the western perimeter of the 2013 Douglas Complex. The fire perimeter overlaps two sections of the southeast end of the PA namely in T32S-R8W-Sec. 3 and 11. The Douglas Complex consumed 48,672 acres with 25,349 of these acres on BLM lands – 4,800 of which exhibited moderate to severe fire intensity. Although short-term drought conditions have recovered, the effects of drought over the last several years have taken their toll on tree vigor in the PA. The spatial and temporal proximity of the Douglas Complex to the Cold Elk PA coupled with its exhibited explosive growth potential presents a

reminder to land managers that the threat to forests from fire and the subsequent loss of NSO habitat due to fire remains ever present.

High temperatures are a major contributing factor to large fire growth. The interior valleys of southwestern Oregon typically have hot, dry climates with environments generally much more severe (temperatures higher and sites drier) than in northwestern Oregon (Franklin and Dyrness 1973, pp. 42, 132). Although Oregon's precipitation ranking has normalized over the last one year and five year periods (NOAA 2016a), Oregon's temperatures over the last one, two, and five year periods recorded the warmest on record (NOAA 2016b). If fall and winter days are too warm, this can shorten the growing season of trees as spring budbursts could be delayed and summer droughts set in early (Harrington and Gould 2016). Moreover, warmer fall and winter days could further affect tree vigor as well as the diversity of tree species. Fewer chilling temperature days were demonstrated to have affected regeneration of pine where the terminal buds, responsible for height growth and a major determinant in inter-tree competition, failed to burst and thereby forestalled normal development (Harrington and Gould 2016). With warmer climates, pine would remain at a competitive disadvantage to other tree species that retain the ability to shift their growing season to the most efficient period between frost and drought.

Soils are another contributor to forest productivity. Soil properties and inter-tree competition largely determine water availability to plants (Tappeiner et al. 2007, p. 40). Section 3.4 - Soil Productivity and Compaction discusses the influence of soil on vegetative productivity in depth.

Biotic Conditions

Other factors influencing tree growth, forest condition, landscape patterns, and vigor of forest vegetation are those living or biotic components. While aspect, temperature, and precipitation greatly dictate species composition, so does the interaction of plant organisms themselves. Inter-tree competition as well as the effect of insects and diseases modify the physical structure of the environment. Human interactions in the form of policy direction and management intervention also contribute to forest structure and composition.

Within the PA forest composition is varied and highly fragmented by clearcuts within a checkerboard ownership pattern. On highly productive sites, stands 150-200 years old often have the open undifferentiated structure of mature stands; while on lower sites, multi-layered canopies and snag creation occur at much younger ages (BLM 1997, p. 25). Stands 80-150 years old often do not possess all the structural characteristics required for some species in that they occur mainly as mature stands with closed canopies, single canopy layers and few snags (BLM 1997, p. 25).

Two major plant groupings characterize the majority of forestland in the PA: Douglas-fir/tanoak-madrone and mixed conifer/madrone deciduous brush/salal (BLM 1997, p. 17). The Douglas-fir group is composed of an overstory of Douglas-fir and a minor component of sugar pine. It supports dense, old growth forests with a closed canopy overstory. Some lower quality sites have fewer stand densities and lower canopy cover than stands on higher sites. Lower sites are primarily those that dominate southerly aspects and shallow soils. They contain a Douglas-fir overstory with a secondary component of sugar pine, incense cedar and ponderosa pine, but generally cannot support late seral/old growth characteristics, namely closed canopy, old growth

forest conditions due to shallow soils, rockiness, nutrient deficiency and droughtiness. These sites fail to support large closed canopy Douglas-fir forests. Where canyon live oak is present some larger (> 16 inch) coarse woody debris (CWD) populates the forest floor in varied amounts where Douglas-fir has receded. These drier, rockier sites exhibited a fire return interval of less than 50 years. On these sites the absence of any disturbances, either from fire or management intervention, has drastically altered these areas where stand densities are now extremely high and would readily carry fire causing severe impacts to vegetation (Figure 7).

Figure 7: Condition of undisturbed stands

The stem densities in these stands inhibit the stand vigor and resiliency required to withstand environmental changes such as wildfire and climate extremes. Undisturbed forests can accumulate an unprecedented amount of vegetative growth, causing detrimental impacts to forests including: increased competition, reduced vigor, increased fuel loading, and threats to habitat loss from fire. The pictured sites would readily carry fire into adjoining lands which can alter entire landscapes. Forests that are left unmanaged also alter the species composition. Certain species are more sensitive to overstocking. Because pine and oaks are shade intolerant, they are typically the first to succumb to competition (as seen in the lower left). The aggregated result is a decline in species diversity across the landscape.

Knobcone pine communities are found on droughty sites with limited nutrients in the westernmost portion of the PA. These stands are noticeably nutrient deficient with chlorotic and slow growing vegetation. Stands have lower growth potential and only support lower timber volumes.

The mixed conifer/madrone-deciduous brush/salal grouping is a smaller component of the watershed characterized by an overstory of Douglas-fir and a minor component of sugar pine, white fir, western hemlock, incense cedar, western red cedar, and occasionally Port-Orford cedar. Hardwoods are a smaller portion of the canopy in the mixed conifer type than they are in the Douglas fir/tanoak/madrone type. This grouping occurs primarily on northerly aspects and along higher elevations. A small amount of white oak stands appear in isolated areas of shallow soils and along ridges. These sites are dominated in the overstory by white and black oak and occasionally ponderosa pine and Douglas-fir, with grass as the primary ground cover. The reduction in the occurrence of wildfire has allowed for conifer encroachment into these areas.

Vegetation community subseries percentages were collated through GIS and are presented in Table 6. These areas reflect both private and Medford District BLM administered lands within the PA. The table below shows that moist Douglas-fir forests comprise less than half of the vegetation subseries. Field surveys on BLM administered land display a larger presence of dry Douglas-fir forests and very small amounts of white fir forests. No detections of Jeffrey pine were recorded on BLM administered land during field surveys of the PA.

Table 6: Vegetation Classes in the Cold Elk PA

Vegetation Sub Series	Approximate BLM Acres	Percentage BLM
Douglas-fir dry	4,016	25
Douglas-fir moist	2,443	15
Jeffrey pine	69	0
Tanoak Douglas-fir dry	3,689	23
Ultramafic	26	0
Western hemlock Coast intermediate NWO	12	0
Western hemlock coastal	3,463	21
Western hemlock hyperdry	1,026	6
Western hemlock intermediate	713	4
Wet nonforest	577	4
White fir cool	43	0
White fir intermediate	45	0
TOTAL	**16,124**	**100**

The natural pure shrubland component has seen decreases in areas where they once existed and now exhibit an increase in conifer encroachment. Natural conifer regeneration is capable of growing under limited light conditions under the shade of an ever expanding overstory. The impact is most prominent on the rockier, drier areas that are prone and adapted to more frequent fires.

Species Diversity

Overall, species composition has become increasingly less diverse. Douglas-fir vastly dominates the landscape leaving little room for the proliferation of shade intolerant species (Table 6). Pine, incense cedar, and oaks are only occasionally present. Sugar pine occurs more frequently, but seedlings rarely germinate due to the dense shade in predominantly overstocked stands. The more mesic areas in the PA contain small amounts of western hemlock, predominantly in the understory. Understories are mostly comprised of evergreen huckleberry, rhododendrons, ferns, shrub tanoak, and dead fuel. In general, very little to no understory recruitment of the most fire resilient tree species is occurring within units, namely among shade intolerant pine, California black oak, Oregon white oak.

Douglas-fir moreover, often encroaches into Oregon white oak savannahs (Figure 8) and meadows. Both of these ecological features show recession in size, quality, and quantity to the establishment of Douglas-fir. Swanson (2007) observed that:

> Through much of the Northwest, montane meadows - those at elevations where snowpack is not deep or persistent - are slowly giving way to forest in a phenomenon referred to as 'conifer encroachment.' Increasingly, meadows that were open throughout recent memory are filling with conifers. Trees are either marching in waves from the forest edge or are forming tree islands that gradually coalesce . . . we know that forests and meadows have formed a shifting mosaic over the centuries. However, recent encroachment appears more extensive and rapid that had occurred historically.

Figure 8: Douglas-fir encroachment

Unit 21-4

Douglas-fir has the competitive advantage over shade intolerant species such as pine and Oregon white oak. Douglas-fir behaves as both a pioneer species and a prolific seeder, giving it the ability to regenerate and persist in unoccupied growing spaces such as the edges of meadows and oak savannahs pictured here. However, Douglas-fir rarely attain their size potential on these lower productive sites.

Unit 3-4

Douglas-fir, the most common tree species, produces conditions that favor large fire growth and intensity. Douglas-fir is self-pruning, often sheds its needles and tends to increase the rate of fuel buildup and fuel drying (Atzet and Wheeler 1982, pp. 8-9). Fire suppression has also allowed tree needles, bark, and limbs to accumulate at tree bases, especially near legacy trees, raising the chances for fires to burn more severely and reside longer which is likely to kill cambiums and roots. The condition is then set to always favor shade tolerant species for many decades, until a disturbance event, or management intervention disrupts this process. The shift in species composition to Douglas-fir has only enhanced the competitive status of shade tolerant trees, increasing its absolute cover and relative density, thereby increasing the overall fire hazard potential which can denude entire landscapes. Oliver et al. (2014) note that:

> The shift toward shade-tolerant species limits the establishment and development of large fire- and drought-resistant pines, and shifts stands toward less fire- and drought-resistant species.

The authors add that “a change in species composition of the forest will change its resilience.” The boom and bust cycle of Douglas-fir ingrowth followed by large wildfire conflagrations is an unprecedented shift from historical conditions. This cycle can be interrupted, curtailed, or lessened by low severity disturbances such as active management or by less reliable natural events such as windthrow and wildfire.

Table 7: Species composition (% proportion)

Source: 2015-2016 BLM stand exam data

Species	Stems	% Proportion
Bigleaf Maple	2	0.04
California Black Oak	1	0.02
Canyon Live Oak	68	1.52
Douglas-fir	3,614	81.03
Golden Chinquapin	259	5.81
Incense Cedar	13	0.29
Knobcone Pine	3	0.07
Pacific Madrone	127	2.85
Pacific Yew	6	0.13
Ponderosa Pine	19	0.43
Red Alder	17	0.38
Sugar Pine	64	1.43
Tanoak	146	3.27
Western Hemlock	80	1.79
Western Redcedar	13	0.29
White Fir	28	0.63

Forest Disturbance Processes

For centuries, frequent low intensity fires shaped the landscape across southwest Oregon. The suppression of fires has removed this disturbance process responsible for a mosaic vegetative pattern across this warmer, drier climate. Fire exclusion applies both direct and indirect impacts on standing structure. Where stands remain undisturbed, fuels accumulate over time and fires become more difficult to control. Emergency suppression activities then require greater effort and more aggressive actions to control wildfires. This results in greater impacts to resources and habitat loss (Figure 9). Chapter 3.2 discusses fire and fuels in greater depth including other effects on vegetation.

Figure 9: Suppression related impacts to standing tree structure

The more difficult a fire is to control, the greater the impacts to habitat required during fire suppression activities, including the indiscriminate felling of valued wildlife structure.

Besides fire, other disturbance agents affecting forested stands in the PA include forest pathogens. Laminated root disease *(Phellinus sulphurascens)* is found throughout T31S-R9W-Sec.25. Susceptibility and damage varies by species and the fungus causes severe root and butt decay, growth loss, and mortality. Infected live trees can be easily windthrown. Douglas-fir, white fir, and mountain hemlock are highly susceptible to laminated root rot. Disease centers could range from a few trees to multiple acres, even infecting susceptible seedlings (Figure 10). Young infected trees could be killed within a few years. The effects on plant growth include reduced height, needle dieback, canopy cover reduction, crown transparency, and susceptibility to insect infestations (Thies and Sturrock 1995). Nelson et al. (1981) state that as a general rule, losses can be expected to double about every 15 years, adding that:

> New stands of susceptible species established on infested sites can be expected to suffer continuing and increasing mortality. Because the fungus can survive in roots of killed trees and in stumps and because it spreads from one tree to another where their roots contact, the more prompt and better stocked the regeneration, the more severe this continuing mortality is likely to be.

Laminated root disease can impede site productivity for decades. The tree species severely damaged by *Phellinus sulphurascens* in the PA include Douglas-fir and white fir, whereas western hemlock is moderately damaged. Species found in the PA that are not damaged by *Phellinus sulphurascens* include western red cedar, Port Orford cedar, and incense cedar, while pine species are seldom damaged. Bark beetles are secondary mortality agents often drawn to infected sites, accelerating the effects of mortality. While *Phellinus sulphurascens* can enhance diversity by creating openings, altering forest composition and succession, its presence will cause repeated mortality in new generations of susceptible species that typically die at an early age and never attain large size. Its ability to infect and colonize is also not associated with tree vigor. The continued presence and regeneration of susceptible species increases the incidence of *Phellinus sulphurascens*. Planting immune or low susceptible tree species can break the continuity of the below ground inoculum, slowing its spread and allowing resistant trees to attain large size, structure, and canopy cover.

Figure 10: Unit 25-4D: Laminated root rot infection center

Douglas-fir and its regeneration are severely damaged by *Phellinus sulphurascens*. The presence of this disease in a stand impedes its ability to grow large woody structure.

Stand Density

Stand exams began October 2015 and are currently ongoing on over 4,714 acres of BLM administered land in the PA on stands over 30 years of age. Secondary field surveys assessed species composition, diameter distribution, commercial volume, and stand density, revealing conditions affecting forest health (e.g. damage to trees, insect and diseases, and mortality). Collected stand data was also used to compute the intensity of competition within a stand expressed as relative density (RD). Drew and Flewelling (1979) identified the zone of imminent competition mortality occurring between 0.55 and 1.0 RD. A RD of 1.00 means that trees on the site occupy the full growing space with mortality levels equaling stand growth. At higher densities the growth rates of individual trees slow down (Davis and Johnson 1987, p. 79), therefore tree vigor declines with increasing competition. Stressed trees can easily succumb to competition mortality and are more susceptible to die from secondary disturbance agents such as fire, insects, and diseases. Stand exam data indicated an average RD of 0.80, within the zone of imminent competition mortality.

Larsson et al. (1983) point out that ponderosa pine vigor decreases as stand density increases, suggesting that comparatively few beetles are needed to kill low vigor trees. As a general rule, stands that contain less than 150 square feet of basal area per acre (BA/AC) are less prone to pine bark beetle attack. Stand exam data recorded an overall average live tree BA of 255 ft^2/acre. A

RD of 0.80 coupled with an average 255 ft^2/BA/AC indicates that surveyed stands are not just facing imminent competition mortality, but that pine are highly susceptible to mortality. Moreover, recent burned areas, such as the 2013 Douglas Complex have provided source material for beetles to infest, breed, and populate in numbers with the potential to spread into adjoining forested lands.

Other stand exam data outputs reported conditions on canopy cover, average diameter, snags, CWD, among others. The estimated canopy cover from 531 stand exam plots averaged 86%. Average diameters from both trees and saplings averaged 9.2 inches DBH, while snags ≥16 inches DBH averaged 2 per acre. CWD summary reports from 520 transects of 200 feet each indicated a total length per acre of 1,021 ft/ac in size classes from 4-60+ inches in diameter, 3% average cover, and an average of 28 linear ft/ac of decay class 1 and 2 ≥16 inches in diameter and ≥16 feet length. The majority of down wood in linear feet consists of stems <16 inches diameter suggesting that suppression related mortality is the primary source for fuel loadings of relatively smaller diameter stems. Smaller diameter fuels often carry fire readily through a stand, increasing a fire's rate of spread and causing detrimental impacts to vegetation growth, conifer productivity, and habitat cover.

Forested areas in CHU are experiencing landscape impacts from the aggregated effects of frequent low severity fire exclusion and high relative densities. Trees in overstocked stands tie up available light, water, and nutrients prohibiting an understory from developing in many cases and contributing to competition induced mortality thereby increasing fuel loads. Disturbance mechanisms such as controlled fire and management intervention can reduce densities, provide growing space, and improve residual tree vigor in the stand to improve its ability to recover from anticipated environmental stressors such as wildfire, climate extremes, and the effects of vegetation ingrowth and competition. The current condition on the landscape is one that is prone to large scale catastrophic fire conflagrations. Overstocked stands have a greater potential for severe, stand-replacing wildfires as discussed in Chapter 3.2 - Fire and Fuels.

3.1.2 Alternative 1 – No Action

Direct and Indirect Effects

The Cold Elk Project is within the USFWS designated NSO Critical Habitat Unit KL1 – Klamath West of the latest 2012 CHU revision. Chapter 3.3 discusses this and other Wildlife Effects in greater detail. Habitat loss due to timber harvest has been greatly reduced on Federal lands over the past two decades (USFWS 2011, p. vi). Even so, NSO populations continue to decline, therefore, the USFWS recommends that "managing sufficient habitat for the spotted owl now and into the future is important for its recovery," and that simply "securing habitat alone will not recover the spotted owl" (USFWS 2011, p. vi). Stands that meet high quality NSO habitat were already deferred from treatment during an RA-10 process as well as those meeting RA-32 habitat. These treatment deferrals apply to both the Action and No Action Alternatives which are discussed in greater depth in Chapter 3.3. In the remaining stands, active management proposals are key to accomplishing short and long-term objectives in lands designated as CHU.

The West Fork Cow Creek Watershed Analysis (BLM 1997, pp. 67-68) concurs, providing both short-term (10-20 years) and long-term (20+ years) management recommendations. Short-term recommendations are described as follows:

> Plantations resulting from past timber harvest are located throughout the watershed. Management in these stands should focus on maintaining conifer stands, promoting their growth and developing habitat conditions. The specific prescriptions will vary, based on the land allocation in which the plantation occurs.
>
> Modified older stands have been partial cut in the past and may not be fully stocked. Management in these stands should promote establishment of fully stocked conifer stands.

Whereas, the long term recommendation for this watershed focuses on management according to the land use allocations in the RMP and the Northwest Forest Plan (BLM 1997, p. 67).

A No-Action scenario relinquishes the vision of active forest management recommended in both the NSO Recovery Plan (USFWS 2011) and the West Fork Cow Creek Watershed Analysis (BLM 1997) applicable to the Cold Elk Project. Specifically, the No-Action Alternative foregoes the opportunity to develop habitat, restore growing conditions, and maintains vigorous conifer stands specifically recommended in these two plans. The No Action scenario would likely rely on the lengthy process of succession (decades, if not centuries) to create complex forest structure, the desired habitat condition for the NSO.

Moreover, the No-Action Alternative opposes the Medford District Resource Management Plan directives to manage vegetation. Namely, these consist of:

1.) producing a sustainable supply of timber and other forest commodities to provide jobs and contribute to economic sustainability in the Matrix LUA (BLM 1995, p. 38);

2.) improving the health of the forest and associated habitats, reduce tree mortality, and restore the vigor, resiliency, and stability of forest stands necessary to meet land use allocation objectives (BLM 1995, p. 62); and

3.) maintaining or restoring components of the Aquatic Conservation Strategy in Riparian Reserves (BLM 1995, p. 22).

Since competing trees in dense forests grow in height, but very little in diameter (Oliver and Larson 1996, p. 75), the No-Action Alternative scenario results in delayed development of large woody structural characteristics. Overall stand growth could stagnate when stands are left in a dense and uniform condition (Tappeiner et al. 2007, p. 124). The current average RD of 0.80 of stands in the PA signifies that they are currently deep within the zone of imminent competition mortality. Drew and Flewelling (1979) approximate crown closure, and the onset of competition as corresponding to a RD of 0.15. Alternative 1 ensures the direct and indirect effect of declining individual tree and stand vigor because if a stand is allowed to grow for many years within the zone of imminent competition mortality, mortality will occur (Drew and Flewelling 1979). In dense stands, non-vigorous large trees will likely not persist and a non-vigorous stand

would likely not develop large woody structure (Figure 11). The No Action Alternative curtails the potential for stands to maintain vigorous conifer growth that would provide the habitat conditions recommended in both the NSO Recovery Plan and West Fork Cow Creek Watershed Analysis.

The conversion of stands from dense, even-aged, single storied Douglas-fir into complex forest with high value habitat would likely not occur until the next disturbance. Figure 11 depicts a typical candidate stand in this condition. Structural heterogeneity would depend entirely on the unreliable means of small or large scale disturbance events or the lengthy, many decades of competition mortality to influence stand development along a new trajectory. This would predispose the forest to vulnerabilities that threaten its progress towards achieving late-successional habitat. With 60-90 inches of annual precipitation, trees will continue to grow in height, but relatively very little in diameter. Forest floors would continue accumulating fuel from branches and limbs as trees prioritize their growth to height and shed their limbs and branches through self-pruning. Moreover, Alternative 1 would continue compounding the effects of competition mortality resulting in more fuel accumulations in the understory and poor stand development. Threats from fire, insects, and diseases, as well as the loss of fire resilient pine and oak species would remain heightened under the No Action Alternative.

Figure 11: Sites left in this condition perpetuate the already heightened inter-tree competition

These sites continue accumulating fuel loadings from competition mortality and self-pruning/thinning. They develop poorly, acquiring height growth but relatively very little diameter growth

The No Action Alternative would likely result in a continued loss in species diversity. Current competing densities threaten the persistence of minor species composition both directly by fire

risk and indirectly by the effects of competition mortality from Douglas-fir. Ponderosa pine, California black oak, incense cedar, Oregon white oak, and sugar pine would continue being replaced by Douglas-fir, thereby reducing the effectiveness of species diversity management goals in CHU (BLM 1995, p. 184). Development of stands in achieving the desired goals of the Revised Recovery Plan for the NSO (USFWS 2011) would likewise be delayed under the No Action Alternative.

Cumulative Effects

Multiple projects have been recently completed or are underway within the PA. These are presented in Appendix C of this EA. The cumulative activities relevant for this analysis are disclosed in Appendix C. Impacts to vegetation are confined to within the Cold Elk PA. Alternative 2 is expected to have a beneficial Cumulative Effect on 3,702 acres when considering other projects. Other density reduction projects on BLM administered lands, in either the overstory and/or understory, would improve conifer growth, resiliency, and vigor, which would benefit habitat conditions.

Past projects where commercial harvesting occurred within the Cold Elk Planning Area include Anaktuvuk Thin, Farout, and Rogue Cow timber sales. The first two sales involved thinning of commercial sized live trees where canopy covers of 40% or 60% were retained. The treated stands would exhibit trees with anticipated response to new growing space, improved conifer growth, and on a developmental pathway to providing large woody structure and other habitat conditions in CHU. Rogue Cow consisted of fire mortality salvage with one 30 acre unit within the PA. The treatment removed the majority of fire-killed and fire-injured trees likely to die within 4 years leaving at least 2-4 snags/acre >16 inches DBH. Subsequent tree planting has occurred that has brought stocking to an acceptable target that sustains conifer forest development.

Current and foreseen projects include the Elk Valley Roadway Clearing Timber Sale, discretionary and non-discretionary roadside hazard tree removal, young stand management projects, prescribed fire, and private industrial timber harvest/reforestation activities. The Elk Valley project involved roadway clearing within 15 feet of the road prism for transportation safety maintenance on these heavily trafficked roads within the PA. Ongoing slash disposal operations are anticipated along potentially 24.1 miles of roads. Other transportation safety treatments involve the removal of hazardous trees which is a current and foreseen activity along roadways in the PA. High traffic use along these roads has prompted the removal of individual snags and damaged overhead hazards to improve traveler safety. Young stand management is anticipated on approximately 4,000 acres of BLM lands up to the next five years. Projects include tree planting, brush cutting, pre-commercial thinning, plantation maintenance and protection treatments contingent upon budget priorities. Prescribed fire is likewise dependent on budgets and can potentially involve controlled burning of up to 1,000 acres within a five year period. Fuels reduction treatments are dependent upon a fuels budget that would facilitate their completion and involve mechanical thinning with chainsaws, hand-piling of slash, and hand-pile burning. Mechanical thinning consists of cutting vegetation up to 12 inch DBH manually to reduce surface and ladder fuels. Slash would be hand piled, covered, and burned. Low intensity under-burning may be prescribed three to five years after initial treatment to ensure desired fuel models are maintained. No logging systems would be used. Long term stand and landscape-

level beneficial effects to vegetation from this project are reduced understories subsequently improving stand density, vigor, species diversity, and resiliency.

Finally, regeneration timber harvest (350 acres) and reforestation (400 acres) is expected and foreseen on private forestland. On private forest industry lands it is assumed that these timber holdings are managed on an area controlled timber rotation of every 40-60 years and continue to be intensively managed for timber production where harvest activities generally remove the majority of the trees (BLM 1997, p. 67). These commercially-managed stands follow Oregon State Forest Practices in leaving large snags, large hardwoods, and large CWD elements. All harvest, reforestation, and haul activities would be under guidance of the Oregon Forest Practices Act. Reduced biological and structural diversity is expected in private industrial forestland which can continue long-term if planted with single crop tree species. Subsequent tree planting operations would ensure reforestation within the Oregon State Forestry Practices regulating the prompt establishment of commercial species. Forest operations on private land were anticipated in the development of the BLM Resource Management Plan (BLM 1995), the landscape planning of the Project itself (RA-10), as well as in the development of criteria for appropriate silvicultural treatments (USFWS 2011, pp. III-11 to III-38).

Fire suppression activities would continue on Federal and non-Federally administered lands. The BLM has a fire protection contract with Oregon Department of Forestry (ODF). This contract gives ODF the responsibility for fire protection on all lands within the PA. The contract directs ODF to take immediate action to control and suppress all fires. Their primary objective is to minimize total acres burned while providing for firefighter safety. The contract requires ODF to control 94% of all fires before they exceed 10 acres.

Under the No Action Alternative, vegetation would continue to develop in overstocked conditions. Untreated stands would see an increase in density related competition mortality and continue adding to surface fuels. Douglas-fir, the primary species component in the PA, produces conditions that favor large fire growth and intensity, is self-pruning, often sheds its needles and tends to increase the rate of fuel buildup and fuel drying (Atzet and Wheeler 1982, pp. 8-9). The PA would remain in moderate to high fire hazard, resulting in a higher potential for increased fire behavior during wildfire, thereby increasing the risk of vegetation and habitat loss.

In summary, the No Action Alternative on remaining BLM administered land of the PA would not contribute to the development of late-successional characteristics, the recovery of the NSO, or to the resiliency of stands to environmental changes, including drought and catastrophic fire. There would be a cumulative adverse effect of not meeting improved conifer growth and habitat development objectives as set forth in the 2011 Revised Recovery Plan, the 1997 West Fork Cow Creek Watershed Analysis, and the 1995 Medford District RMP.

3.1.3 Alternative 2

Direct and Indirect Effects

The Cold Elk project is situated on matrix land also classified as CHU. The Cold Elk Project is within the USFWS designated NSO Critical Habitat Unit KL1 – Klamath West of the latest 2012

CHU revision. This Action Alternative addresses the need to restore, conserve, and enhance NSO habitat as recommended in the 2011 Revised Recovery Plan. BLM staff followed the RA-10 process that deferred forested areas already meeting high quality NSO habitat while identifying other areas demonstrating a need to enhance and develop habitat conditions. According to the West Fork Cow Creek Watershed Analysis, riparian reserves occupy about half of the General Forest Management Area acreage in the watershed; other restrictions reduce timber availability further (BLM 1997). These include 100-foot radius special status plant buffers, 10-acre RTV buffers, 70-acre NSO nest patches, fragile nonsuitable woodland, RA-32 patches, 100-acre NSO owl cores, 180 year old stands, marbled murrelet habitat, and others. Chapter 3.3 – Wildlife discusses these management deferrals in greater detail, including the RA-10 process.

Active management proposals are key to accomplishing short and long-term objectives in lands designated as CHU. The West Fork Cow Creek Watershed Analysis (BLM 1997, pp. 67-68) concurs, providing both short term (10-20 years) and long term (20+ years) management recommendations. Short term recommendations are described as follows:

> Plantations resulting from past timber harvest are located throughout the watershed. Management in these stands should focus on maintaining conifer stands, promoting their growth and developing habitat conditions. The specific prescriptions will vary, based on the land allocation in which the plantation occurs.
>
> Modified older stands have been partial cut in the past and may not be fully stocked. Management in these stands should promote establishment of fully stocked conifer stands.

Whereas, the long term recommendation for this watershed focuses on management according to the land use allocations in the RMP and the Northwest Forest Plan (BLM 1997, p. 67).

The Record of Decision/Medford District Resource Management Plan (BLM 1995) defines silviculture as “the art and science of managing forest sands to provide or maintain structures, species composition, and growth rates that contribute to forest management goals.” Matrix objectives for silviculture include:

- Production of commercial yields of wood
- Retention of moderate levels of ecologically valuable old-growth components such as snags, logs, and relatively large green trees.
- Increasing ecological diversity by providing early successional habitat.

Stand management in CHU would focus on stands regenerated following timber harvesting, stands that have been thinned, or unmanaged even-aged stands. Silviculture treatments aim to enhance or maintain NSO habitat. Alternative 2 provides the closest opportunity to meet this goal. Similarly, the West Fork Cow Creek Watershed Analysis recommends management intervention to specifically “focus on maintaining conifer stands, promoting their growth and

developing habitat conditions" (BLM 1997, p. 68). Silvicultural systems proposed in CHU have two principal objectives:

1.) Development of old-growth characteristics including large diameter trees, large diameter snags, large diameter logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition.

2.) Reduce the risk of large-scale disturbances by fire, wind, insects, and diseases that would destroy or limit the ability of the reserves to sustain viable forest species populations.

The objective of proposed silvicultural systems would be the development of old-growth characteristics including snags, down logs, large trees, canopy gaps, multiple layers, and diverse species composition (BLM 1995, p. 184). Retained trees, snags, and down logs would provide for structural and biological legacies necessary to maintain ecosystem processes throughout the management cycle (BLM 1995, p. 188). Thick-barked large diameter conifers with high canopy base heights and shaded understories may be the most fire resistant components in southwest Oregon. Through management intervention, development of large fire resilient tree structure can be accelerated by many decades as opposed to no treatment. This is also the recommendation provided in the Revised Recovery Plan for the NSO (USFWS 2011, p. II-11) even where there are short-term risks to achieve long term benefits:

> Active, restoration-focused management to address climate change and dynamic ecosystem processes is also necessary in many areas with the goal of maintaining or restoring forest ecosystem structure, composition and processes so they are sustainable and resilient under current and future climate conditions.
>
> . . . Active management for ecological values trades short-term negative effects for long-term gains.

Radial thinning around fire resilient trees aims to serve three functions: 1.) provide growing space for the tree to persist in the stand, 2.) contribute to species diversity goals by selectively cultivating these minor tree species, and 3.) introduce sunlight and space for seedlings of these species to germinate and establish.

Roadside tree removal is proposed on 13.5 miles of roads within the PA. The Medford District RMP identified the need to remove trees along rights-of-way if they are a hazard to public safety (BLM 1995, p. 34). This action is designed to: 1.) Develop and maintain a transportation system that serves the needs of users in an environmentally sound manner (BLM 1995, p. 84), 2.) Manage and design road systems that reduce hazards to public health and safety, fire risks, and vandalism to public and private property (BLM 1995, p. 88), and 3.) Maintain haul roads to accommodate the safe movement of vehicles and machines (Oregon OSHA Chapter 437, Division 7, Section F).

Removing roadside vegetation would improve motorist safety by increasing sight distance around corners. Vegetative removal would reduce shading and allow the roadbed to dry faster and be drier for longer periods thereby reducing road failures and extending dry weather road use

on rocked roads. The treatment would reduce future road maintenance costs and improve wildfire defensibility. Recover side cast rock that has been overgrown with vegetation.

Because this treatment is limited to the first 15 feet of roadside, impacts to stand conditions are minimal. Additional sunlight would benefit residual trees beyond the 15 feet treatment. Where roadside treatments join Variable Density Thinning, leaving the largest tree every 75 to 100 feet would be a less abrupt break in vegetation against road openings. This effect is sometimes referred to as "feathering a treatment." Along all roadside treatment areas, the contrast in forest structure would exhibit a 15-foot transition to a road opening instead of a wall of residuals against a road opening. This is a more desired condition for both the development of habitat and for stand composition.

Alternative 2 proposes tree removal using conventional and helicopter logging systems. To facilitate operations, 5.3 miles of new temporary route construction, 0.3 miles of permanent road construction, 1.92 miles of existing temporary route renovation/reconstruction, and 214 miles of existing road maintenance is proposed. All temporary roads constructed or reconstructed/renovated for timber harvest under this project would be fully decommissioned after use. No increase in the open road network is proposed for this project.

Alternative 2 would have a short term increase of fine fuels deposited on the forest floor resulting in an immediate increase in fire hazard until activity fuels are treated. Activity fuels treatments are proposed that would reduce this immediate deposition of fuels as described in Chapter 2.3, PDFs and BMPs and the Fire and Fuels write-up, Chapter 3.2.

Species Diversity / Forest Disturbance Processes / Stand Density

Maintaining and enhancing species diversity through commercial and noncommercial competition reduction treatments ensures that NSO Critical Habitat Unit (CHU) and RMP species diversity goals could be met (USFWS 2011, p. III-20; BLM 1995, p. 191). Moreover, Franklin et al. (2002) explain that diversity in tree species and sizes as well as large woody structure are important contributors to ecosystem structure and function. The mix of evergreen, deciduous, shade-tolerant, shade-intolerant species and structural features supply a wide variety of ecological processes. Less represented species such as ponderosa pine, incense cedar, and very large thick-barked Douglas-fir provide long-term fire resilient structure when the stands they occupy are of low density. In lower densities ponderosa pine is expected to increase in diameter growth, including the diameter of the largest trees (Tappeiner et al. 2007, p. 127). Through management intervention, development of large fire resilient tree structure, often comprised of diverse tree species, can be accelerated by many decades as opposed to no treatment.

Vigorous growing conditions lead to the development of high quality habitat in structure, function, and processes. Vegetation must expand in size to live and a tree cannot grow larger unless its growing space is increased (Oliver and Larson 1996, p. 36). In addition, it is known that trees can increase their diameter growth in less dense stands (Tappeiner et al. 2007, p. 127). This is true even in older trees. Because disturbances free up resources to claim by residual trees, trees would correspondingly allocate their growth in order beginning with increased crown volume, followed by height growth, diameter growth, seed and cone production, and lastly,

defense mechanisms to insects and diseases. This can be accomplished through silvicultural intervention as proposed in Alternative 2. Providing growing space as well as increasing water and nutrient availability to residual trees after silvicultural treatment would increase the stand's vigor and resiliency to environmental stressors such as drought, fire, inter-tree competition, insects, and diseases throughout a forest stand. Gaps of various sizes would contribute to stand heterogeneity. Openings would stimulate the regeneration of new stand cohorts to develop multi-layered structure.

Silvicultural treatments proposed in Alternative 2 would increase species diversity, develop habitat conditions, and reduce stand densities. Increased growing space following management intervention would contribute to larger scale benefits to the watershed where the aggregate effect results in improved conifer growth, habitat conditions, and persistence of diverse species composition. In Alternative 2, the current overall average RD of 0.80 would be reduced to more acceptable densities. Silvicultural prescriptions selectively identify residual trees to leave that meet management objectives of the RMP, recommendations provided in the Watershed Analysis, as well as the goals of the NSO Recovery Plan. In summary, with silvicultural manipulation, active creation of structural complexity can be achieved where the resulting lowered densities would reallocate growing space to more desirable diverse tree species and larger tree structure desirable by wildlife, and improve stand resiliency and tree vigor.

Cumulative Effects

Appendix C discloses the cumulative activities relevant for this analysis. Impacts to vegetation are confined to within the Cold Elk PA. Chapter 3.1.2 describes these activities in detail under the No Action Alternative Cumulative Effects section. Alternative 2 is expected to have a beneficial Cumulative Effect on 3702 acres when considering other projects. In density reduction projects on BLM administered lands, a reduction in either overstory and/or understory stand density would improve conifer growth and contribute to developing habitat conditions.

Actions in Alternative 2 are expected to have measurable beneficial cumulative impacts because variable density thinning is designed to improve growing conditions for conifers and restore, enhance, and promote development of high value habitat over short term (0-20 years) and long term (21+ years) scales. Alternative 2 also reduces fuels to decrease the intensity and severity of future fires at the stand level within the PA. The development of trees into large woody structure would contribute to the future snag and CWD components desired in CHU for ecological functions (USFWS 2011, pp. III-17, A-10) and per RMP requirements (BLM 1995, p. 39).

Figure 12: Forest management treatments resulting in fire resiliency

Management intervention can improve fire resiliency. This BLM unit (left) was thinned prior to the arrival of wildfire (prior to hand pile and burn activity fuels treatment). When the Douglas Complex ignited and severely burned adjacent land, the treated unit (right) received little to no crown scorch.

Decreased stand densities would improve short term (0-20 years) and long term (> 21 years) forest health and resiliency. Improvements in stand scale resiliency to fire, changes in climate, and other environmental disturbance processes would likely occur with density reduction. This was demonstrated in a BLM commercial harvest that withstood a wildfire event from the Douglas Complex (Figure 12). In this example, a harvest unit with reduced densities exhibited decreased fire severity, so that the integrity of the forested stand was maintained. Thinned stands such as this exhibit a greater resiliency to survive post-fire than adjacent untreated stands. The cumulative vegetation effects from Alternative 2 would likewise improve resiliency to environmental stressors such as fire and drought.

3.2 Fire & Fuels

After Euro-American settlement, several factors including fire exclusion, forest management activities, and climatic events have greatly altered historical vegetation patterns. This trend is being readily observed across the entire country and catastrophic fires are becoming more common.

3.2.1 Methodology

- Fuels Models (Scott and Burgan 2005) and photo series were used to estimate and predict surface fuel loading and flame lengths.
- Fire Regimes data was derived from LANDFIRE Refresh 2008 (http://landfire.cr.usgs.gov/viewer/).
- Fire Regime Condition Classes data was derived from Landfire National Vegetation Dynamics Models http://www.landfire.gov/index.php.
- Fire Behavior Fuel Models data was derived from LANDFIRE Refresh 2008 (http://landfire.cr.usgs.gov/viewer/

3.2.2 Assumptions

The following assumptions were made to generate a more accurate surface fuel loading representation after harvest and before activity fuels treatment:

- Unmerchantable material is less than 8 inches in diameter.
- All harvest material (top and boles) greater than 8 inches at diameter breast height (DBH) would be whole tree yarded to reduce fuel loading.
- Un-merchantable activity slash (tops and branches) could remain on-site (lopped and scattered) where fuel loading is 7 tons or less per acre

Background Information on Fire Hazard

The Cold Elk project is within the Klamath Siskiyou province forests in southwestern Oregon where fire is recognized as the primary natural disturbance agent; influencing vegetation structure, species composition, soil properties, nutrient cycling, hydrology, and other ecosystem processes (Agee 1993). Fire has played an important role in influencing successional processes and creating diverse forest conditions, creating a landscape of patchy mixed seral states of shrubland, woodland, and forests in both open and closed conditions (Perry et al. 2011; Taylor and Skinner 1998).

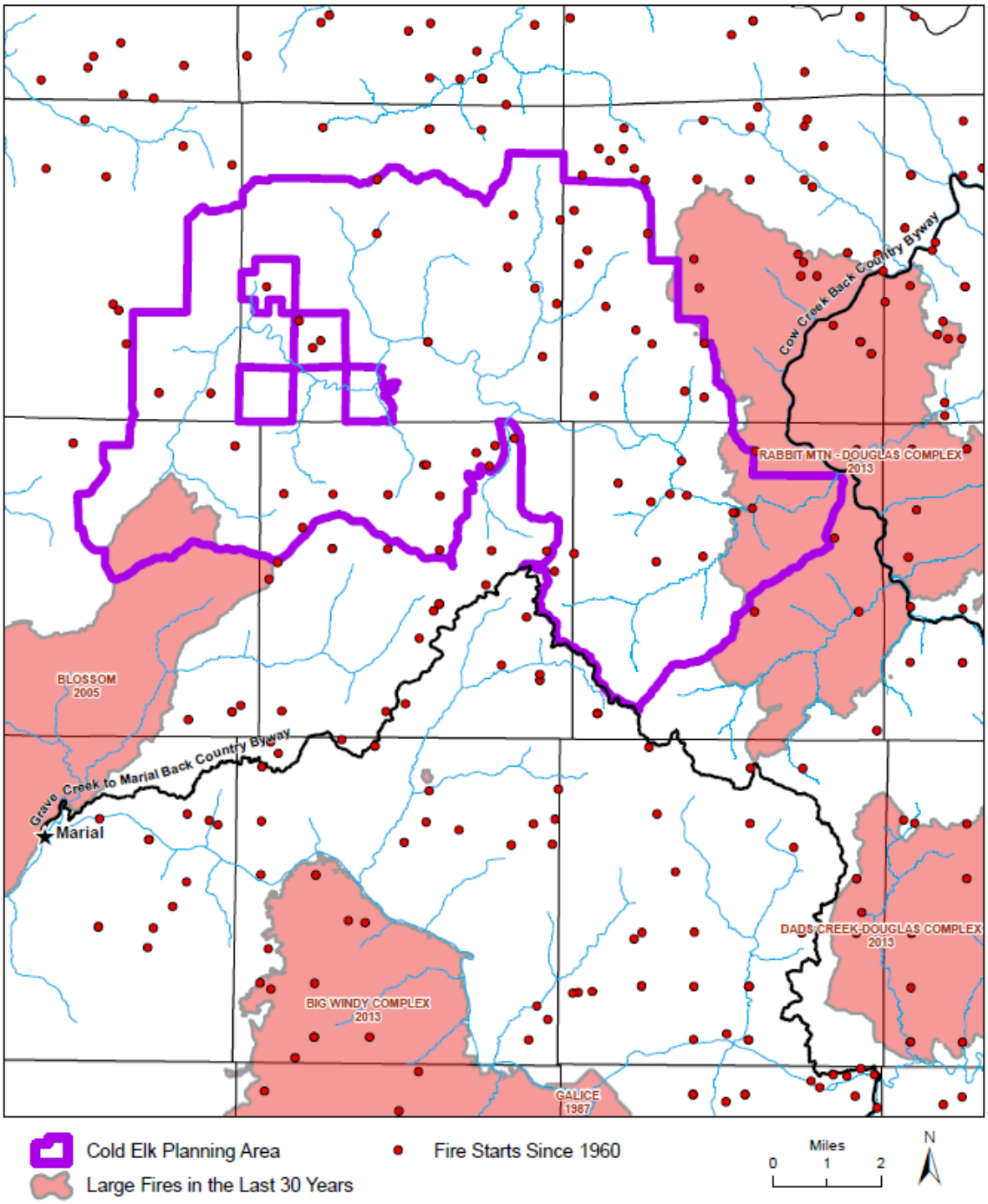
Prior to the twentieth century, low to mixed-severity fires burned regularly in most dry forest ecosystems, with ignitions caused by both lightning and humans. Frequent low severity to moderate severity fire influenced the regeneration of fire intolerant species, promoted fire tolerant species regeneration, such as Douglas-fir and ponderosa pine, and maintained an open forest structure with mosaics of frequent, low severity burn areas. This resulted in the reduction of forest biomass, decreased the impacts of insects and diseases, and maintained wildlife habitats for many species that utilize open stand structures (Graham et al. 2004).

In the early 1900s, suppression of all fires became a goal of land management agencies. This altered the fire return intervals and severity from what would take place under the historical fire regime. Based on calculations using fire return intervals, two to five fire cycles have been missed in the southwest Oregon mixed conifer forests that occur at low elevations (Thomas and Agee 1986).

As a result of the exclusion of fire, natural levels of vegetation have shifted towards overstocked stands, with an increase in the number of suppressed tree and shrub species. Fuel loading has increased and plant succession shifted to more fire-prone vegetative conditions. Surface and ladder fuels have increased in loading and continuity, increasing the potential for larger scale crown and stand replacing fires, relative to historic occurrence.

Figure 13 on the next page shows a map of the planning area and recorded starts since the 1960s.

Figure 13: Map of the Cold Elk Planning Area and Fire Starts



3.2.3 Affected Environment

Fire Regimes

Fire regimes refer to a general classification of the role fire would play across a landscape naturally, meaning in the absence of modern human intervention, but including the influence of aboriginal burning (Agee 1993). Fire regimes refer to the combination of fire frequency, predictability, intensity, seasonality, and extent characteristic of fire in an ecosystem. Coarse scale definitions for natural (historical) fire regimes have been developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001). The fire regimes are classified based on fire return interval and fire severity.

Fire severity is the measure of the amount of damage, or mortality caused by the fire. Lower fire severity means that a fire burns through the forest but stays on the ground without resulting in a drastic amount of mortality (less than 25% of the dominant overstory vegetation). High fire severity means that the fire burns hot enough to cause major mortality to the forest by burning through the crowns of the trees (over 75% of the dominant overstory vegetation).

Three historical fire regimes are found within the analysis area (LANDFIRE Refresh 2008 - http://landfire.cr.usgs.gov/viewer/:

> *Fire Regime 1*: (32,765 acres) 0-35 years fire return interval and low (surface fires) to mixed severity (less than 75% of the dominant overstory vegetation replaced). Typical climax plant communities include mixed conifer and dry Douglas-fir / ponderosa forests. Large stand-replacing fire can occur under certain weather conditions, but are rare events (i.e., every 200 years).
>
> *Fire Regime 3*: (11,452 acres) 35-100 + years fire return interval. Fire severity is mixed with large, high severity fires occurring rarely (i.e. every 200 years). This fire regime exhibits fire behavior that results in mosaic patterns on the landscape with burned and unburned patches. Typical plant communities include mixed conifer and Douglas-fir forests.
>
> *Fire Regime 5*: (4,663 acres) 200 + year frequency and high (stand replacement) severity. Plant communities include mixed conifers and Douglas-fir / Western hemlock. This fire regime exhibits high fire severity with stand replacement fires that reset large landscapes that occur every 200 + years.
>
> *Other*: (30 acres) Non vegetative areas either barren or water.

According to LANDFIRE Refresh 2008 (http://landfire.cr.usgs.gov/viewer/) data, the Cold Elk PA includes approximately 67% in Fire Regime 1, 23% in Fire Regime 3, 10% in Fire Regime 5 and less than 1% as non vegetative areas. Plant association groups are a credible link to historical ecological process, including fire regimes that occurred on sites in the past (Franklin and Agee 2003). Historical fire regimes and the departure from them correlate to the change from historical to current vegetative structure. The change in vegetation also helps to describe the difference in fuel loading (dead and live fuels in the form of increased vegetation) from historical to current conditions.

These changes in vegetation and fuel conditions help to determine the expected change in fire behavior and its effects. This difference in many respects is attributed to fire exclusion, but also includes all human practices that would affect the extent, severity, or frequency of fire events compared to historical accounts.

Fire Regime Condition Class (FRCC)

Fire regime condition classes are one approach to evaluating potential fire conditions and are most useful at the watershed and larger scales. FRCC has become a measure of ecological departure used by the BLM, as well as other federal agencies, to describe resource conditions. FRCCs are a function of the degree of departure from historical vegetation and disturbance regimes. These departures result in ecosystem component alterations such as species composition, structural stage, stand age, and canopy closure. The process for making an assessment on how much fire exclusion along with other management activities has affected an ecosystem is through classifying the current condition of the site based on a reference usually pre-dating when fire exclusion became an influence.

Condition class descriptions are used to describe these affected ecosystems. They are a function of the degree of departure from historical fire regimes, resulting in alterations of components such as species composition, stem densities, canopy closure and densities, and ground fuel accumulation (often measured in tons per acre). Coarse-scale FRCC classes have been defined and mapped by Hardy et al. (2001) and Schmidt et al. (2002). They include three condition classes for each fire regime. Under the Cold Elk project, FRCCs 2 and 3 account for 67 % of BLM administered lands. Data derived from Landfire National Vegetation Dynamics Models http://www.landfire.gov/index.php.

FRCC 1 – (7,284 acres) Fire regimes are within or near the historical range for the area. The risk of losing key ecosystem components is low. Vegetation species composition and structure are intact and functioning within the historical range for the area.

FRCC 2 – (10,421 acres) Fire regimes have been moderately altered from their historical range (i.e., missed more than one return interval). This change results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns.

FRCC 3 – (4,509 acres) Fire regimes have been substantially altered from their historical range. The risk of losing key ecosystem components is high. This change results in increases to fire size, frequency, severity, and landscape patterns.

Fire Hazard

Fire hazard is a fuel complex, defined by vegetation type, arrangement, volume, condition, and location. These characteristics combine to determine the threat of fire ignition, the spread of a fire, and the difficulty of fire control or fire behavior. Fire behavior dictates which fire suppression strategy may be effectively employed, and therefore the extent to which a fire may grow and the subsequent damage it may cause. Because fire behavior is critical in fire suppression strategy selection, it serves as the threshold used for this analysis. The unit of measurement for determining the threshold is considered in terms of flame length. Typically flame lengths less than four feet can generally be managed by fire suppression personnel using

direct attack on the fire edge. Flame lengths greater than four feet generally require firefighting equipment and utilize an indirect attack strategy, where personnel back off to a defensible position away from the fire's edge.

Fire hazard is a useful tool in the planning process because it helps in the identification of broad areas within a watershed that could benefit from forest management activities. Hazard ratings were developed for the PA and reflect the results of past human and natural disturbances. In general the existing fuel profile within the PA represents a moderate to high resistance to control under average climatic conditions. The table below summarizes the percent of acres of all the BLM land in each fire hazard rating category for the PA.

Figure 14: Fire Hazard Rating Category for the Cold Elk PA

Fire Hazard Rating	Acres by Hazard Category	Percentage by Hazard Category
TruLow hazard	5,556	25
Moderate hazard	3,614	16
High hazard	13,064	59

Crown Bulk Density (CBD) and Crown Base Height (CBH) are important components of overall fire hazard. CBD is the mass of available canopy fuel per unit canopy volume. It is evaluated at the stand level, not an individual tree. The CBH is the average distance (height) from the ground level to the lower branches of the trees that form the main forest canopy where there is sufficient crown loading in needle and 1 hour fuels for a certain level of surface fire intensity to transition into the crown (0.011 kg/m3) (Rebain et al. 2010; Reinhardt and Crookston 2003). Potential crown fire activity is assessed based on the relationship of surface fuels (fuel model), average height from the surface fuel to the lowest crowns of the trees (CBH), and the volume of crown fuel present across the upper strata of the vertical fuel layer (CBD).

Fuel Models

Fire behavior fuel models are grouped by fire-carrying fuel type. Fuels models are used to predict the potential behavior and effects of wildland fire. The majority of the PA can be identified within the timber understory (TU) and the timber litter (TL) fuel models. The table below shows the typical flame lengths associated with each of these fuel models during fire season weather conditions given a 5 mph wind.

Figure 15: Fire Behavior Fuel Models, Acres, and Flame Lengths

Fire Behavior Fuel Model and Number	Fuel Model Group	BLM Acres	USFS Acres	Private Land Acres	State Acres	Total Acres	Flame Length (in feet)
NB1 (91), NB3 (93)	Non Burnable	154	14	170	2	340	0
GR1 (101), GR2 (102)	Grass - Low Fuel Load	123	306	1,968	---	2,397	1-5

Fire Behavior Fuel Model and Number	Fuel Model Group	BLM Acres	USFS Acres	Private Land Acres	State Acres	Total Acres	Flame Length (in feet)
GS1 (121), GS2 (122)	Grass - Shrub - Low / Moderate Fuel Load	798	54	1,727	45	2,624	1-5
SH1 (141), SH2 (142), SH3 (143), SH5 (145),	Shrub - Moderate / High Fuel Load	32	2	89	2	125	1-15
TU1 (161), TU2 (162)	Timber Understory - Low / Moderate Fuel Load	119	19	571	---	709	1-4
TU5 (165)	Timber Understory - Very High Fuel Load	15,815	1,425	13,006	191	30,437	3-8
TL1 (181), TL2 (182), TL3 (183), TL6 (186), TL8 (188), TL9 (189)	Timber Litter - Moderate / High Fuel Load	1,107	132	1,580	59	2,878	1-6
TL4 (184), TL5 (185), TL7 (187)	Timber Litter -Downed Logs / High Fuel Load	4,086	733	4,252	330	9,401	1-3
SB1 (201)	Slash - Blowdown - Low Fuel Load	---	---	---	---	---	2-4
SB2 (202)	Slash - Blowdown - Moderate Fuel Load	---	---	---	---	---	5-8

(Scott and Burgan 2005)

LANDFIRE Refresh 2008 - http://landfire.cr.usgs.gov/viewer/

Environmental Effects on Fire Hazard

Some of the objectives of the proposed forest management activities are to restore ecosystems function, reduce stand density, create diversified stand structure, and reduce natural and activity based fuel hazards. These treatments are considered to have long-term beneficial effects decades into the future by setting forested stands on a trajectory toward larger, more fire resilient trees that are able to withstand wildfire events with a minimized amount of mortality within the forest.

3.2.4 Alternative 1 – No Action Effects on Fire Hazard

Direct and Indirect Effects

The proposed acres for Variable Density Thin, Disease treatments, Riparian Thin and Understory Reduction) under the Proposed Action would not be treated; therefore the ecological restoration and corresponding fuels reduction objectives for these areas would not be accomplished. Without treatment the FRCC of these stands would continue to deteriorate to a FRCC 3, which means the fire regimes would have been substantially altered from their historical range. The risk of losing key ecosystem components is high.

The current trend would continue for surface, ladder, and aerial fuels (crown density). Crown Base Height (CBH) would decrease due to continued increases in understory density, increasing the potential for crown fire initiation. Crown Bulk Density (CBD) would increase, as would the potential for active crown fire events. Increasing stand densities and fuel loadings would increase the chance of more acres that would burn in high intensity fires within the PA.

With these conditions, wildland firefighters and the public would be at greater risk of loss of life, property, and other values. Strategies and tactics for fire suppression would shift from direct attack to indirect attack utilizing topographic features such as ridgetops and existing roadways resulting in larger fires.

Fire suppression would continue, because there are no policies in place or being proposed that will allow fires to burn naturally across the Medford District BLM. Initial attack suppression goals (94% of new fire starts are confined to 10 acres or less) would become increasingly difficult to attain due to increased fireline intensity and flame length. Initial attack success would decline over time resulting in larger fire sizes. Aerial attack effectiveness would decrease with extreme fire behavior: As upper and mid-level canopies close, penetration of aerial applications of water or retardant would be reduced. As a result, in the event of a wildfire, many stands would experience stand replacement.

3.2.5 Alternative 2

Direct and Indirect Effects

Forest Management Activities

Variable Density Thinning, and Riparian Thinning

VDT treatments would reduce stand basal area by removing mostly small-to-medium sized trees and improve growth of residual trees and restore spatial heterogeneity. Prescriptions designed to improve spatial heterogeneity, through the creation of small openings, would promote more patchy fire severity and intensity in the event of a wildfire and move conditions closer to historical vegetative and disturbance regimes. Riparian Thinning would improve or maintain stand vigor, promote larger future woody debris, enhance species diversity, reduce the existing fire hazard, and promote fire resiliency. Reduction in shade-tolerant trees and dense shrub species would promote individual tree vigor, reduce competition/encroachment, and promote fire resiliency.

Treatments would reduce ladder fuels and the risk to older trees from wildfire and competition, while favoring more fire and drought tolerant tree species. Thinning treatments would reduce torching and crowning potential by increasing CBH and reduce CBD. There could be a short-term increase in surface fuels, usually less than two years from activity slash within units and at landing sites. These units would have a reduction in potential fire behavior following activity slash treatments.

Open forest canopies result in microclimatic changes particularly at the forest floor. A more open stand allows more wind and solar radiation resulting in a drier microclimate, compared to a closed stand. Drier microclimates can contribute to more severe fire behavior, due to influences

on live and dead fuel moistures. The degree of effects of microclimate change on fire behavior is highly dependent on stand conditions after hazard fuel treatment, mitigation to offset the effects of microclimate change, and the degree of openness. For example, Pollet and Omi (1999) found that more open stands had significantly lower fire severity compared to the more densely stocked untreated stands.

Activity Fuel Treatment (Disposal)

Activity fuel disposal methods would include lop and scatter, hand pile and burn, and biomass removal. In some instances, the fuel hazard may be low, resulting in no fuel hazard reduction treatment. Forest management activity that treats the understory and/or overstory vegetation and leaves additional increases in activity slash on the forest floor would temporarily increase surface fuel loadings and therefore potential fire behavior; however, the activity slash would be recommended for hand pile and burn, and/or lop and scatter, resulting in a short-term increase (1-2 years) in fire behavior/fire hazard until treated.

It is anticipated that fuel loadings (material 3 inches and less) after harvesting would temporarily increase in areas where whole tree yarding and/or biomass removal is not feasible by approximately 3-11 tons to the acre. This could change the existing fuel model from a Timber type (TU or TL) to Slash / Blowdown Group (SB1 or SB2) which in turn would create higher rates of spread and greater flame lengths in the event of a wildfire. However, despite the temporary increase in ground fuels, research indicates that a reduction in crown fuels outweighs any increase in surface fire hazard (Omi and Martinson 2002).

Understory Reduction

Understory reduction prescriptions are designed to reduce high vegetation density within a stand. The priority for treatments is to treat understory vegetation (less than 8 inches DBH) to promote residual tree growth, vigor and reduce surface fuels and ladder fuels. Prior to slash mitigation, fire behavior potential could increase from the current potential fire behavior due to increases in curing/drying of surface fuels. Activity slash would be recommended for lop and scatter and/or hand pile and burn, resulting in a short-term increase in fire behavior/fire hazard. Following activity slash, treatment of surface and ladder fuels would reduce crowning potential by increasing CBH.

Biomass Removal

Biomass removal would be utilized wherever feasible. The removal/extraction of additional ground fuels created through forest management activities would reduce the amount of fuel loading and smoke emissions and potentially the need for hand pile burning.

Prescribed Burning

A number of ecological functions can be corrected by simply reintroducing fire in the ecosystem. However, the reintroduction of prescribed fire without thinning would be problematic due to the existing conditions of overly dense stands of trees that have developed during fire exclusion and would result in greater proportions of high severity fire than has historically occurred (Agee and Huff 1985). Therefore most treatment areas would involve treatments such as thinning as the

initial entry. These treatments could be followed up with prescribed fire (hand pile burns) to further reduce fuel loading.

Cumulative Effects

Alternative 2 would help restore, maintain, and enhance fire-adapted ecosystems by reducing fire hazard within the PA. The PA boundary is defined by ridgelines and road systems and is the cumulative effects analysis area for fire hazard. In the event of a wildfire, strategic locations may be utilized for fire suppression activities to contain a fire within the PA, or conversely, to prevent a fire from entering it.

The Cold Elk Project would implement forest management activities to move toward meeting fuels reduction objectives for these areas and enhancing fire-adapted ecosystems by reducing fire hazard. Treatments could create defensible areas within the PA and move those treated areas to near historical ranges.

The cumulative beneficial effects of the Cold Elk project are measured in terms of fire hazard. Current and past projects were designed to reduce the existing fire hazard by removing some of the surface, ladder fuels, and crown density. By treating the understory and overstory vegetation, potential fire behavior is reduced to surface fires and passive crown fires. Since 2003, approximately 1,187 acres within the PA have been treated for HFR. There are no known planned HFR projects planned in the foreseeable future within the Cold Elk PA. Non-commercial silvicultural treatments consisting of understory treatments is expected to continue within the Planning Area over the next 5 years.

Variable Density Thin, Riparian Thin, and Understory Reduction treatments proposed under Alternative 2 are designed to accomplish similar objectives. Treatments completed under this project would affect the fuel characteristics at the surface, and mid and upper canopies altering the current trend of large scale high severity fire events by disrupting fuel continuity, uniformity and structure by reducing potential fire behavior (i.e., raise CBH, reduce CBD, reduce surface fuel loading).

Alternative 2 would result in a short-term increase (6 months to 2 years) in fire hazard due to the presence of slash or until the time it is treated and/or partially decomposed. Long-term beneficial effects are anticipated in terms of decreased fire hazard on approximately 3702 acres which could be utilized as strategic holding points for fire suppression personnel for the next 10 to 20 years.

3.3 Wildlife

Scale of Analysis

This section discusses terrestrial wildlife habitats and the potential impacts to terrestrial wildlife species from the proposed action as described in Chapter 2. The terms “Planning Area,” “Project Units,” and specific “Analysis Areas” are used throughout this analysis.

The larger Planning Area usually includes subwatersheds and is defined by major ridgetops or creeks and rivers, and is more applicable for habitat analysis of species where known locations

are minimal or unknown. The Planning Area is used for BLM-designated Sensitive species where either there is little or no known site information, and where there is a likelihood of occurrence based on the current range of the species and availability of potentially suitable habitat within the watershed. Project Units (proposed units or proposed action describe specifically where the action is proposed, such as units where forest thinning is proposed and where road construction or road improvements are proposed. Project units are utilized where there is specific guidance to apply surveys to ground disturbing activity activities in suitable habitat. Specific analysis areas are used where effected species' ranges are well defined and suitable habitat is affected by the proposed action.

The Analysis Areas describe the scope or area for each species' analysis. For threatened or endangered species, or species proposed to be listed as threatened, analysis areas are defined by territorial ranges around known locations, and geographically landscape designated Critical Habitat Units (CHU). For spotted owls, analysis areas include a home range circle with a radius of 1.3 miles (3,340 acres), a core (heavily used breeding season area) circle with a 0.5 mile radius (500 acres) within the home range circle, and a nest patch circle with a 300-meter radius (70 acres) within the core area. Habitat threshold levels within these areas are not absolute levels of likelihood of occupancy, survival, and reproduction, but minimum levels at which negative effects to spotted owls may occur from habitat alteration. In spotted owl Critical Habitat Units, a 500 acre core area (.5 mile radius) scale is used as a screen to assess local effects of treatment areas downgrading or removing NRF habitat.

Only federally listed (Threatened & Endangered or Candidate), Bureau Sensitive, and Survey and Manage species, known or suspected to be present within the Grants Pass Resource Area (GPRA) and could be affected by the Action Alternatives are addressed in this EA. The following list of species in Table 8 below are those that are known or suspected to occur within the PA and have habitat in the project area. Those that may be affected by the Action Alternative will be evaluated in more detail.

Table 8: Wildlife Species Known or Suspected to occur within the Cold Elk PA

Scientific Name	Common Name	Status	Occurrence
Strix occidentalis caurina	northern spotted owl	FT	Known
Brachyramphyus marmoratus	marbled murrelet	FT	Suspected
Pekania pennanti	fisher	SEN	Suspected
Strix nebulosa	great gray owl	SM	Suspected
Haliaeetus leucocephalus	bald eagle	SEN/EPA	Habitat
Aquila chrysaetos	golden eagle	EPA	Known
Arborimus longicaudus	Oregon red tree vole	SM	Known
Antrozous pallidus	pallid bat	SEN	Suspected
Corynorhinus townsendii	Townsend's big-eared bat	SEN	Known
Myotis thysanodes	fringed myotis	SEN	Suspected
Actinemys marmorata	Pacific pond turtle	SEN	Known
Helminthoglypta hertleini	Oregon shoulderband	SEN	Known
Bombus occidentalis	Western Bumblebee	SEN	Suspected

Status:
FT – Federally Threatened PT – Proposed Threatened SEN – Bureau Sensitive Species EPA – Bald and Golden Eagle Protection Act SM – Survey and Manage Species
Occurrence:
Known – Species is known to occur in the PA
Suspected – Species not known to occur but reasonable potential to exist in the PA; occurrences may be very low or incidental
Habitat – Less probable for species to occur but suitable habitat is found in the PA and is within the known or suspected range of the species

3.3.1 Affected Environment

Special Status Wildlife Species

Special Status Species are those species that are federally listed as Threatened or Endangered, Proposed or Candidates for federal listing as Threatened or Endangered, or are BLM-designated Sensitive species (BLM 2011). The Northwest Forest Plan (NWFP) listed S&M species for protection and are modified in the 2001 S&M EIS ROD. Table 8 lists the Special Status and S&M species that are known or suspected in the PA. Species determined to not occur, or habitat would be unaffected, have a very low likelihood of occurring in the PA, or presence would be considered to be incidental and are not expected to be effected, are not included in the Environmental Effects analysis.

Affected Environment - Northern Spotted Owl (NSO)

The Cold Elk PA is overlapped by 31 historic owl sites (Figure 16), with proposed action located within the provincial home ranges (1.3-mile radius from the site center) of twenty-five historic NSO sites. Historic sites within the Cold Elk PA have been surveyed or monitored for project clearances and do not have continuous annual protocol surveys with the exception of site occurring within the KDSA.

The NSO is perhaps the most studied raptor in the world, and thus there exists a tremendous quantity and quality of data. The NSO, a Federal-listed Threatened species, is associated with existing late-successional habitat within and adjacent to the Cold Elk PA. NSOs prefer coniferous forest with multiple vertical layers of vegetation and a variety of tree species and age classes with the presence of large logs and large diameter live and dead trees (snags) for nesting, roosting, and foraging (NRF) habitat. They may also be found in younger stands with multilayered, closed canopies, large diameter trees, and abundance of dead and down woody material.

A detailed account of the taxonomy, ecology, and reproductive characteristics of the NSO can be found in:

- Interagency Scientific Committee Report (Thomas et al. 1990)
- Final Rule designating the spotted owl as a threatened species (USFWS 1990)
- Forest Service Ecosystem Management Report (USFS 1993)

- Scientific Evaluation of the Status of the Northern Spotted Owl (5 Year Status Review; Sustainable Ecosystems Institute (Courtney et al. 2004))
- Status and Trends in Demography of Northern Spotted Owls, 1985-2003 (Anthony et al. 2006)
- Northwest Forest Plan – The First Ten Years (1994-2003): Status and trend of northern spotted owl populations and habitat (Lint 2005)
- Population demography of Northern Spotted Owls (Forsman et al. 2011)
- 2011 Revised Recovery Plan for the Northern Spotted Owl (USFWS 2011)
- The effects of habitat, climate, and Barred Owls on long-term demography of Northern Spotted Owls (Dugger et al. 2016)

Eleven demographic study areas have been established to represent owl status across the range of the NSO (Forsman et al. 2011). Owl sites and productivity are monitored annually within these areas to assess changes in population trend and demographic performance of spotted owls on federally administered forest lands within the range of the NSO, and assess changes in the amount and distribution of NRF habitat and dispersal habitat for NSOs on federally administered forest lands.

Although Forsman et al. (2011) indicated that survival on the Klamath Study Area was stable through 2006, the most recent data regarding occupancy has shown a decline, which suggests the stability of the survival rate may no longer be valid. Forsman et al. (2011) noted that the fecundity rate on the KSA was declining and the most recent data agrees with this conclusion.

Anthony et al. (2006) published meta-analysis of owl demographic data collected in 14 demographic study areas across the range of the NSO. Four of the study areas are in western Washington, six are in western Oregon, and four are in northwestern California. Although the agencies anticipated a decline of NSO populations under land and resource management plans during the past decade, Anthony identified greater than expected NSO population declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California.

The most recent metadata analysis found that fecundity, the number of female young produced per adult female, is declining; Dugger et al. (2016) concluded that fecundity, apparent survival, and/or populations were declining in most study areas, and that increasing numbers of barred owls (BOs) and loss of habitat were partly responsible for these declines. The 2016 metadata analysis found these declines are occurring in more study areas than indicated in the last 2011 metadata analysis (Forsman et al. 2011). The 2016 data indicates that competition with BOs may now be the primary cause of NSO population declines across their range.

These reports listed above did not find a direct correlation between habitat conditions and changes in NSO populations and were inconclusive as to the cause of the declines. Even though some risk factors had declined (such as habitat loss due to harvesting), other factors had

continued, such as habitat loss due to wildfire, potential competition with the BO, West Nile virus, and sudden oak death. The BO is present throughout the range of the NSO, so the likelihood of competitive interactions between the species raises concerns as to the future of the NSO (USFWS 2004, Lint 2005).

The Medford District shares the Klamath Demographic Study Area (KDSA), with Roseburg BLM and the Rogue River Siskiyou National Forest. The Southern Oregon Cascades Demographic Study Area is also near the Medford District. The Cold Elk project occurs partially in the KDSA with three sites in the study area. Metadata analysis evaluates population statistics of the owls in the demographic study areas. The last metadata analysis was completed in 2011, which found that fecundity, the number of female young produced per adult female, is declining. Forsman (2011) concluded that fecundity, apparent survival, and/or populations were declining on most study areas, and that increasing numbers of BOs and loss of habitat were partly responsible for these declines.

In recent reports, it has become evident that BO populations are increasing across the range of the NSO. Forsman et al. (2011) indicates that NSO populations have declined across most of the range, with the most significant declines occurring in Washington where the BO has been present the longest. For each of the individual demographic study areas, there has been an almost steady increase in the number of BOs as measured by the proportion of NSO sites with BOs detected (Forsman et al. 2011). In some areas, as many of 60% of the NSO sites have detected BOs; specifically for the Klamath study area, approximately 30% of the NSO sites have BOs in recent years. Forsman et al. (2011) found BO detections to be an important source of variation with negative effects on NSO apparent survival and recruitment. Although analysis within the nearest NSO demography study area (Klamath Study Area, or KSA) to the PA indicates a stable NSO population during the study period, the recent data shows the beginning of a trend towards a declining population.

There is mounting evidence that barred owls are negatively impacting spotted owl population within the KSA. This is illustrated by several population trends beginning about 2003, which is when barred owl detections within the KSA exceed 10% of the sites. Spotted owl detections have been steadily decreasing since 2002 and reached the lowest point in 2010, the same year barred owl detections reached their highest level. Fecundity rates appear to be declining during the past 8 years and in only 1 of those 8 years was the rate above average. Fecundity rates for sites with known barred owl presence were lower than at other sites. If these trends continue, a combination of lower occupancy and reduced fecundity, there may be cause for concern regarding the spotted owl population (Davis et al. 2010).

On June 30, 2011, the USFWS released the Revised Recovery Plan for the Northern Spotted Owl for public comment (USFWS 2011). This Revised Recovery Plan recommends achieving recovery of the NSO through 1) the retention of more occupied and high-quality habitat, 2) active management using ecological forestry techniques, inside and outside of reserves, 3) increased conservation of NSOs on state and private lands, and 4) the removal of BOs in areas with NSOs. The plan recommends retaining the NWFP reserve network while the USFWS utilizes a habitat modeling framework to develop and designate a new critical habitat network for the NSO. The original foundation for NSO recovery was the 1994 NWFP. Management direction and land allocations in the standards and guidelines (S&G) of the NWFP are intended

to constitute the USFS and BLM contributions to the recovery of the NSO. The NWFP provides a network of late-successional reserves, 100-acre Known Spotted Owl Activity Centers (KSOACs), connecting riparian corridors, and connectivity blocks across the lands within the NWFP area.

The revised Critical Habitat was designated in 2012, becoming final in January 2013. The Revised Recovery Plan also included a number of "Recovery Actions" that are near-term recommendations to guide the activities needed to accomplish the recovery objectives and achieve the recovery criteria included in the Revised Recovery Plan. Of the 33 Recovery Actions (RA) included in the Revised Recovery Plan, two are applied to the Cold Elk project: RA10 and RA32. These two RAs are discussed at other points in this document

No known nests are located within the proposed treatment units. For purposes of this analysis, all sites are conservatively assumed to be occupied unless protocol surveys did not locate resident owls in the last several years. While there is no requirement to survey for NSOs prior to implementing forest management actions, the BLM conducted surveys at known sites, and in suitable owl habitat outside of known sites in 2015 - 2016 to locate possible new sites and minimize negative impacts of harvesting to unknown or undetected sites. These surveys covered habitat patches which occur near the edge and between occupied home ranges.

Northern Spotted Owl Habitat

For the purposes of this analysis, the vegetation within the PA was typed into habitat categories pertinent to the NSO. Canopy cover is used as one of the critical habitat thresholds because it is highly important to NSO nest site selection and general habitat use, because increased levels of canopy afford protection from predators and regulates temperature extremes (Courtney et al. 2004). These habitat types are used throughout this document to describe and quantify habitat conditions across the landscape.

Nesting, Roosting, and Foraging (NRF) Habitat for the NSO consists of habitat used by owls for nesting, roosting, foraging and dispersal. Generally, this habitat is multistoried, 80 years old or older (depending on stand type and structural condition), and has sufficient snags and down wood to provide opportunities for nesting, roosting, and foraging. The canopy closure is high (70-90%), but canopy closure or age alone does not qualify a stand as NRF. Overstory trees are generally greater than 21 inches in diameter. Other attributes include a high incidence of large mature and old growth trees (greater than 30 inches DBH) with various deformities (e.g. large cavities, broken tops, mistletoe infestations, and other evidence of decadence), large snags, large accumulations of fallen trees and other woody debris on the ground, multi-storied, multi-species, and sufficient open space below the canopy for owls to fly (Forsman et al. 1984; Thomas et al., 1990). In Southwest Oregon, NRF habitat varies greatly, but is typified by mixed-conifer habitat, recurrent fire history, patchy habitat components, and a higher incidence of woodrats (a high quality spotted owl prey species). It may consist of somewhat smaller tree sizes. One or more important habitat components, such as dead down wood, snags, dense canopy, multistoried stands, or mid-canopy habitat, might be lacking or even absent in portions of Southwest Oregon.

Recovery Action 32 (Structurally complex multilayered habitat). Under the Revised Recovery Plan, the USFWS recommends "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." Evaluation of stands proposed for harvest in the Cold Elk Project used aerial photos, LiDAR, and field review, and resulted in approximately 1,200 acres of withdrawal from the proposed action. Application of RA32 will more effectively address the threats of competition with and displacement by BOs, as well as the impacts of past and current habitat loss.

Roosting and Foraging Habitat has less decay and structure than NRF and is typically younger. It has an average canopy cover greater than 60% and canopy structure is generally single layered, or less multilayered canopies than NRF. It lacks nest structures such as remnant trees, cavities or platform structures. Overstory trees are generally greater than 16 inches in diameter, and tree diameters are usually variable with many in the 11-21 inch diameter range. Most natural stands that lack presence of old-growth and remnant trees but have consistent shrub and herb ground cover, provide roosting and foraging habitat. The presence of snags and down wood are not considered a requirement.

Dispersal habitat will be used to describe the lowest quality of habitat used by NSOs. Thomas et al. (1990) defined dispersal habitat as forested habitat with canopy closure at least 40%, average diameter greater than 11 inches, and flying space for owls in the understory and does not provide the components found in NRF habitat. It provides temporary shelter for owls moving through the area between NRF habitats and some opportunity for owls to find prey, but it does not provide all of the requirements to support an owl throughout its life. Dispersal will be used throughout this document to refer to habitat that does not meet the criteria to be NRF habitat, but has adequate cover to facilitate movement between blocks of NRF habitat. Dispersal habitat is variable, and may include hardwood stands. NRF habitat is also used by dispersing owls.

Capable habitat is not currently NSO habitat, but can become NRF or dispersal in the future as trees mature (i.e. young plantations), and structure develops and canopy fills in.

Non-suitable habitat does not provide habitat for NSO and would not develop into NRF or dispersal in the future (open prairies, meadows, shrub lands, hardwoods with low canopy cover).

Northern Spotted Owl Habitat Treatments

The proposed treatments can be assigned into the following general effect type:

Treat and Maintain NRF or Dispersal Habitat is the treatment defined when an action or activity in NRF or dispersal habitat removes some trees, but does not change the conditions that would classify the stand as NRF or dispersal post-treatment, as defined by Thomas et al. (1990). The NRF stand will retain at least 60% canopy cover. In treatment areas with large trees, multistoried canopy, standing and down dead wood, diverse understory adequate to support prey, mistletoe or other decay, platforms for nesting, and large trees with cavities or defects to support

owl nesting, approximately 180 feet^2 of conifer and hardwood basal area would be retained. In these nesting habitat quality stands, basal area removal of midstory and overstory trees from the treatment units generally would not exceed approximately 20%. In younger and less structurally diverse treatment areas that support foraging and roosting, approximately 150 feet^2 of conifer and hardwood basal area would be retained. Dispersal habitat will retain at least 40% canopy, flying space, and trees 11 inches DBH or greater, on average. The habitat classification of the stand following treatment will be the same as the pretreatment habitat classification.

Downgrade NRF alters the condition of NSO NRF habitat so the habitat no longer supports nesting, roosting, and foraging behavior. Downgraded NRF habitat has enough tree cover to support NSO dispersal. Downgrade is defined when the canopy cover in a NRF stand drops to 40-60% at the stand level, and when conditions are altered such that an owl would be unlikely to continue to use that stand for nesting, roosting and foraging. Downgraded NRF continues to provide habitat for dispersal.

Remove NRF or Remove Dispersal alters known NSO NRF so the habitat no longer functions as nesting, roosting, foraging or dispersal. Removal generally drops canopy cover to less than 40%, alters the structural diversity and dead wood in the stand or otherwise changes the stand so it no longer supports owls for nesting, roosting, foraging, or dispersal.

All existing habitat within the PA was categorized into one of the three categories of NSO habitat described above. The habitat values were derived from two sources: 1) in areas that do not have proposed commercial treatments, habitat values were obtained from a BLM GIS (Geographical Information Systems) dataset representing NSO habitat values across BLM lands and potential NRF habitat on private land, and 2) in areas that are proposed for commercial treatments, field visits were conducted by BLM wildlife technicians, biologists, foresters, and silviculturalists to further identify and delineate the habitat values within those areas. Habitat on lands other than BLM administered lands were only categorized into NRF or not NRF, and thus areas identified as not NRF were assigned into an unclassified category composed of either dispersal only or unsuitable habitat quality. Table 9 below provides information on the types and amounts of habitat by land ownership within the PA.

The majority of the PA is mixed O&C and private land, with the southwest PA consisting of solid federal ownership. It has been heavily managed in the past and the existing NRF habitat is moderately to highly fragmented into small blocks especially in the mixed ownership areas, mostly confined to the federal ownership. The majority of the private land within the PA has been clear-cut and provides little habitat value for species associated with late-successional habitat. It is expected that private timber lands would be managed primarily for timber production and harvested on a 50-80 year rotation. As a result, NSO habitat within the PA is expected to continue to be mostly limited to federally administered lands. Federal lands within the PA (24,919 acres) currently contain approximately 91% of the total existing NRF habitat within the PA. On the BLM lands within the PA, approximately 55% of the BLM lands meet the minimum habitat standards of NRF habitat, and 20% are dispersal (Table 9).

Table 9: Acres of NSO Habitat Types within the Cold Elk PA

Habitat Type	Ownership	
	Federal	Private
Nesting, Roosting & Foraging (NRF)	13,751acres	1,353 acres
Dispersal Only Habitat	5,007 acres	Unknown
Unsuitable Habitat/Capable	5,324 acres	Unknown
TOTAL	24,082 acres	1,353 acres

Table 10: NSO Critical Habitat Unit Acres

CHU/ Subunit	NRF	Dispersal	NRF+Dispersal	Capable/ Non-habitat	Total
9 / KLW-1	72,080	45,511	117,591	29,672	147,263

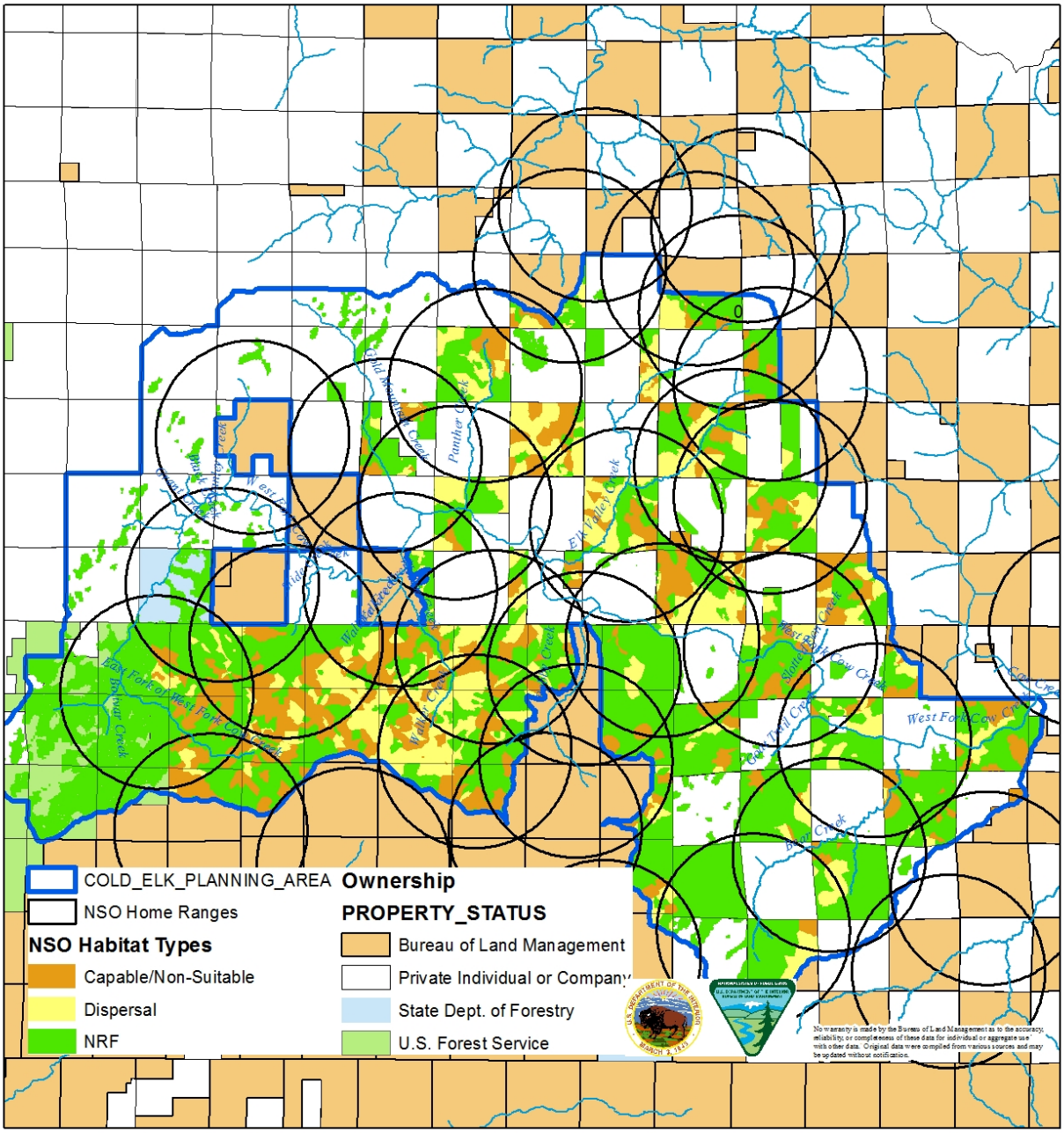
Recovery Action 10 in the Revised Spotted Owl Recovery Plan conserves NSO sites and high-value NSO habitat to provide additional demographic support to the spotted owl population. Application on all lands will more effectively address the threats of competition with and displacement by BOs, as well as the impacts of past and current habitat loss. Recovery Action 10 (USFS/BLM/USFWS 2013) was used while designing the proposed treatments. Surveys are being conducted for all the NSO sites affected by the proposed action, which are assessed based on the occupation and reproduction results of protocol surveys. Based on these survey results, all the NSO sites within the PA that exhibited pair occupancy or reproductive success within the last five years are categorized as high value sites. Sites with at least single owls and sufficient habitat to be viable sites, but have incomplete surveys within the last five years are rated as high value sites because pair status could not be reasonably discounted. NSO sites that do not have any pairs detected within the past 5 years are categorized as low value sites. The ranking of these NSO sites are used to inform treatment locations and intensity consistent with recommendations included in the “Restoring Moist Forest Ecosystems” and “Restoring Dry Forest Ecosystems” section of the Revised Recovery Plan for the Northern Spotted Owl (USFWS 2011). Table 11 included in this section list the NSO sites found and their value ranking, and Figure 16 displays the location of these NSO sites in relation to proposed treatments.

Table 11: Northern Spotted Owl Sites within the Cold Elk Planning Area and Value ranking.

ID#/ NSO SITE NAME	PAIR STATUS LAST 5 YEARS* (2011-15)	YOUNG IN LAST 5 YEARS*	BARRED OWL IN LAST 5 YEARS	SITE "VALUE"
0098A Wilson Creek	YES	YES	NO	HIGH
0249O Stubborn Mule	YES	UNK*	NO	HIGH
0368B Dice Creek	YES	YES	NO	HIGH
0905O Bobby Creek	NO*	UNK*	YES	HIGH
0920 Finger Walker	NO*	UNK*	NO	LOW
0937O Finger Divide East	NO*	UNK*	NO	LOW
1911C Hutch Creek	YES	NO	NO	HIGH
2016B Bear Roost	YES	YES	YES	HIGH
2023O Slotted Cow	YES	YES	NO	HIGH
2072O Snowy Dutchman	YES	NO	NO	HIGH
2079A Cow Elk	YES	NO	YES	LOW
2236O Feathered Elk	YES	NO	YES	LOW
2249 Wall Walker	YES	UNK*	YES	HIGH
2407A Crafty Dutch	YES	NO	YES	LOW
2622A Cain and Mabel	YES	NO	YES	HIGH
2623B/0 Landslide	YES	UNK*	NO	HIGH
2662 Haystack	NO*	NO*	YES	LOW
2663O No Sweat	YES	UNK*	NO	HIGH
2666O Bobby Walker	YES	UNK*	NO	HIGH
3281O Gold Mountain	YES	YES	NO	HIGH
3926 Knee Deep	NO*	UNK*	YES	LOW
4051O/B Dutchman Butte	YES	UNK*	NO	HIGH
4615O Fuzzy Dice	NO	NO	YES	LOW
4671 JJ Walker	NO*	UNK*	YES	LOW
9802T August Second	NO*	UNK*	NO	HIGH

*Not all 5 years were surveyed adequately to determine negative pair/reproduction status; 2-3 years of surveys (2014-2016) yielded no pairs status or reproduction.

Figure 16: Northern Spotted Owl Sites Overlapping the Cold Elk Planning Area



Connectivity/Diversity Blocks

The 1995 Medford District ROD/RMP designated connectivity/diversity blocks that are located throughout the northern GFMA matrix land use allocation. These blocks provide habitat connectivity for old growth dependent and associated species within the northern GFMA and between late-successional reserves. Each block is to maintain at least 25% to 30% in late-successional forest (BLM 1995, p. 40). These blocks may be a combination of NSO nonhabitat and nesting/roosting/foraging, dispersal, and capable habitat. The Project Area contains five connectivity/diversity blocks in T31S, R8W, section 29; T32S, R9W sections 2,3,4 and 11. Currently all of the connectivity blocks exceed 30% in late-successional forest.

NSO Prey Base

Dusky-footed woodrats, a primary prey species for spotted owls in Southwest Oregon, are found in high densities in early-seral or edge habitat (Sakai and Noon 1993). Down wood is an important habitat feature for these major prey species in southwest Oregon. Dusky-footed woodrats build stick nests, sometimes incorporating logs or the base of trees as part of the structure. Northern flying squirrels are another major source of owl prey in southwest Oregon, while red tree voles (RTVs) comprise only approximately 2.6% of the diet of NSOs in this area (Forsman et al. 2004).

Barred Owls (BOs)

Barred owls (*Strix varia*) are native to eastern North America, but have recently colonized the Western US. The BO's range now completely overlaps that of the NSO (Gutierrez et al. 2004). BO are considered generalists and make use of a variety of vegetation and forage species (Wiens et al. 2014). Existing evidence suggests BOs compete with NSOs for habitat and prey with near total niche overlap. Interference competition is resulting in increased NSO site abandonment, reduced colonization rates, and likely reduction in reproduction (Olson et al. 2005; Forsman et al. 2011; Wiens et al. 2014; Van Lanen et al. 2011; Dugger et al. 2011), ultimately resulting in probable range-wide population reductions. BO effects on NSO survival and colonization appear to be substantial and additive to effects of reduction and fragmentation of habitat in NSO home ranges. The magnitude of the BO 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 NSO 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). When BOs are present, the effect of such activities on NSO 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). Some NSOs appear to be able to successfully defend territories and reproduce when BOs are present (Wiens et al. 2014), but the mechanism that allows them to persist is currently unknown.

BO surveys are not required, but BOs are detected opportunistically while conducting NSO surveys. While the BLM did not specifically survey for BOs, a study in the Oregon Coast range suggests that over the course of a season, NSO surveys to protocol (> 3 visits) allow

approximately 85% of the BOs present in the area to be detected (Wiens et al. 2011). Spotted owl surveys elicited BO responses at 11 of the 25 sites over the last 5 years. Additionally, the USFWS's Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owls allows for a reasonable assurance that NSOs in an area will be detected, even where BOs are present (USFWS 2012a). The USFWS and cooperators conducted analyses of historical NSO survey data, leading to estimates of detection rates for NSOs that account for the effects of BO presence.

Affected Environment - Northern Spotted Owl Critical Habitat

The Cold Elk project occurs entirely within designated critical habitat. Critical habitat is designated under the Endangered Species Act of 1973 and was designated for the NSO first in 1992. Critical habitat includes the primary constituent elements (PCE) and physical and biological feaures that support nesting, roosting, foraging, and dispersal. The final rule was published in the *Federal Register* on December 4, 2012 (USFWS 2012b). The 2012 critical habitat designation encompasses approximately 9.6 million acres; 1.2 million acres of that is BLM-OR Oregon and California Lands/Coos Bay Wagon Road lands (O&C). Of the 1.2 million acres: approximately 78% (~937,000 acres) is Congressionally reserved or designated as "Late Successional Reserve" under the NWFP and approximately 22% (~263,000 acres) is designated as "Matrix" under the NWFP. The proposed project is located in the Klamath West (KLW 9) critical habitat subunit KLW-1.

Primary Constituent Elements of Critical Habitat

Based on current research on the life history, biology, and ecology of the NSO and the requirements of the habitat to sustain its essential life history functions, the USFWS has identified the following primary constituent elements (PCEs) for the NSO:

- Forest types that may be in early, mid, or late-seral states and support the NSO across its geographical range.
- Habitat that provides for Nesting and Roosting (NR). This habitat must provide:
    - Sufficient foraging habitat to meet the home range needs of NSOs
    - Nesting Roosting stands that are generally characterized by:
        - Moderate to high canopy closure (60 to over 80%),
        - Multilayered, multispecies canopies with large (20-30 in or greater DBH) trees,
        - High basal area (greater than 240 ft2/acre (55 m2/ha),
        - High diversity of different diameters of trees,
        - High incidence of large live trees with various deformities an decadence,

        - Large snags and large accumulations of fallen trees, other woody debris, and
        - Sufficient open space below the canopy for NSOs to fly.

- Habitat that provides for Foraging, which varies widely across the NSO's range, in accordance with ecological conditions and disturbance regimes that influence vegetation structure and prey species distributions .
    - Klamath and Northern California Interior Coast Ranges
        - Stands of NR habitat; and other forest types with mature and old-forest characteristics;
        - Presence of the conifer species, hardwood species as shrubs;
        - Forest patches within riparian zones
        - Brushy openings, dense young stands or low-density forest patches
        - High canopy cover
        - Multiple canopy layers;
        - Mean stand diameter greater than 21 inches
        - Increasing mean stand diameter and densities of trees greater than 26 inches
        - Large accumulations of fallen trees and other woody debris
        - Sufficient open space below the canopy for northern spotted owls to fly.

- Habitat to support the transience and colonization phases of dispersal, which in all cases would optimally be composed of nesting, roosting, or foraging habitat (PCEs (2) or (3)), but which may also be composed of other forest types that occur between larger blocks of nesting, roosting, and foraging habitat. In cases where NRF habitats are insufficient to provide for dispersing or nonbreeding owls, the specific dispersal habitat PCEs for the NSO may be provided by the following:
    - Habitat supporting the transience phase of dispersal, which includes:
        - Stands with adequate tree size and canopy closure to provide protection from avian predators and minimal foraging opportunities; in general, this may include, but is not limited to, trees with at least 11 in (28 cm) DBH and a minimum 40% canopy closure; and
        - Younger and less diverse forest stands than foraging habitat, such as even-aged, pole-sized stands, if such stands contain some roosting structures

and foraging habitat to allow for temporary resting and feeding during the transience phase.

- Habitat supporting the colonization phase of dispersal, which is generally equivalent to nesting, roosting, and foraging habitat as described in PCEs 2 and 3, but may be smaller in area than that needed to support nesting pairs (USFWS 2012a, pp. 71905-71906).

Unit 9: Klamath West (KLW)

Unit 9 contains nine subunits, and consists of the western portion of the Klamath Mountains). A long north-south trending system of mountains (particularly South Fork Mountain) creates a rainshadow effect that separates this region from more mesic conditions to the west. This region is characterized by very high climatic and vegetative diversity resulting from steep gradients of elevation, dissected topography, and the influence of marine air (relatively high potential precipitation). These conditions support a highly diverse mix of mesic forest communities such as Pacific Douglas-fir, Douglas-fir tanoak, and mixed evergreen forest interspersed with more xeric forest types. Overall, the distribution of tanoak is a dominant factor distinguishing the Western Klamath Region. Douglas-fir dwarf mistletoe is uncommon and seldom used for nesting platforms by northern spotted owls. The prey base of northern spotted owls within the Western Klamath is diverse, but dominated by woodrats and flying squirrels. (USFWS 2012b).

KLW-1

The subunit KLW-1 covers 100% of the Cold Elk PA, occurs in Douglas, Josephine, Curry, and Coos Counties, Oregon, and comprises lands managed by the State of Oregon and the BLM. Of this subunit 7,682 acres (3,109 ha) are managed by the State of Oregon for multiple uses including timber revenue production, recreation, and wildlife habitat (ODF 2010). Federal lands are managed as directed by the NWFP (USFS/BLM 1994a). Special management considerations or protection are required in this subunit to address threats to the essential physical or biological features from current and past timber harvest, losses due to wildfire and the effects on vegetation from fire exclusion, and competition with BOs. This subunit is expected to function for demographic support to the overall population and for north-south and east-west connectivity between subunits and critical habitat units. This subunit sits at the western edge of an important connectivity corridor between coastal Oregon and the western Cascades. There are approximately 114 total historic NSO sites in this critical habitat sub-unit on BLM and FS lands.

The Cold Elk Project is contained within Critical Habitat Unit (CHU) 9, sub-unit KLW-1. Approximately 3,395 acres of NRF and dispersal habitat are proposed for treatment.

Table 12: Critical Habitat Baseline (Acres)

CHU / Sub-Unit	NRF	Dispersal -Only	Dispersal (NRF + Dispersal Only)	Capable	Total Acres (Dispersal + Unsuitable + Non-Habitat)
9/KLW-1	72,080	45,511	117,591	29,672	147,263

** Total Unit acres,. Source: Recent projects in the USFWS NWFP tracking database subtracted from the USFWS NSOCH_2012_Baseline_Summaries_Dec19_2012 Data on May, 2, 2016*

Affected Environment - Marbled Murrelet

The Marbled murrelet survey zone A in the GPRA includes the western hemlock/tanoak vegetation zone, and zone B up to10 kilometers to the east of zone A, and covers the western area of the PA (Figure 17) Marbled murrelets are not known to occur in the GPRA, including the PA. Suitable marbled murrelet habitat includes old-growth multilayered stands, and old-growth or dominant trees in mature or younger stands, with multiple platforms containing moss, lichen, mistletoe, or duff (McShane et al. 2004). Murrelets prefer habitat with high rainfall and humidity and cool weather, and prefer nesting in lower to mid slopes below 1,000 meters.

Over 2,000 intensive protocol surveys and 950 general surveys were conducted east of the western hemlock/tanoak zone in southwestern Oregon from 1988 to 1994 and no marbled murrelets were found (Dillingham et al. 1995). These surveys included the West Fork Cow Creek 5th field watershed. Additional surveys after 1995 continued to detect no murrelets in the watershed with approximately 500 survey stations from 1995 – 2002 (Alegria et al. 2002). An additional 54 survey stations were surveyed for project clearance (2009-2011) which overlap the Cold Elk project area, totaling approximately 554 survey stations, with no murrelets detected. Including surveys in Zone A and B within the GPRA (approximately 35 miles inland from the coast) which includes the west portion of the PA, 850 stations from 1995 through 2011 have been surveyed with no detections.

In a southern Oregon and northern California study, Meyer & Miller (2002) hypothesized that murrelet pair-exchange flights every dawn during incubation, and feeding several times a day in the early nesting stage incur high energy costs, particularly for nests distant from marine feeding areas. Consequently, murrelets were not found occupying areas 25 miles from the coast, even when the western hemlock zone extended farther inland. Just north of the study area, the hemlock zone extended 35 miles inland, yet the occupied plot farthest inland in that area was only 23 miles. Although birds were detected 35 miles inland at one location in the study area, no nesting behaviors were observed in these areas despite many follow-up surveys. They hypothesized that they were nonbreeders. They found that the birds tend to not use ridgetops, which may be more windy and exposed to the elements. They hypothesized that murrelets would use the western hemlock zone because it may have larger trees and a cooler, foggy climate that reduces heat stress. Hunter et al. (1998) did not find any birds inland of the fog zone in northern California, where the temperatures were quite warm (5.9–9.1 Celsius warmer) than where murrelets were found in the fog zone. Murrelet records for northern California from 1988 through 1992 indicate that 89% were within 10 km of the coast (Miller and Ralph 1995). The 2003 revision of the approved protocol (Mack et al. 2003) confirmed the marbled murrelet is not

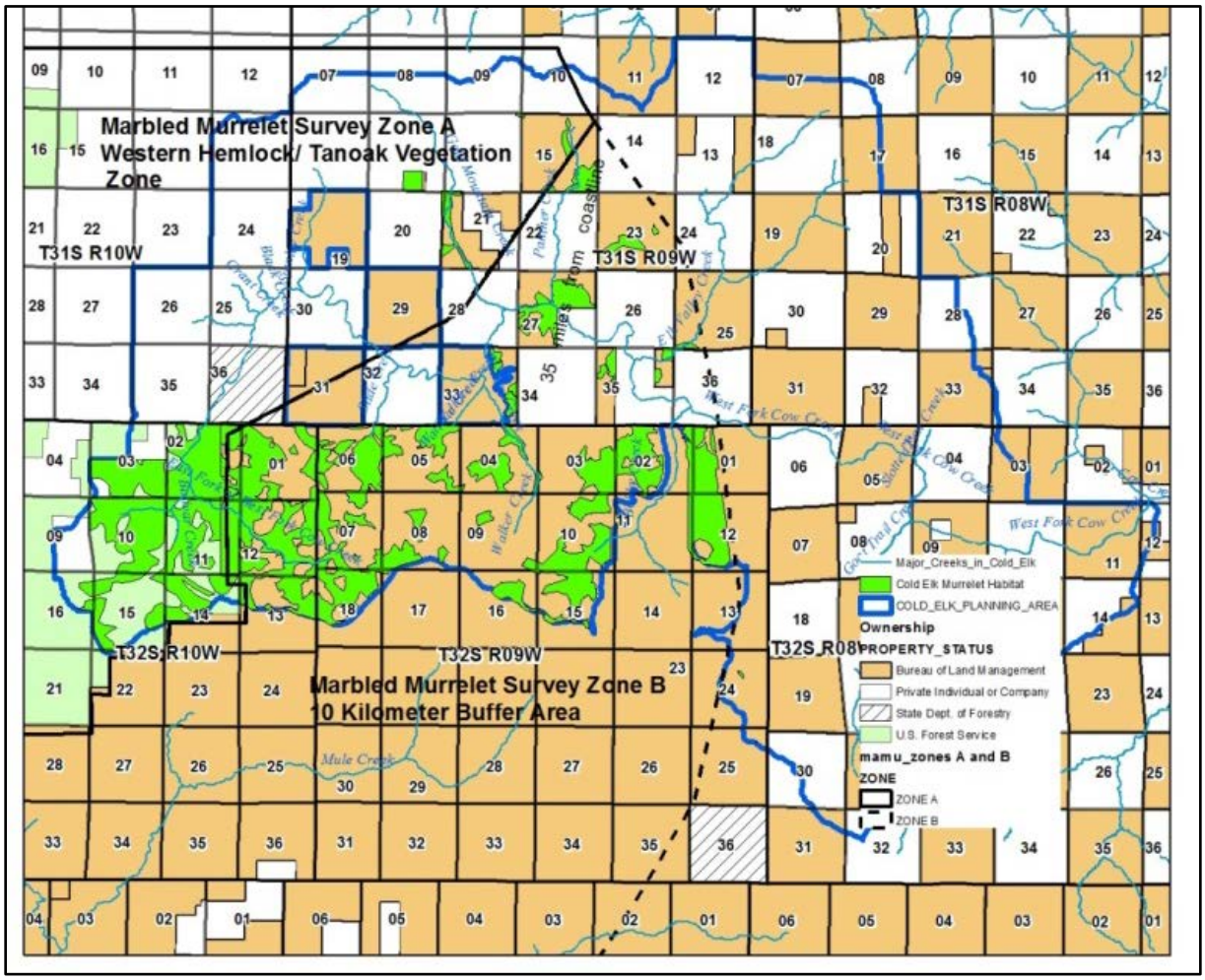
likely to be found beyond the western hemlock/tanoak zone at the latitude of the Medford District BLM Grants Pass and Glendale Resource Areas. They stated that murrelet occurrence in the Siskiyou Mountains in Oregon was associated with the extent of the hemlock/tanoak vegetation zone, which occurs 16-51 km (10 - 32 miles) inland. Based on the number of surveys beyond the western hemlock/tanoak and fog zone (Zone A) and no detected occupancy and nesting behavior, the likelihood of occupation or nesting murrelets in the PA is very low. The possible few occurrences would not contribute significantly to the of the overall population, particularly with the excessive energy demands, increased stress from warmer and drier environmental conditions, and increased exposure to predation (Hunter, et al 1998).

For Oregon and California, elevation of nest trees ranged from 150 to 2,119 feet (McShane et al. 2004). Nest trees were located mostly in old-growth conifers, old-growth forests, decadent trees, or trees with multiple platforms with mistletoe and deformations and moss on limbs. Nest tree diameters in Oregon and Washington averaged 43-46 inches DBH. The majority of nests in the Pacific Northwest, and in Oregon and California, were located on the lower one-third or middle one-third of the slope. Marbled murrelets were generally not occupying areas inland of the fog-influenced western hemlock zone or above 1000 meters. Dillingham et al. (1995) found the same result.

Occupied stands in Oregon ranged from 180 to 350 years old and had 2 to 3 layers, with canopy closure in Oregon and California ranging from 12-99% and averaging approximately 40%; in the Pacific Northwest mean canopy closure was 49% (Hamer and Nelson 1995).

There are approximately 5,715 acres of habitat that is suitable or potentially suitable in the PA within Zone A (1,825 acres) and Zone B (3,889 acres).

Figure 17: Suitable Marbled Murrelet Habitat within the PA



Affected Environment - Survey and Manage Species

Red Tree Vole

The red tree vole (RTV) is a Northwest Forest Plan Survey and Manage species and currently grouped into Category C, with not all known sites or populations are likely to be necessary for reasonable assurance of persistence (USFS/BLM 2001). The broad management objective for this species is to retain sufficient habitat to maintain its potential for reproduction, dispersal, and genetic exchange; and to provide for reasonable assurance of species persistence. Red tree vole habitat occurs throughout the PA. Red tree voles are strongly associated with late-successional habitat (Corn and Bury 1991). RTV surveys were conducted where proposed management activities would trigger the need for pre-disturbance surveys and contain suitable habitat for RTVs (Huff et al. 2012) on 3,450 acres of suitable habitat at least 80 years old in compliance with the Court Ruling in Conservation Northwest et al. v. Bonnie et al (BLM 2014). These surveys detected 217 active RTV nests and 145 inactive nests throughout the survey areas. Active sites are managed following RTV Management Recommendation Guidelines

(USFS/BLM 2000). Approximately 1,020 acres were buffered (dropped) from treatment where active and associated inactive RTV nests were found and protected.

The RTV is an arboreal rodent species with very low dispersal capabilities. RTVs depend on conifer tree canopies for nesting, foraging, travel routes, escape, cover, and moisture (Carey et al. 1991). RTVs are primarily arboreal but will come to the ground to move between trees if there are no branch pathways between trees (Forsman and Swingle 2009). RTVs tend to select older forests with a mixture of old and large trees, multiple canopy layers, snags and other decay elements, understory development and biologically complex structure and composition (USFWS 2011). Primary habitat for the RTV is generally forest stands dominated by multi-storied and single-storied conifer trees greater than 20 inches DBH (USFS/BLM 2000). Douglas-fir needles provide the primary food and building materials for nests (USFS/BLM 2002). Many biologists who have studied tree voles have noted that their nests tend to occur in clumps on the landscape. Signs of their presence range from areas with many nests in a single stand to stands in which only a few nests can be found (Forsman and Swingle 2009).

Great Gray Owls

The great gray owl (GGO) is a Northwest Forest Plan Survey and Manage species and currently grouped into Category C, with not all known sites or populations are likely to be necessary for reasonable assurance of persistence (USFS/BLM 2001).

GGOs nest in a varied array of open forests associated with grassy areas suitable for their preferred prey species (e.g., voles, moles, gophers). Broken-top trees, abandoned raptor nests, mistletoe clumps, and other platforms provide suitable nest structures (USFS/BLM 2004). Foraging habitat is described as relatively open, grassy habitats, such as bogs, natural meadows, open forests and recent selective/ RH areas. The majority of the forested stands present around the PA are dense, steep, heavily forested, or with dense understories, and do not provide an open, grassy understory, or interspersed small natural openings, typical of GGO habitat.

Potentially suitable habitat is very limited, with natural meadows and open forest conditions occurring in small patches and very limited across the PA. Past surveys (1996, 2000, 2001, 2010, 2011, 2013) conducted in the PA around the few natural openings or manmade pastures have had no detections. There have been no confirmed incidental observations in adjacent watersheds. There are no known or historical sites in the GPRA north of the Rogue River and west of Interstate 5. It is unlikely that GGOs reside in the PA, and no significant impacts are expected to occur from proposed action prescriptions. Surveys for GGOs were not conducted for the Cold Elk project and this species will not be analyzed further in the EA.

Mollusks

No S&M species are expected to occur in the PA. Continued persistence and viability are not affected by the PA.

Affected Environment - BLM Bureau Sensitive Species/Species of Concern

Bureau Special Status Species (SSS) are species listed or proposed for listing under the ESA and species requiring special management consideration to promote their conservation and reduce the

likelihood and need for future listing under the ESA. The SSS list was most recently updated in January 2012. This list has two categories: Sensitive and Strategic. Medford 1995 RMP guidance states, "Manage for the conservation of Federal candidate and Bureau-sensitive species and their habitats so as not to contribute to the need to list, and to contribute to the recovery of the species." Per BLM Manual 6840 (Section .06), Bureau sensitive species will be managed consistent with species and habitat management objectives in land use and implementation plans to promote their conservation and to minimize the likelihood and need for listing under the ESA or other provision of BLM Manual 6840.02. The RMP requires that the BLM manage, over time and across the landscape, so as to not contribute to the need to list a species, and not for every action, to contribute to the recovery of the species. Project implementation will adhere to the requirements set forth in Section 6840.2.C, and only Sensitive species are required to be addressed in NEPA documents. All Sensitive species were considered and evaluated for this project, and only those that could be impacted by the Proposed Action are discussed in more detail.

Fisher

On April 14, 2016, the USFWS issued its finding that the fisher does not require the protection of the Endangered Species Act. The USFWS reviewed the status of the fisher, responding to comments and new information submitted under the proposed rule to list the fisher as Threatened. The state of Oregon lists the fisher as a sensitive species in the critical category, and it is currently listed as a federal sensitive species.

In Oregon, the west coast distinct population includes the Oregon Cascades west to the coast. Fisher, a mammal from the weasel family, is found in forest woodland landscape mosaics that include conifer-dominated stands. Their occurrence is closely associated with low- to mid-elevation forests (generally less than 4,100 feet) with a coniferous component, large snags or decadent live trees and logs for denning and resting, and complex physical structure near the forest floor (Aubry and Lewis 2003). Forest type is probably not as important to fishers as the vegetative and structural complexity that lead to abundant prey populations and potential den sites and they will use harvested areas if patches of habitat with residual components are retained (i.e., logs, hardwoods) and areas where patches of larger trees are left in the landscape (Lofroth et al. 2010). Fishers do not appear to occur as frequently in early-successional forests as they do in late-successional forests in the Pacific Northwest (Powell and Zielinski 1994).

Currently, there are two populations of fisher in Oregon which appear to be genetically isolated from each other: a small population in the Southern Cascades near Prospect and Butte Falls, and a second population in Southwest Oregon in the Klamath Siskiyou Mountains and in Northern California (Lofroth et al. 2010).

The PA does not occur within the Northern California Southern Oregon range known to be occupied by fisher.

Fisher surveys using baited camera stations were conducted in portions of the West Fork Cow Creek watershed and adjacent to the PA in 2000, 2004, and 2009, and 2016, with no detections. Some historical potential sightings have occurred in the PA but have not been verified. The absence of detections from camera surveys, relatively few potential sightings from BLM field

personnel, and lack of reported sightings from extended BLM field work and BLM personnel field visits in the watershed, compared known occupied areas in Southern Cascades and Klamath Siskiyou Mountains, indicates it is unlikely that a resident population occurs, or that it is an area of low and/or incidental use. The Proposed Action management for the NSO and marbled murrelet are likely to provide landscape management for the fisher as well, an therefore would not have measureable negative effects to potential fisher habitat, nor would it contribute to the need to list it as threatened, and therefore will not be analyzed in any further detail.

Oregon shoulderband snail

Known sites in the Grave Creek watershed and the PA are generally associated with shrublands, rocky inclusions in forested habitat, exposed serpentine rock, rock talus, and oak/grassland habitat. Although very little is known regarding the ecology of the Oregon shoulderband snail, it generally associates with moist areas and rock substrate, large woody debris, and logs as refugia during the dry months (Duncan et al. 2003). The PA is not expected to degrade suitable habitat, affect persistence within the PA or project units, or contribute to the need to list the species as threatened.

Bald Eagle

The bald eagle is a Bureau Sensitive Species and is also protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

Bald eagles generally nest near coastlines, rivers, large lakes or streams that support an adequate food supply, usually fish and waterfowl. They often nest in mature or old-growth trees; snags (dead trees); cliffs; rock promontories; rarely on the ground; and with increasing frequency on human made structures such as power poles and communication towers. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds. Nest sites typically include at least one perch with a clear view of the water where the eagles usually forage. Shoreline trees or snags located in reservoirs provide the visibility and accessibility needed to locate aquatic prey. Eagle nests are constructed with large sticks, and may be lined with moss, grass, plant stalks, lichens, seaweed, or sod. Nests are usually about 4-6 feet in diameter and 3 feet deep, although larger nests exist (USFWS 2007).

There are no known bald eagle nests in or adjacent to the PA. Forest stands do have trees large enough to support nesting or roosting along Cow Creek, and sightings of foraging eagles occur in fall and winter. The PA is not expected to negatively impact bald eagles.

Townsend's big-eared bats are found in the western U.S. in habitats that include conifer forest (Verts and Carraway 1998). Townsend's big-eared bats typically roost and hibernate in mines and caves, but have been found roosting in hollow trees as well (Fellers and Pierson 2002). Townsend's big-eared bats are known to occur with the PA due to the presence of mining adits and shafts which provide some suitable habitat. No suitable adits/caves requiring habitat buffers occur in proposed units. The Proposed Action is not expected to negatively impact this species.

Pallid bats are found in southeastern and southwestern Oregon. West of the Cascade Range, they are restricted to the drier interior valleys of the southern portion of the state. They are usually found in brushy, rocky terrain, but have been observed at edges of coniferous and

deciduous woods and open farmland (Verts and Carraway 1998). Roost habitat includes buildings, bridges, large decadent snags, and rock outcrops. Pallid bats have not been confirmed but could be present within in the PA. Retention of large snags and dominant trees with cavities within units, and surrounding large rock outcrops to maintain suitable NSO habitat also provides potential habitat for the pallid bat. The Proposed Action is not expected to negatively impact this species.

Fringed myotis bats appear adapted to live in areas with diverse vegetative substrates. They are associated with a variety of habitats including conifer forests, oak woodlands, and boulders with cracks. They roost in buildings, bridges, caves and mines, and in crevices and cavities in large trees and snags. Fringed myotis bats have not been confirmed but could be present in the Planning Area. Retention of large snags and dominant trees with cavities within units to maintain suitable NSO habitat also provides potential habitat for the fringed myotis bat. The Proposed Action is not expected to negatively impact this species.

Johnson's Hairstreak Butterfly

The Johnson's hairstreak butterfly is dependent on conifer mistletoe for egg-laying and for food in its larval stage. The host plants are dwarf mistletoes (*Arceuthobium campylopodum*) and other mistletoes (including *A. tsugense*). It spends much of its lifespan in and near the tops of conifer trees, although it descends to ground level for nectaring (including Oregon grape, Pacific dogwood, ceanothus, pussy paws, and *Rubus* species), and to visit moist muddy areas as a source of water (Pyle 2002). Surveys for the species are difficult as it spends the majority of its lifecycle high in the canopy of older conifers with mistletoe infection. Pyle (2002) states that the Johnson's hairstreak is one of the only old-growth obligate butterfly species. The host mistletoe occurs mainly on western hemlock and occasionally on true firs (Xerces 2016). It is not known to occur in the PA or West Fork Cow Creek Watershed, and there is some uncertainty whether the PA is within its range. Some stands with substantial components of hemlock and true fir do occur in Project Area. Old-growth complex stands would be deferred in the PA, and heathy dominant true firs would be retained, therefore the Proposed Action is not expected to affect the persistence of the species.

Western Bumblebee

This species was until recently common across much of the western United States. This species is associated with open grassland/shrubland where abundant flowering plants occur and serve as a food source. The species has experienced a population decline in the last decade, likely due to introduction of non-native pathogens. The Proposed Action is not expected to affect this species.

Pond Turtle

The pond turtle is associated with streams and ponds throughout southwestern Oregon. Egg laying sites are terrestrial and located near water sources. Over-wintering sites may be aquatic or terrestrial, sometimes several hundred yards from water. Pond turtles have been documented in West Fork Cow Creek and may occur in the lower portions of major tributaries, and man-made ponds within the PA. The PA maintains suitable habitat conditions in RRs, and is not expected to affect the persistence of pond turtle populations.

Peregrine Falcon

The peregrine falcon is a Bureau Sensitive species. This species nests on rock cliffs and outcrops and feeds on a variety of birds including pigeons and waterfowl. Suitable habitat does not occur within or adjacent to the PA; therefore the Proposed Action is not expected to affect this species.

USFWS Birds of Conservation Concern and Game Birds Below Desired Condition

Resident (found year-round) and Neotropical bird species are addressed here due to widespread concern regarding downward population trends and habitat declines. The BLM has interim guidance for meeting federal responsibilities under the Migratory Bird Treaty Act and Executive Order (EO) 13186. Both the Act and the EO promote the conservation of migratory bird populations (BLM 2007). Two lists prepared by the USFWS in determining which species are to receive special attention in land management activities. The lists are *Bird Species of Conservation Concern* (BCC) found in various Bird Conservation Regions (PA is in BCR 5) and *Game Birds Below Desired Condition* (GBBDC). Table 15 displays those species that are known or likely to be present in or adjacent to the PA. The Proposed Action is not expected to negatively impact habitat for these species.

Table 13: BCC and GBBDC Species Known or Likely to be Present in the PA

Common Name	Status
band-tailed pigeon	GBBDC
mourning dove	GBBDC
olive-sided flycatcher	BCC
rufous hummingbird	BCC
purple finch	BCC

GBBDC – Game Birds Below Desired Condition
BCC – Birds of Conservation Concern

Current research indicates the most appropriate scale to study impacts to migratory birds is at the eco-regional scale (Zack 2002). Breeding bird surveys in the Southern Pacific Rainforest Physiographic Region (which includes Western Oregon) indicate that songbirds are declining. The exact cause of these declines are still unclear, but issues associated with their winter grounds (Central and South America) are suspected to be an important factor.

Band-tailed pigeons are generally found in temperate and mountain coniferous and mixed forests and woodlands, especially pine-oak woodland. They will often forage in diverse habitats not used for nesting, including cultivated areas, suburban gardens and parks. Mineral springs and mineral graveling sites are important for mineral intake by adults, especially during the nesting season. Pigeons show strong fidelity to mineral sites and have been documented traveling 32 miles from a nesting site to a mineral spring (Sanders 2002).

Mourning doves breed in a variety of open habitats, including agricultural areas, open woods, deserts, forest edges, cities and suburbs. A dove may have up to five or six clutches in a single year. Human alteration of original vegetation in North America is generally beneficial for this species, with creation of openings in extensive forests and plowing of grasslands for cereal-grain

production of particular importance. Mourning doves are one of the most widespread avian species in North America.

Olive-sided flycatchers are most often associated with forest openings, forest edges near natural openings (e.g., meadows, canyons, rivers), human-made openings (e.g., harvest units), or open to semi-open forest stands. In Douglas-fir forests of northwest California, Olive-sided flycatcher is the only common species detected more often at forest edges than in forest interiors (Rosenberg and Raphael 1986). In rainforests of western Oregon, which are characterized by dense canopy closure and function as unsuitable habitat, Olive-sided flycatchers occur primarily in harvest units where at least a few large snags and live trees are retained.

Rufus hummingbirds' breeding habitat includes coniferous forest, second growth, thickets and brushy hillsides, foraging in adjacent scrubby areas and meadows with abundant nectaring flowers. They are associated with secondary succession communities and forest openings (Healy and Calder 2006). Nest sites are located in a variety of plants and sites including shrubs and drooping lower branches of conifers and oaks.

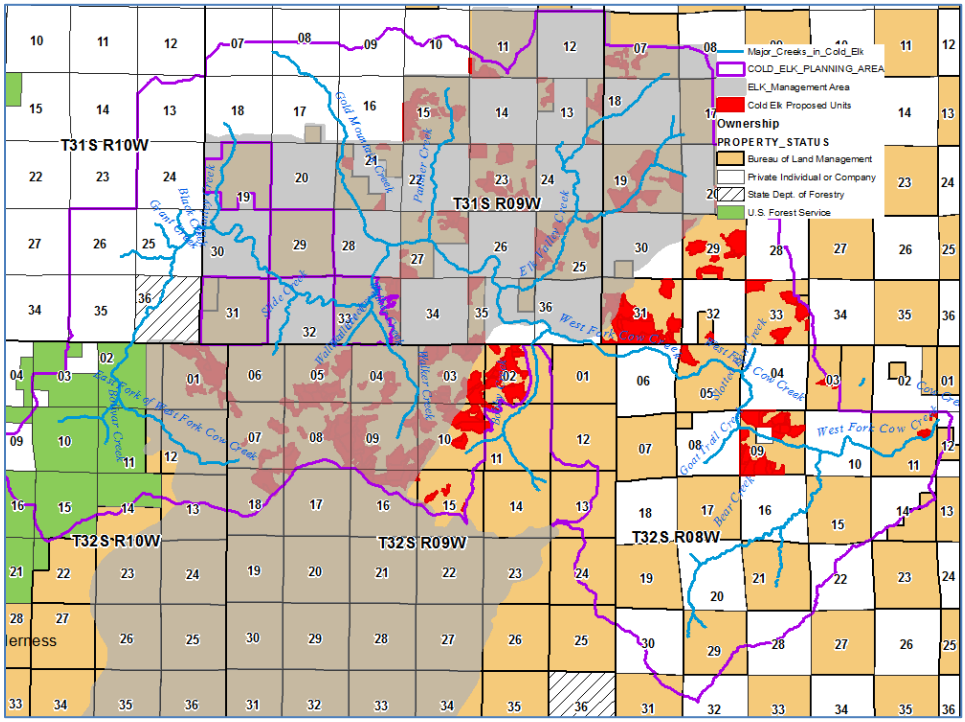
Purple finches are most often associated with moderately moist, open conifer forests, and edge habitat at low-to-mid elevations. They use a variety of habitats including deciduous woodlands, riparian corridors, and edge habitat (Marshall et al. 2003). They are more widespread in winter, using forests, shrubby areas, weedy fields, hedgerows, and backyards.

The golden eagle is not recognized as a federal or state listed species or under the Bureau's SSS program. However, protection is afforded under the Bald and Golden Eagle Protection Act and under the 1995 Medford District RMP. In Oregon, golden eagles inhabit a wide range of habitats, including shrub steppe, grasslands, juniper, open ponderosa pine, and mixed conifer/hardwood/deciduous habitats. The preferred foraging habitat is generally open areas with a shrub component that provides food and cover for small mammal prey; primarily black-tailed jackrabbit and ground squirrels. Nests are typically built in large live ponderosa pines or Douglas-fir (>30 inches DBH) or on ledges along rims and cliffs (Marshall et al. 2003). A historical golden eagle site occurs in the PA, however, the Proposed Action would not affect habitat near the known nesting area, and seasonal restriction would avoid disturbance near the nest stand. No change to foraging habitat or prey availability would occur.

Affected Environment - Elk Management Area

The Mule Creek Elk Management Area (EMA) covers a portion of the Cold Elk planning area (Figure 18), and is one of 13 elk and big game management areas on Medford BLM designated in the 1995 RMP (RMP MAP 7). The entire RMP designated Mule Creek EMA is 54,030 acres (42,520 BLM acres). Elk in the PA are most commonly observed in the main drainages of Panther Creek, Gold Mountain Creek and Elk Valley Creek. No meadows or natural grassland occur in the proposed units. Such habitat provides a continual source of high quality forage. Elk are often observed near recent harvested areas or private agricultural grassland that are currently providing forage. Forage quality is the major limiting habitat factor for elk (BLM 1994).

Figure 18: Mule Creek Elk Management Area



Cold Elk project is consistent with 1995 RMP Elk Management Area objectives:

- All roads except for major collectors and arterials will be closed. New road construction will be minimized;
- Limit motorized vehicle use to an open road density of 1.5 miles per square mile, where possible;
- Impose seasonal restrictions on activities if needed to avoid disturbance and harassment;
- Maintain or enhance forage where appropriate by creating small openings in conifer stands of all ages, prescribed burning, seeding, fertilizing, underburning forest stands, or other means. In Matrix lands, priority would be given to utilizing portions of stands with little or no conifer stocking

Roads within the PA are under reciprocal right-of-way agreements and cannot be decommissioned or closed without agreement from other affected agreement stakeholders. Letters were sent out to Reciprocal Right-of-Way agreement holders with possible road segments for decommission. It is not the road density that may negatively impact elk, but the disturbance caused from road access. Elk avoidance of roads increases with increasing traffic rates, providing further evidence that elk are not reacting to roads, but to the activities associated with roads (Wisdom et al. 2004). The proposed units do not qualify as a continual source of high quality forage and are well stocked with conifers and not candidates for creating elk forage.

RMP Objectives for elk management remain in place with the exception of using the Wisdom Elk Model or equivalent model to manage the mix of forage areas, thermal cover, hiding cover, and optimal cover to maintain or attain highly viable habitat condition. Recent research to test

the Wisdom Model documented that the thermal cover component is incorrect and could not be validated. The Pacific Northwest Research Station is in the process of revising the elk model with newer research, but it is not yet available for use.

Cover would remain high (>60% canopy) in mature and older stands on the gentler lower and mid slopes favored by elk. There would be no change to the open road density as no permanent construction is proposed. Forage habitat condition would function within marginal conditions in proposed thinning units, similar to the No Action Alternative. Elk population levels are expected to continue to be moderate and unchanged by the proposed action within the PA, due to meadows and grassland (quality forage) on private, and the recent intensive harvesting on private land, providing a temporary increase of forage for the next 5-15 years. The elk population within the Elk Management Area are expected to be stable or declining slightly (BLM 1994).

Environmental Effects

Impacts to wildlife are best measured by the predicted potential changes in stand structure within different habitat types that would result from the activities proposed under each Alternative. Quantifying the predicted changes in wildlife habitat is the best method to evaluate the potential effects to wildlife species because they reflect the modification to and the resulting functionality of the residual stand after treatment. Each wildlife species will respond differently to these stand structure changes; some may be negatively affected, others may benefit, while still others may remain unaffected. The effects to key species associated with these habitats are linked to these changes in stand structures, as well as the magnitude (total treatment acres) and intensity of the treatments. Only federal listed, Bureau Sensitive, and S&M species known or suspected to occur within the PA and with the potential to be impacted by the Proposed Action are addressed further in this EA.

3.3.2 Alternative 1—No Action

Under the No-Action Alternative, no vegetation management (VDT, UR, FH/Laminated Root Rot, Roadside Management), road construction, or decommissioning would be implemented; nor would there be direct, indirect, or cumulative effects to wildlife species. Stands providing suitable habitat for the threatened northern spotted owl (NSO) and marbled murrelet would remain habitat; as early, mid-seral, and late seral stands would also provide for other sensitive species. Without treatment, the current tree plantation stands and natural mid and late-seral stands may develop into less complex stand structures and species compositions. Douglas-fir species are likely to continue to dominate many stands and suppress other species such as oaks, pines, cedars, maples, chinquapin, and madrones. Late successional development may still occur, but may take longer as forest stands go through other processes (i.e. competition suppression, disease, drought, insects and forest pathogens). Habitat would continue to develop along current successional pathways. The development of large tree structure comparable to that of remnant trees used by NSOs is not likely to occur because current stand conditions are too dense and trees are not developing the diameter-to-height ratio required to develop such structure. This ratio was historically created through frequent fire events that reduced stem densities and competition that created greater spacing between trees and provided for faster and larger growth with larger limbs and crowns. Current stand conditions would likely develop into less complex stand structures and species compositions than that of old growth stands (Sensenig

2002) or at the very least, would require a much longer time scale to develop (Tappeiner et al. 1997).

Unthinned stands would remain at a higher risk of stand-replacement fire than thinned stands. Recent trends in Southwest Oregon illustrate that fire has been converting mature forest structure into earlier seral stages at a higher rate than harvest. Recent large wildfires have occurred in the Grants Pass Resource Area (Douglas Complex Fire 2013, Big Windy Complex 2013, Brimstone Fire 2013, Labrador fire 2013, Oak Flat Fire 2010, Blossom Complex Fire 2005, Biscuit Fire 2002). For this reason, the retention of mature forest habitat is problematic in dry forested ecosystems (Spies et al. 2006; Courtney et al. 2004). In the short term, habitat conditions would remain generally unchanged at the unit scale, barring a major disturbance such as fire, wind, insects, or disease.

Conditions in the proposed thinning units would be most affected in the long-term by this competition of overstory trees. Overstocked stand conditions would result in relatively slow growth rates that would prolong crown differentiation. Eventually, some trees would become dominant and shade out suppressed trees. Suppressed trees would stand as small-diameter snags or smaller trees with minimal crowns, and ultimately fall, but would not create large canopy openings because of their small size. The remaining dominant trees would soon expand their crowns into the newly-available growing space, increasing the effects of mortality on understory vegetation. Multiple waves of such competition mortality would occur before dominant tree density could be low enough for understory re-initiation. This growth trajectory would be unfavorable to the development of mature and late-successional forest attributes.

Changes to NSO habitat may occur on the landscape in the PA regardless of the Cold Elk Project. Recent and current large scale private timber harvesting and road building is observable within the PA. BLM parcels in mixed O&C/private ownership will continue to become more fragmented and isolated with hard edge vegetation boundaries. NSO sites within majority privately managed parcels are at risk of no longer being able to support NSOs as private harvesting removes suitable habitat. Most private forest lands are managed as tree farms for production of wood fiber on forest rotations. It is expected that any remaining late-seral forests on private timber lands will be converted to early-seral forests. For those species dependent on early-seral habitat, private forest lands are not expected to provide quality early successional habitat as competing vegetation that includes flowering plants, shrubs, and hardwood trees are regularly treated with herbicides to reduce competition with future harvestable trees.

NSO surveys have detected barred owls within seven of the 25 home ranges of known NSO sites in the Project Area from 2011-2015. The total number of barred owls in the area is unknown; however, barred owl range completely overlaps that of the NSO. Even though barred owls are rapidly expanding their range in North America and within the range of the NSO and contributing to the decline of the NSO, disturbance from timber harvest is often offered as an explanation for the cause. However, Courtney et al. (2004) concluded that “habitat loss to timber harvest is often postulated to be a major factor in spotted owl decline, but habitat is still present in the study areas (indeed some areas where spotted owls are in the worst decline, such as Olympic National Park, have never been harvested).” The population of barred owls is likely to continue to increase with negative impacts on spotted owls.

3.3.3 Alternative 2

Direct and Indirect Effects

Federal Threatened Species—Northern Spotted Owl

Effects to NSO Habitat

Under Alternative 2, approximately 1,315 acres of NRF habitat, 2,113 acres of dispersal habitat, 313 acres of capable habitat, and 8 acres of non-suitable habitat would be thinned or impacted by methods used for thinning. Capable and non-suitable areas are considered to be too young and dense, or too open to be functioning currently as habitat contributing to NSO survival.

When analyzing the impacts of timber harvest to NSOs, the amount, intensity and duration of the harvest are not the only factors to consider. A critical factor to consider is the spatial distribution of the habitat found across the landscape and where the proposed treatments would occur in relation to known NSO sites. The areas surrounding a NSO site can be delineated into three concentric circles. These concentric circles represent three scales of use during the course of breeding and non-breeding season, and provide a means of comparing effects similarly between owls and important threshold levels. The actual landscape habitat use is not circular, but follows drainages and lower topographic slopes (Blakesley et al. 1992; Hershey 1998; McDonald et al. 2006).

The following definitions are used to describe the anticipated effects of the proposed action with respect to the location of NSOs. These three areas represent how NSOs utilize the forest environment around their territories, and the importance of the habitat located within each spatial scale to a given occupied site. They also provide a better understanding of how habitat altering treatments may affect NSO life functions, depending on where the treatment would occur in relation to known NSO sites.

- **Nest Patch** is the 300-meter radius (70 acres) around a known or likely nest site and is included in the core and home range area. Nest area arrangement and nest patch size have been shown to be an important attribute for site selection by NSOs (Swindle 1997; Perkins 2000; Miller 1989; Meyer et al. 1998). Models developed by Swindle (1997) and Perkins (2000) showed that the 200-300 meter radius (and sometimes greater), encompassing approximately up to 70 acres, around a nest is important to spotted owls. The nest patch size also represents key areas used by juveniles prior to dispersal. Miller (1989) found that on average, the extent of forested area used by juvenile owls prior to dispersal averaged approximately 70 acres.

- **Core Area** has a radius that captures the approximate core use area, defined as the area around the nest tree that receives disproportionate use (Bingham and Noon 1997). The Medford District uses a 0.5 mile radius (500 acre) circle to approximate the core area. Research has indicated that the quantity and configuration of “older forest” (analogous to NRF Habitat) provides a valid inference into the likelihood of occupancy (Hunter et al.

1995), survival, and reproduction (Franklin et al. 2000; Olson et al. 2004; Dugger et al. 2005; Dugger et al. 2011). Generally survival and reproduction are supported when there is between 40 and 60% older forest within the core (Dugger et al. 2005), but local conditions and possibly pair experience, contribute to large variance in actual amounts for individual owls. The amount of habitat within an approximate 0.5 mile radius provides reliable predictor of occupancy, and the quantity and configuration have been shown to provide reasonable inferences into survival and reproduction. Core areas represent the areas that are defended by territorial owls and generally do not overlap the core areas of other owl pairs (Wagner and Anthony 1998; Dugger et al. 2005; Zabel et al. 2003; Bingham and Noon 1997).

- **Home Range** is an approximation of the median home range size used by NSOs in the Klamath Mountains Province. Medford District uses the median home range estimated for southwestern Oregon of 3,400 acres or a circle with a radius of 1.3 miles. The Home Range Circle provides a coarse but useful analogue of the median home range for NSO (Lehmkuhl and Raphael 1993; Raphael et al. 1996). Although it provides an imprecise estimate of actual home ranges, the home range circle approach has been used to show that stand age/structure, patch size, and configuration within the circle influences the likelihood of occupancy. When less than 40 to 60% of the circle is in NRF habitat, the likelihood of NSO presence is lower, and survival and reproduction may be reduced (Thomas et al. 1990; Bart 1995; Bart and Forsman 1992; Dugger et al. 2005). Therefore, the home range circle is a useful analytical scale for the purpose of quantifying habitat and the impact to owl sites from proposed habitat modification. The provincial home ranges of several owl pairs may overlap.

Habitat threshold levels within these areas are not absolute levels of likelihood of occupancy, survival, and reproduction. The response of resident owls to the environment depends on many factors, such as weather, prey species availability and density, the quality and placement of habitat, competition for resources from other species, retention of suitable habitat on private forest land, and many other biotic and abiotic factors. Private forested land contributes to habitat, but is not included in this analysis because it is often harvested and on short rotations, therefore available habitat may be significantly higher in many of these sites, but is not expected to contribute to long term NSO management. Some sites within the analysis area are significantly below thresholds on federal land, but are consistently occupied with breeding pairs. Threshold habitat levels are recommended minimum levels, and with increased competition from barred owls minimum levels may not be adequate to sustain occupation and reproduction.

Direct/Indirect Effects to NSO Habitat

The intensity of proposed treatments is described by the following five effects categories:

Dispersal Treat and Maintain

Dispersal function would be maintained with 40% canopy closure on approximately 2,040 acres

(21% of dispersal-only habitat with the PA and 0.12% within the critical habitat unit) through VDT or VDT/UR (1,893 acres) and UR (147 acres) treatments. The treatment of dispersal-only habitat within critical habitat is expected to have an insignificant effect to NSO critical habitat because the treatment will not change the intended function of the habitat and the conditions that would classify the stand as dispersal would remain post-treatment. Canopy cover within affected stands would be maintained at 40% or greater post-treatment. Decadent components important to owls such as large snags, large down wood, and large hardwoods would be retained. The proposed treatments would be dispersed in relatively small patches within the CHU to further minimize the potential for adversely affecting stand and landscape characteristics for dispersal habitat.

NRF Treat and Maintain Treatments

Nesting, roosting, and foraging (NRF) function would be maintained with 60% canopy closure on approximately 996 acres (1.4% within CHU and 7.2% in the PA), with VDT or VDT/UR prescriptions that would modify approximately 894 acres, and UR prescriptions would modify 102 acres. Treatment within the critical habitat is not expected to have negative effects because the treatment would not change the intended function of the habitat and the conditions that would classify the stand as NRF would remain post-treatment.

- Canopy cover within treated stands would be maintained at 60% or greater post-treatment.
- Nest quality stands would maintain a total basal area (conifer and hardwoods) between approximately 180-200 feet squared per acre.
- No more than approximately 20% of the existing basal area would be reduced to ensure post-treatment maintenance of NRF habitat.
- Foraging stands would maintain between approximately 150-180 total basal area
- Decadent components important to NSOs such as old growth trees, large snags, large down wood, and large hardwoods would remain post-treatment.
- If present prior to treatment, multi-canopy, uneven-aged tree structure would remain post-treatment.
- Dominant and high crown-ratio trees, and trees species with limited presence on the landscape (oaks, pines, cedars) would be preferred for retention to maintain species heterogeneity.
- No NSO nest trees would be removed.

Dispersal-only Removal

Approximately 60 acres of dispersal-only habitat removal is spread widely throughout the project in small areas of removal, in areas of less than one acre, or peripherally along existing roads. Dispersal removal would reduce dispersal-only habitat in the PA by only 1.2%, although

downgrade of 270 NRF acres would function as dispersal-only habitat and result in increase of dispersal-only habitat acres. Removal of dispersal-only habitat within the critical habitat unit would result in 0.12% reduction. Dispersal function and capability across the landscape within the PA and CHU would not substantially change. Habitat would be removed from temporary road construction, roadside tree and vegetation management, young plantations infected with of laminated root rot, and landings for helicopters or large cable fan settings for yarding. Temporary road construction may vary in width from 12 to 20 feet, with occasional wider spots for parking or turns. Landings may be ½ to 1 acre, with natural topography and existing openings used to minimize tree removal. Habitat capable of providing dispersal function for owls on federal land in the project planning area is not limited, and is well distributed with approximately 75% (18,758 acres) of federal land within the planning area capable of providing nesting, roosting and foraging, and dispersal.

NRF Downgrade Treatments

NRF downgrade of 270 acres would reduce the percentage of foraging habitat in the PA by 1.9% in the PA (Table 14) and 0.39% in the Critical Habitat Unit (Table 16), negatively effecting six owl sites. The selection of habitat downgrade areas on upper slopes and ridgetops reduces adverse effects, maintains viable functioning core areas, and avoids nest patches and nesting and foraging habitat within the NSO preferred lower and mid slope areas. Downgrade would occur outside of the core areas, on upper slopes and ridgetops where NSO use is less (Blakesley et al. 1992; Hershey et al. 1998; McDonald et al. 2006), but would reduce habitat within the home range of six owl sites. The NRF function would downgrade to dispersal functioning habitat by applying variable density spacing and reducing canopy cover to approximately 40%. Canopy cover is used as one of the critical habitat thresholds because it is highly important to NSO nest site selection and general habitat use because increased levels of canopy afford protection from predators, and regulate temperature extremes (Courtney et al. 2004). These treatments would have long term beneficial effects to the forest structure and overall forest health. Treatments would reduce competition and increase the vigor of the residual trees left in the stand. A substantial portion of the physical structure of the habitat in the treatment areas would still be present after implementation; therefore, the treatment effects to habitat are mostly related to changes in canopy cover from removal of subdominant trees and thinning in areas of denser uniform trees. Retention would emphasize important key feature in critical habitat, including healthy dominant trees, preference for pines, cedars, large dominant hardwoods, oaks, remnant/legacy trees, and retaining trees with large limbs and crown ratios, and coarse wood.

NRF Removal Treatments

The NRF Removal would reduce the percentage of NRF in the PA by a negligible amount of .07%, and 0.01% within the Critical Habitat Unit, and avoids critical areas of NSO nest trees, nest patches, and high quality habitat. Roosting and foraging function would be removed on approximately 9 acres for temporary road construction and helicopter landings through small areas of removal ½ acre or less. Removal avoids nest patches, and most habitat removal would occur outside of the NSO core areas, with only approximately 2 of the acres of removal distributed in five core areas. Habitat removal would occur on or near ridgetops, or in younger stands without complex habitat structure, where habitat use by NSOs is low and no nesting or heavy foraging use is expected to occur. Habitat removal from landing or temporary road

construction would not deter owls from moving across small openings created due to the narrow linear nature of constructed or existing road clearing (averaging approximately 20 feet) which are traversable, and also used as foraging edges. NSOs are known to cross large openings such as clearcuts, meadows, and highways (Forsman et al. 2002). Construction and tree removal would occur in roosting/foraging or dispersal habitat and would avoid old-growth stands and lower slopes where habitat use by NSOs is selected for (Blakesley et al. 1992; Hershey et al. 1998; McDonald et al. 2006) and avoids nest patches. The upper slope and ridgetop location of road construction, the dispersed occurrence of the multiple segments, narrow linear tree removal for road construction, and avoidance of old-growth stands, lower slopes, and nest patches, is expected to have minimal negative effects on NSO feeding, breeding, foraging, and dispersal where nesting and roosting and foraging is avoided (Blakesley et al. 1992), and therefore is not expected to change NSO occupation or viability. Removal of small areas of NRF may have some negative effects at the immediate area by causing prey to shift locations or alter habitat use, or may favor other prey such as woodrats, rabbits, and ground voles and mice that rely less on canopy cover.

Table 14: Treatment Effects to NSO habitat types on in the Cold Elk PA

Habitat Type	Pre-Project Planning Area Acres (%)	Treat and Maintain Acres	Downgrade Acres	Removal Acres	Total Post-Project PA Acres (%)	Percent of PA Habitat Type change
NRF	13,751 (57.1%)	996	270 (1.9%)	9 (0.07%)	13,472 (55.9%)	-1.2%
Dispersal-only	5,007 (20.7%)	2040	(270 added from NRF Downgrade)	60 (1.2%)	5,217 (21.6%)	+0.9%
Unsuitable / Capable	5,324 (22%)	321	0	(increased by 69)	5,393 (22.4%)	+0.4%
Total PA Acres	**24,082**				**24,082**	***NA***

Effects to NSO Sites

Under Alternative 2, project units, temporary road and landing construction, and roadside management occurs within the home range of twenty-five historic NSO sites. The effects to the owl sites are analyzed below and summarized in Table 15. Thirteen owl sites would be affected by proposed treatments of NRF and dispersal habitat in the core area, with the majority of treatments as NRF Treat and Maintain and Dispersal Treat and Maintain habitat, and minimal

(0.3 acres or less) NRF removed for landings or temporary road construction. One low priority site core area (#0920) is affected by 4 acres of Downgrade and Treat and Maintain of NRF habitat. Seven owl sites (#0249O, #0920, #2079A, #2622A, #2666O, #4671, #9802T) have substantial amount of Treat and Maintain or downgrade prescriptions in the core or home range and may impacted from changes to prey abundance, distribution, or shift in species diversity from a moderate reduction in canopy cover and tree density and vegetative layering conditions. Downgraded NRF habitat would create soft forest edges and would still provide foraging habitat near the edges, and may favor ground dwelling prey such as chipmunks, woodrats, voles, and rabbits.

Downgrade of NRF habitat occurs within the home range of four high value sites and two unoccupied low value sites, in addition to Treat and Maintain of NRF and dispersal treatments. Downgrade of NRF habitat negatively affects critical habitat at the stand level by removing the primary constituent element of canopy cover and may reduce prey level or create open stand conditions avoided by spotted owls (Courtney et al. 2004).

Table 15: Cold Elk NSO Sites Affected by the Proposed Action

Site (%BLM own)	Pre-treatment NRF Habitat[1] acres /%		NRF Habitat Reduced[2] (acres)			T&M in Core acres /%		T&M in Home Range (acres)		Post-Treatment NRF Habitat acres /%		Survey Results[3] 2014-15 and May 2016	Effects
	Core	HR	Core	HR	NP	NRF	Disp	NRF	Disp	Core	HR		
0098A Wilson Creek	373	2113	**0**	1	0	0	0	158	30	373	2113	NSO Pair 2014-15, 1 Juv-2015	No negative effects expected
0249O Stubborn Mule	331 66%	1961 57.7%	0	2	0	0	0	0	0	331 (66%)	1961 57.6%	No survey 2014; NSO Pairs 2015-2016	No negative effects expected
0368B Dice Creek	139 28%	907 27%	0	0	0	0	0	6	2	139 28%	907 27%	Pair 2014 with 2 juveniles, Pair 2015	No negative effects expected
0905O Bobby Creek	412 82%	2072 61%	0	26	0	76	2	243	137	412 82%	2046 60%	No NSO Response 2014-15	Negative effects may occur
0920 Finger Walker	253 51%	1820 54%	4	153	0	34	58	143	367	249 50%	1667 49%	No NSO occupation 2014/2015	Negative effects may occur

Site (%BLM own)	Pre-treatment NRF Habitat[1] acres /%		NRF Habitat Reduced[2] (acres)			T&M in Core acres /%		T&M in Home Range (acres)		Post-Treatment NRF Habitat acres /%		Survey Results[3] 2014-15 and May 2016	Effects
	Core	HR	Core	HR	NP	NRF	Disp	NRF	Disp	Core	HR		
0937O Finger Divide East	288 57%	2152 63%	0	0	0	0	0	8	11	288 57%	2152 63%	No NSO Response 2014-15	No negative effects expected
1911C Hutch Creek	70 14%	530 15%	0	0	0	0	0	3	0	70	530	No NSO occupation 2014/2015	No negative effects expected
2016B Bear Roost	183 37%	1256 37%	0	0	0	0	0	49	0	183 37%	1256 37%	NSO Pair 2015; Pair and one juvenile 2014	No negative effects expected
2023O Slotted Cow	246 49%	702 21%	0	0	0	6	20	58	199	246 49%	702 21%	NSO pair 2014; Pair+2Juv 2015; Nesting 2016	No negative effects expected
2072O Snowy Dutchman	284 57%	1023 30%	0	0.1	0	0	0	8	112	284 57%	1023 30%	NSO pairs 2014-2015	No negative effects expected
2079A Cow Elk	167 33%	429 13%	0	1.5	0	32	26	123	198	167 33%	427 13%	No NSO Response 2014-15	Negative effects may occur
2236O Feathered Elk	146 29%	396 12%	.2	0	0	17	38	34	179	146 29%	396 12%	No NSO response 2014; unknown pair status 2015	No negative effects expected
2249 Wall Walker	367 73%	1006 30%	.2	1	0	15	16	95	185	367 73%	1005 30%	No NSO Response 2014-15	No negative effects expected
2407A Crafty Dutch	132 26%	937 28%	0	0.5	0	0	75	33	317	132 26%	937 28%	No Response 2014-15	No negative effects expected

Site (%BLM own)	Pre-treatment NRF Habitat[1] acres /%		NRF Habitat Reduced[2] (acres)			T&M in Core acres /%		T&M in Home Range (acres)		Post-Treatment NRF Habitat acres /%		Survey Results[3] 2014-15 and May 2016	Effects
	Core	HR	Core	HR	NP	NRF	Disp	NRF	Disp	Core	HR		
2622A Cain and Mabel	190 38%	927 27%	0	0	0	32	25	141	80	190 38%	927 27%	No NSO Response 2014/2015	Negative effects may occur
2623B Landslide	217 43%	1090 32%	0	0	0	0	0	145	22	217 43%	1090 32%	NSO Pairs 2014-2015	No negative effects expected
2623O Landslide	337 67%	1403 41%	0	0	0	0	0	198	219	337 67%	1403 41%	NSO Pairs 2014-2015	No negative effects expected
2662 Haystack	199 40%	858 25%	0.5	0.5	0	21	39	21	276	199 40%	858 25%	No Response 2014-15	No negative effects expected
2663O No Sweat	234 47%	1338 39%	0	0	0	7	33	25	227	234 47%	1338 39%	NSO Single 2014, Pair status unk 2015	No negative effects expected
2666O Bobby Walker	466 93%	2585 76%	0	22	0	0	0	91	63	466 93%	2562 75%	No NSO response 2014; Unk pair status 2015	Negative effects may occur
3281O Gold Mountain	167 34%	831 24%	0.5	1	0	6	14	46	30	167 34%	830 24%	Pair status 2014-15	No negative effects expected
3926 Knee Deep	216 43%	618 18%	0	1	0	27	4	73	156	216 43%	617 18%	No Response 2014-15;	No negative effects expected
4051A Dutchman Butte	169 34%	759 22%	0	0.3	0	6	4	14	59	169 34%	759 22%	Unoccupied 2014-15 Pair 2016	No negative effects expected
4051O Dutchman Butte	222 44%	877 26%	0	.3	0	4	1	14	67	222 44%	877 26%	Unoccupied 2014-15 Pair 2016	No negative effects expected

Site (%BLM own)	Pre-treatment NRF Habitat[1] acres /%		NRF Habitat Reduced[2] (acres)			T&M in Core acres /%		T&M in Home Range (acres)		Post-Treatment NRF Habitat acres /%		Survey Results[3] 2014-15 and May 2016	Effects
	Core	HR	Core	HR	NP	NRF	Disp	NRF	Disp	Core	HR		
4615O Fuzzy Dice	173 35%	564 17%	0	0	0	0	0	24	30	173 35%	564 17%	Unoccupied 2014-15	No negative effects expected
4671 JJ Walker	167 33%	1153 34%	.3	82	0	95	108	324	293	167	1071 32%	No occupancy 2014-2015	Negative effects may occur
9802T August Second	417 83%	1472 43%	0	42	0	0	0	0	0	417 83%	1430 42%	2014 unknown status; Male& Female responses	Negative effects may occur

1- NRF on federal lands
2- NRF reduced = NRF removed or downgraded from the PA
3- More information in Admin Record

Connectivity/Diversity Blocks

The proposed action occurs in five of six Connectivity/Diversity blocks. Currently all of the connectivity blocks exceed 30% in late-successional forest at least 80+ years old. The Connectivity/Diversity blocks would continue to function within RMP (p.38-39) objectives.

Effects to Northern Spotted Owl Prey

Timber harvest (VDT) and associated temporary road construction, landings, and Understory Reduction treatments could impact foraging habitat by changing habitat conditions for prey. Some disturbance of habitat can improve forage conditions, provided some ground cover is retained or created. Removal of tree canopy would bring more light and resources into the stand, stimulating grass, forbs, shrubs, and other prey food. The understory habitat conditions for prey foraging would improve until residual trees close the canopy and reduce sunlight to the forest floor. Disturbance from prescribed “maintain” or “downgrade” treatments may have insignificant to substantial negative effects, by removing midstory or overstory vegetation that may be used directly or indirectly by prey for cover, breeding, foraging, or dispersal. Short-term negative effects for individual species for long-term broader ecological gains are expected to occur, but not to the extent that would contribute to the need to list species as threatened or endangered, while promoting more ecologically healthy and resilient stands.

While some reports suggest negative impacts of thinning on flying squirrels (Wilson 2010; Holloway and Smith 2011), there is also some counter research that suggests thinning does not have measurable short-term effects on density, survival, or body mass of flying squirrels (Gomez et al. 2005). Additionally, thinning provided more resources for larger tree growth, which in turn

increased density of hypogeous sporocarps (underground fungi), which is an important factor in determining flying squirrel abundance.

Frequency of hypogeous sporocarps were correlated with flying squirrel density, and indicated that the squirrels were not old-growth specialists but were also found in relatively high densities in younger stands (Waters and Zabel 1995) Flying squirrel abundance was significantly higher in medium and high-density stands than unthinned stands and similar to, or greater than, that in old-growth stands (Ransome 2004). The proposed treatments in this project would be applying patch cuts to 20% of the thinned stands and would have a lesser effect than most treatments in the aforementioned papers.

Woodrats (both bushy-tailed and dusky-footed) are important components of the NSO diet (Forsman et al. 2004). Some beneficial effects to dusky-footed woodrats habitat could occur due to shrub development in thinned stands (Sakai and Noon 1993; Suzuki and Hayes 1997). Also, bushy-tailed woodrat presence is more dependent on cover and food availability than on a stand's seral stage. In the Interior Southwest region of Oregon, woodrats comprised 27% of NSO prey items and 48 percent of prey biomass, and Northern flying squirrels 28% of prey items and 30% of prey biomass (Forsman et al. 2004). RTV comprised only 2.6% of the prey numbers and 0.6% of biomass in the diet, the lowest of all measured regions in Western Oregon.

Treatments associated with Alternative 2 that would remove or maintain NSO habitat may impact foraging by changing habitat structure for NSO prey species, with Treat and Maintain prescriptions having less impacts due to less tree removal, less ground disturbance, and higher canopy retention. Retained trees, snags and down wood (if present) retained in the thinned stands would provide some cover for prey species over time, and would help minimize harvest impacts to some prey species. Treatment implementation would be spread out temporally and spatially within the PA, which would provide areas for NSO foraging during project implementation and reduce the impact of these short-term effects at the project level. Additionally, while portions of habitat would be removed within the gaps created in variable density and maintain treatments, the stand function of the habitat would remain. Even though NSOs seldom venture far into non-forested stands to hunt, edges created by the treatments may present new foraging opportunities.

Edges created from harvest can be areas of good prey availability and may potentially increase prey vulnerability and better hunting for owls (Zabel et al. 1995). Prey animals may be more exposed in the disturbed area or could move away from the disturbed area for the short-term. Changes in prey availability occur as cover is disturbed and prey species move around in the understory. As a result, they can become more vulnerable and exposed. The disturbance could attract other predators such as hawks, other owls, and mammalian predators. This may increase foraging competition for NSOs in the treatment area, but the exposure of prey will also improve prey availability for NSOs.

Bingham and Noon (1997) reported that a NSO core area (closest to the nest) is the area that provides the important habitat elements of nest sites, roost sites, and prey access, benefiting NSO survival and reproduction. NSOs are "central place" animals with the core area being the focal area (Rosenberg and McKelvey 1999). Therefore, effects to prey species are most critical at the

nest patch and core areas. Several studies (Wagner and Anthony 1998; Dugger et al. 2005; Zabel et al. 2003; Bingham and Noon 1997) indicate the core area size for the Klamath province is 0.5 miles from the nest site (or 500 acres). Effects to prey species should then be assessed by the amount of habitat treated within the core area and level of treatment. Due to the spatial distribution of the proposed treatments, not treatment in nest patches and high quality habitat, only Treat and Maintain treatments in NRF and foraging habitat in the middle to lower drainage slopes preferred by NSOs, mosaic of untreated riparian areas, the PA would continue to provide suitable foraging habitat and prey refugia within the core area.

Implementation of PDFs that retain large down wood while also retaining non-hazardous snags (to the extent safely feasible during operations) in the treatment units would provide coarse wood structure for prey species, and would help minimize harvest impacts to prey habitat.

Barred Owls (BOs)

BO effects on NSO survival and colonization appear to be substantial and additive to effects of reduction and fragmentation of habitat in NSO home ranges. The magnitude of the BO effect may increase somewhat as habitat quantity decreases and fragmentation increases (Dugger et al. 2011). Activities that reduce the quantity of older forests adjacent to NSO activity centers reduce the probability of continued occupancy, survival, and reproduction (Franklin et al. 2000; Olson et al. 2004; Dugger et al. 2005). When BOs are present, the effect of such activities on NSO pair survival may be exacerbated by 2 - 3 times. Some NSOs appear to be able to successfully defend territories and reproduce when BOs are present (Wiens et al. 2014; Dugger et al 2011), but the mechanism that allows them to persist is currently unknown.

BO surveys are not required, but BOs are detected opportunistically while conducting NSO surveys. While the BLM did not specifically survey for BOs, a study in the Oregon Coast range suggests that over the course of a season, NSO surveys to protocol (> 3 visits) allow approximately 85% of the BOs present in the area to be detected (Wiens et al. 2011). Spotted owl surveys elicited BO responses at 11 of the 25 sites over the last 5 years. Additionally, the USFWS's Protocol allows for a reasonable assurance that NSOs in an area will be detected, even where BOs are present (USFWS 2011). The NSO Revised Recovery Plan (USFWS 2011) Recovery Action #32 addresses a recommended action to reduce the negative effects of barred owls. Approximately 1,192 acres were determined to meet RA 32 stand conditions and would not be treated. Maintaining or restoring forests with high-quality habitat will provide additional support for reducing key threats faced by NSOs. Protecting these portions of forest stands aid in providing NSOs with high-quality refugia habitat from the negative competitive interactions with barred owls.

Habitat Effects to NSO Critical Habitat

The reduction of NRF habitat from 270 acres from VDT and removal of 9 acres from landings or temporary road construction would decrease canopy cover levels below that which afford spotted owls protection from predators. It may also increases temperature extremes, and may reduce prey use by species such as red tree voles or flying squirrels which prefer high canopy level and vegetative layering, which would reduce NSO foraging opportunities for those species. It may not change all prey levels, or may increase the use by other species such as voles, rabbits, and

woodrats that benefit from increased forb and shrub components and depend on forest structural other than canopy cover. The combined NRF habitat removal and downgrade would reduce the amount of NRF habitat by 0.39% within the Critical Habitat Unit, and avoids critical areas of NSO nest trees, nest patches, and high quality habitat.

The proposed action would negligibly affect the intended conservation function of CHU subunit KLW-1. This subunit is expected to function for demographic support to the overall population and for north-south and east-west connectivity between subunits and critical habitat units. This subunit sits at the western edge of an important connectivity corridor between coastal Oregon and the western Cascades. KLW-1 would still maintain the intended function of providing demographic support for NSOs because only 0.39% of CHU would be negatively impacted, and key habitat features of coarse wood, legacy/remnant trees, hardwoods, healthy pines and cedars, and moderate canopy cover would be retained, providing structural elements that support prey and foraging opportunities with the edges of treatment areas. NSO sites that are likely to be occupied would not have substantial removal within the core or home range, and treatment areas occur on the landscape near ridgetops and upper slopes where foraging use is less than lower and midslope areas. The 270 acres proposed for downgrading habitat in KLW-1 would occur in unoccupied low value owl sites (#4671 JJ Walker, #0920 Finger Walker) or near the outer edge of the home range and in low RHS habitat of high value owl sites that have adequate NRF habitat levels (#2666 Bobby Walker, #0905 Bobby Creek, #0249 Stubborn Mule, #9802T August Second). Approximately 114 total historic sites occur within KLW-1, and even though downgrading of NRF habitat would reduce habitat levels within four sites, the habitat levels within core and home ranges would remain substantially above the levels at which negative effects to occupation and reproduction would be expected to occur. The owl sites would continue to provide demographic support in the sub-unit.

Table 16: Effects to NSO Critical Habitat

	Primary Constituent Habitat Element	Acres	Treat and Maintain	Downgrade	Remove	Post-Project Acres	Percent Change of Primary Constituent Element
KLW-1	Foraging	72,080	996	270	9	71801	- 0.39%
	Dispersal-Only	45,511	2040	(+270)	60	45,721	+0.5%

Beneficial Effects to CHU

The following beneficial effects may be realized as a result of implementing the Proposed Action:

- Treated stands are likely to be more ecologically sustainable because residual stands would be less susceptible to suppression mortality.

- Understory Reduction/vegetation management treatments are designed to reduce dense understory competition and increase growth and vigor of understory conifers and would improve recruitment and layering of conifers.

- Very dense stands would be opened by thinning, thereby improving the ability for NSOs to disperse within these stands. Thinning stands that currently provide poor quality dispersal habitat would improve the dispersal function for NSOs by providing more "flying space," and encouraging residual trees to develop more size and structural diversity.

- The quality of NSO foraging habitat in treated stands may improve in response to the relatively more open structure of the treated stands.

- Thinning and understory treatments are likely to contribute to reducing the rate of spread and intensity of wildland fires common to the action area.

- Thinning in young stands that do not currently provide dispersal or NRF habitat, would accelerate the development of NSO habitat.

- Increased survivability and vigor of more drought or fire tolerant species (pines, cedars, hardwoods) on ridgetops, and in areas where site conditions do not Douglas-fir, or areas where Douglas-fir suppresses the occurrence of pines.

- Thinning in 40 to 60 year old plantations would accelerate growth, improve future foraging conditions for NSOs, and promote the development of more structurally complex forest conditions.

The effects of the Proposed Action are anticipated to increase the health and vigor of the residual stands post-treatment within 30 years recommended in the NSO recovery plan. It is likely that the treated stands will develop into more complex, structurally diverse forests in the long-term in comparison to the No-Action Alternative. In fact, thinning dense stands may be necessary in order to achieve old-growth forest characteristics in the absence of natural disturbance events (Tappeiner et al. 1997). Thinning younger forest stands may provide growing conditions that more closely approximate those historically found in developing old growth stands (Hayes 1997). Many of the treatments proposed, especially those that would occur in dispersal quality habitat, would have long-term beneficial effects to NSOs by increasing growth rates of the residual stand and accelerating the development of late-successional structural complexity within the treated areas than would occur if left untreated.

NSO Recovery Action #10

Alternative 2 meets the intent of Recovery Action #10 (RA 10) of the 2011 Recovery Plan, by maintaining NRF habitat or improving dispersal or capable habitat conditions within NSO home ranges and core-use areas, and deferring treatment within high quality and nesting habitat within

high suitable habitat on lower slopes within drainages (USFWS 2011). Treatment was deferred in 430 acres for NSO nest patch areas. Approximately 2,500 acres of NRF habitat were deferred from NSO core areas, with contributing factors including high quality NSO habitat and critical habitat, NSO nest patches, red tree vole buffer areas, fragile soil or slope classifications, riparian reserves, and nesting habitat for the threatened marbled murrelet. Downgrade of NSO habitat would be limited to outside or near the outer edge of NSO site home ranges, and on or near ridgetops where NSO roosting and foraging is less or avoided (Blakesley et al. 1992) and where NSO Relative Habitat Suitability (RHS) is low according to the MaxExtent Model (USFWS 2011).

Treatments were designed to have minimal impacts to high value sites by: 1) limiting the overall amount of treatments, especially within the 0.5 mile core areas of these sites, and 2) only proposing treatments that would have minimal short-term impacts on NSO habitat (treat and maintain) within these high value sites. Conversely, the majority of the proposed treatments were focused in low value NSO sites or outside of NSO home ranges. All proposed treatments were designed and are expected to increase the quality of habitat in the long-term (>30 years).

The total acres of treat and maintain prescriptions within the 0.5 mile core area of high priority owl sites were reduced and in some cases eliminated in order to reduce the effects to NSOs at those sites. Silvicultural prescriptions that would have adverse impacts to NSO habitat were considered in areas outside of high value owl sites. The IDT focused on reducing the amount of timber harvest within the 0.5-mile core area because it is the area that provides the important habitat elements of nest sites, roost sites, and access to pray that benefit NSO survival and reproduction (Bingham and Noon 1997).

No downgrade of NRF habitat was proposed within high value sites, with the exception of small removal associated with logging systems. Since these stands were already functioning as NRF habitat, the team determined that treatments were not necessary to improve the habitat.

In limited cases, where road construction was necessary to access the proposed treatment and no other road was available, small amounts of roosting/foraging and dispersal removal would occur. The removal of small amounts of habitat from road and landing construction were considered in areas that would allow access to treatments that would have long-term benefits to NSO habitat.

NSO Recovery Action #32

High quality NSO habitat for Recovery Action #32 (RA 32) was identified and deferred from proposed treatment units as a recovery measure for the NSO, as identified as Recovery Action #32 in the NSO Recovery Plan. Stands evaluated and meeting the definitions in the methodology are referred to as RA 32 stands. Approximately 1,192 acres were determined to meet RA 32 stand conditions and would not be treated. Maintaining or restoring forests with high-quality habitat will provide additional support for reducing key threats faced by NSOs. Protecting these portions of forests stands aid in providing NSOs with high-quality refugia habitat from the negative competitive interactions with barred owls.

Federal Threatened Species—Marbled Murrelet

Effects to Marbled Murrelet Habitat

No murrelets have been detected on Grants Pass Resource Area, which occurs almost completely east of the Western Hemlock/Tanoak zone, and no murrelet nesting behavior has been detected in the Medford BLM District and Siskiyou National Forest east of the zone. Because surveys do not detect all murrelets, and not all of the landscape has been surveyed, murrelets displaying occupied behavior, or nesting murrelets may occur in the planning area. However, the historical negative survey efforts and few inland detections in beyond the western hemlock/tanoak fog zone in the Klamath Province and northern California indicate that is it not a significant population source.

Approximately 3,643 acres of late-successional and old-growth habitat containing potentially suitable murrelet nest structures was deferred from treatment within Zone A and B. Deferring treatment that would modify the nesting structure of late-successional and old-growth stands in lower and middle elevations and slopes avoid negative effects to optimal nesting habitat (Meyer and Miller 2002; Meyer et al. 2004; Grenier and Nelson 1995; McShane et al. 2004). No suitable nesting habitat would be treated within the known occupied range of the Western Hemlock/Tanoak zone (Zone A). Approximately 280 acres of old-growth stands or stands with remnant trees on BLM land were deferred in Zone A for resource protection, including spotted owl habitat, stream buffers, red tree vole buffers, S&M fungi, and marbled murrelet habitat.

Within Zone B, approximately 3,363 acres of older complex and multilayered stands or stand stocked primarily with old-growth trees were deferred from the project, reducing potential impacts to marbled murrelets. Approximately 102 acres of UR would treat stands with old-growth trees, but would not modify overstory and midstory trees, and therefore would not negatively affect the potential nest function of the stands. UR would increase fire resiliency of the treated area by reducing understory fuel loading. Variable Density Thinning of approximately 480 acres in Zone B would treat stands with scattered remnant trees or clusters of older trees within younger stands, but would retain these trees and trees with visible branch platform structures, and adjacent trees with interlocking crowns to preserve overhead cover and protection. These stands avoid lower and mid slope old-growth stands. Withdrawal of untreated portions of riparian reserves would reduce proposed treatment acres. Seasonal operating restrictions would avoid negative effects from disturbance to stands with murrelet habitat structure and potential occupation, and avoid disturbance to adjacent suitable untreated stands. Thinning would reduce canopy cover to 60% in stands functioning as NRF habitat for NSOs, and at least 40% in stands functioning as dispersal habitat. Thinning may improve overall stand suitability, as occupied murrelet stands had average canopy closure of 40-50% percent (McShane et al 2004; Grenier and Nelson 1995), but it not expected to negatively impact nesting structure. The proposed action would not remove or downgrade suitable murrelet habitat, does not occur within designated marbled murrelet critical habitat, would avoid potential disturbance, and occurs in a zone where no nesting murrelets have been detected in southwest Oregon, therefore no substantial negative impacts to murrelets are expected.

Survey and Manage Red Tree Vole Species

Red tree voles (RTV) are common throughout the PA. RTV sites were detected in the Cold Elk Proposed Action as a result of protocol completed in April 2016. Surveys were applied to planning units greater than or equal to 80 years old that would modify habitat. Approximately 735 acres were buffered out for RTV sites across the project area, and excluded from habitat disturbing actions that would modify midstory and overstory trees according the RTV Survey & Manage (S&M) Management Recommendations (USFS/BLM 2000).

Protocol surveys are not intended to detect all nests, but are survey techniques needed to have a reasonable chance of locating the species when it is present on the site (USFS/BLM 2001), and loss of some individuals and nest structures would occur under the Proposed Action. The 2001 ROD Standards & Guidelines (S&G) addresses concern for persistence (page 5), relative rarity (page 6), and uncommon management category "C" (page 10) and provides that not all known sites or populations are likely to be needed for reasonable assurance of persistence based on protocol survey results. The intent of the approved interagency documents (protocols) are to mitigate for the long-term persistence concerns, and the protocol describes survey techniques needed to have a reasonable chance of locating the species when it is on site. The approved interagency Management Recommendations are applied to these results to manage for long-term persistence. The RTV viability was rated as 78% in Appendix J2 of the NWFP (USFS/BLM 1994b). With the application of mitigation measures including S&M S&G, Riparian Reserves, emphasizing clumped green tree and snag retention, landscape management controls in matrix to provide for NSO dispersal, retaining old-growth forests in the marbled murrelet zone, and providing residual habitat areas around NSO activity centers (USFS/BLM 1994a, Appendix J2 pp. 55-57), the viability of the RTV was rated as an undetermined amount above 80% to achieve large well-distributed populations on federal land. The Proposed Action therefore is not expected to negatively impact the persistence of the species, and is likely to provide for relatively well-distributed RTV and reasonable assurance of species persistence.

Cumulative Effects

Cumulative effects are environmental changes that are affected by more than one land-use activity, and include beneficial changes. Cumulative effects for wildlife species and habitat are reviewed at the watershed level to capture the varying habitats, species home ranges, and varying degrees of species mobility. Technical issues that complicate analysis of cumulative effects include the large spatial and temporal scales involved, the wide variety of processes and interactions that influence cumulative effects, and the lengthy lag-times that often separate a land-use activity and the landscape's response to that activity. Fire suppression, road building, and timber harvest throughout the PA have resulted in habitat modification and fragmentation, and have changed the distribution and abundance of wildlife species surrounding the PA. Timber harvest has occurred on BLM-administered lands in the West Fork Cow Creek watersheds for decades. The associated habitat modification has negatively affected late-successional forest habitat-dependent species by reducing stand seral stage and changing habitat structure. However, species associated with younger forested conditions have benefited from these changes due to the increased acres of young stands within the watershed.

Private lands surrounding the PA are made up of early-, mid-, and late-seral forests, agriculture, urban areas, and barren land. Most private forest lands are managed as tree farms for production of wood fiber on forest rotations. It is expected that any remaining late-seral forests on private timber lands will be converted to early seral forest over the next one or two decades. For those species dependent on early-seral habitat, private forest lands do not always provide quality habitat as competing vegetation that includes flowering plants, shrubs and hardwood trees are regularly sprayed to reduce competition with future harvestable trees.

Ongoing and foreseeable management actions that are occurring and may have effects within the West Fork Cow Creek watershed include:

- Up to 4,000 acres of Silviculture Reforestation, Young Stand Management, and Forest Condition Restoration Treatments. Brushing and thinning of early seral stage young plantations is not expected to have adverse effects to T&E or sensitive species and would improve stand health and growth of young stands.

- Elk Valley/Panther Creek Log Placements would not degrade terrestrial habitat function for T&E and sensitive species, and increase of large coarse wood within streams may improve small mammal habitat near streams.

- Hazardous tree removal adjacent to roads

- Elk Valley Creek Road #31-9-27 road decommissioning and new non-discretionary new road construction

- Up to 1,000 acres Hazardous Fuel Reduction acres within the planning area would be spread out spatially and temporally and Treat and Maintain NSO dispersal and NRF habitat, or marbled murrelet habitat, and would retain current habitat function while reducing risk of habitat loss due to fire.

No adverse cumulative effects are expected to occur when considering the above mentioned projects.

Non-Federal lands are not expected to provide demographic support for spotted owls across and between physiographic provinces (Thomas et al. 1990; USFS/BLM 1994). The Medford BLM assumes these past private industrial management practices will continue and reduce the amount of NRF habitat for spotted owl on non-Federal lands over time.

Non-Federal lands are not expected to provide demographic support for spotted owls across and between physiographic provinces (Thomas et al. 1990; USFS/BLM 1994). The Medford BLM assumes these past management practices will continue and reduce the amount of NRF habitat for NSO on non-Federal lands over time.

3.4 Soils - Productivity and Compaction

3.4.1 Existing Condition/Affected Environment

The West Fork Cow Creek Watershed Analysis (BLM 1997, p. 43) describes soils within the West Fork Cow Creek watershed. Soils have developed from sedimentary, metasedimentary, and metavolcanic rock types. The soils associated with the sedimentary rock type tend to be relatively deep and gently sloping. Soils developed from metasedimentary rock tend to be moderately deep on slopes less than 60%. Soils developed from metavolcanic rock types tend to be shallow. A small portion of the metavolcanic zone contains serpentine-derived soils. Landslides associated with these soils occur in portions of Walker, Wallace, Gold Mountain, and Stanley creeks. Areas where soil stability concerns exist along portions of Walker Creek, Panther Creek, a western portion of Gold Elk Creek, and the upper portion of Elk Valley Creek.

<u>Soil Productivity</u>

Soil productivity in a forested setting is primarily the soil's capacity to support plant growth over time as reflected by some index of biomass accumulation. The threshold of commercial forestland site productivity is 20 ft^3/acre/year (BLM 1986a, p. 9). Soil nutrients and their water holding capacity provide important resources for vegetation growth to occur. Losing a soil's plant growth capacity also means losing the site's ability to sustain a level of timber production. There are five major ecosystem functions of forest soils that influence forest productivity: 1) water storage, 2) nutrient accumulation, 3) carbon storage, 4) structural support, and 5) habitat for organisms. Forest soil maintenance is a key factor for sustaining productive forests. Some soils have high erosion hazard under bare mineral soil conditions where slopes are steep and very steep (greater than 35% slope).

Soil conditions coupled with annual precipitation present the biggest variation within the West Fork Cow Creek watershed for timber productivity (BLM 1997, p. 54). South aspects, drier areas along rocky, shallow soils, such as in the Bear Creek drainage, typically have lower stand densities and canopy closure than stands on higher quality sites, and are the least productive. These stands can be classified as the Douglas- fir/tanoak/canyon live oak subgroup (BLM 1997, p. 54). Annual precipitation ranges from 50 inches in the eastern portion of the watershed to over 100 inches in the very western regions.

Fire frequencies are also substantially different between the two regions, affecting the long term forest productivity on the respective sites. Fire exclusion in both regions tends to increase the rate of fuel loading and biomass accumulation. As discussed in Chapter 3.1.1, Douglas-fir vastly dominated the Cold Elk Project in unprecedented amounts. Atzet and Wheeler (1982) note that "Douglas-fir tends to produce conditions that favor fire wherever it occurs" which can significantly reduce site productivity. Because undisturbed sites continue to add biomass accumulation, overstocking ensues. Not only does this expose the sites to the risk from intense fire, but also further affects tree vigor, forest resiliency, and site productivity.

Areas with heightened vegetative competition curtail the growth capacity and productivity of these sites. Droughty sites with limited nutrients such as serpentine soils and the sandstone derived soils in Stanley Creek also have lower growth potential (BLM 1997, p. 54). Some BLM

lands have been administratively withdrawn from planned forest management and scheduled timber harvest through the Timber Productivity and Capability Classification based on rocky soils, fragile slopes, high water tables and other factors.

Site productivity is reduced by the presence of laminated root rot (*Phellinus sulphurascens*) in some stands. The fungus survives on below ground roots of infected trees and spreads via contact with the roots of other susceptible tree species. Seedlings of susceptible tree species can die within a few years of contact thereby perpetuating the infection cycle and suppressing site productivity for decades.

Timber Production Capacity Classification (TPCC)

The TPCC is a land classification system used to partition all public lands within the Sustained Yield Unit (SYU) boundary of BLM administered lands (BLM 1986a). Portions of the Cold Elk PA are classified as having TPCC fragile soils or reforestation limited soils under the TPCC Handbook (BLM 1986a). The reforestation TPCC classifications in the PA are captured in the following Table:

Table 17: Reforestation TPCC Classifications

TPCC Category	Classification	Units Affected
FGR/RMR	Fragile Gradient Restricted / Reforestation Moisture Restricted	1-5, 1-11, 2-2, 2-15, 3-1, 3-2, 4-12, 5-6, 5-19, 7-5, 7-28, 9-3, 9-8, 11-19, 2-1B, 5-6B, 11-19B, 15-11A, 15-11B, 15-19, 23-3, 23-4, 23-34, 23-43, 25-11, 31-5
FGR/RTR	Fragile Groundwater Restricted / Reforestation Temperature Restricted	1-11, 3-8, 4-7, 5-6, 7-7, 7-28, 9-1, 9-3, 10-4, 10-7, 11-3, 11-19, 5-6B, 9-1B, 11-19B, 15-4, 15-11B, 15-18, 20-4, 21-4, 23-3, 23-4, 25-4, 33-1, 33-3, 33-7, 33-8, 33-18, 35-8
FWR/RMR	Fragile Groundwater Restricted / Reforestation Moisture Restricted	7-3, 7-9, 13-2, 21-9
RMR	Reforestation Moisture Restricted	8-36, 1-11, 2-2, 2-15, 3-1, 3-2, 3-3, 3-4, 3-8, 3-12, 3-14, 4-7, 4-12, 4-29, 5-1, 5-6, 5-15, 5-19, 6-16, 7-2, 7-3, 7-5, 7-27, 7-28, 8-1, 8-4, 8-7, 8-8, 8-10, 8-14, 8-22, 9-3, 9-5, 9-8, 9-13, 10-2, 10-4, 10-5, 10-7, 10-17, 10-20, 2-1A, 2-1B, 5-6B, 13-9, 13-10, 15-1, 15-4, 15-19, 16-2, 18-7, 19-3, 19-6, 19-8, 19-9, 21-4, 23-3, 23-4, 23-7, 23-11, 23-12, 23-13, 23-25, 23-33, 23-34, 23-38, 23-43, 23-47, 25-4, 25-1, 25-11, 27-4, 27-8, 27-8, 27-34, 29-3, 29-4, 29-7, 31-2, 31-4, 31-4B, 31-5, 31-11, 33-1, 33-3, 33-7, 33-8, 33-18, 35-4, 35-8

TPCC Category	Classification	Units Affected
RSMR	Reforestation Surface Rock Moisture Restricted	9-8, 15-11A, 15-11B, 15-19, 29-5
RSTR	Reforestation Surface Rock Temperature Restricted	8-36, 1-5, 1-11, 5-6, 6-16, 7-27, 8-4, 19-8, 21-4, 25-21, 29-3, 29-4, 29-5
RSW	Reforestation Surface Rock Withdrawn	3-12, 11-3, 29-4, 29-31, 32-3
RTR	Reforestation Temperature-Restricted	8-36, 1-5, 1-11, 3-1, 3-4, 3-5, 3-8, 3-12, 3-14, 3-18, 5-1, 5-6, 5-15, 5-19, 6-16, 7-2, 7-3, 7-7, 7-9, 7-28, 8-1, 8-4, 8-7, 8-10, 8-14, 9-1, 9-8, 9-13, 10-2, 10-4, 10-5, 10-7, 11-3, 11-8, 11-13, 2-1B, 5-6B, 9-1B, 13-2, 13-3, 13-9, 15-4, 15-18, 15-19, 16-2, 18-7, 19-6, 19-8, 19-9, 20-4, 21-4, 21-6, 21-9, 23-3, 23-4, 23-11, 23-12, 23-13, 23-33, 23-38, 23-43, 23-47, 25-4, 25-11, 27-1, 27-2, 29-3, 29-5, 29-7, 31-2, 31-4, 31-4B, 31-11, 31-22, 33-1, 33-3, 33-7, 33-8, 33-18, 33-28, 35-4

Sites categorized with the reforestation TPCC classification of Non Suitable Woodland were deferred from treatments in the PA. Sites classified as reforestation problem sites are those where environmental, physical, and biological factors have the potential to reduce the survival and/or growth of commercial tree seedlings. These factors include light, temperature, moisture, frost, surface rock, animals, and disease. These classifications in the PA are listed in Table 17 above. These TPCC reforestation classifications could have limitations for establishing new trees within 5 years due to temperature, moisture, and surface conditions (i.e. rocky) without further management, rather than have impacts to the physical structure and stability of the soils.

Though TPCC withdrawn lands are not included as part of the Annual Sale Quantity (ASQ), timber harvest could occur as part of strategies to enhance other resources (BLM 1995, p. 72). There are 5 units with portions of TPCC reforestation withdrawn areas classified as RSW (Table 17) totaling 23 acres. These areas all contain enough forest cover to be classified as spotted owl habitat. Timber harvest would occur as part of a strategy to enhance wildlife or riparian habitat (BLM 1995, p. 72). One unit contains a withdrawn portion (0.6 acres) classified as NF (Non-forest). Non Forest Land generally consists of rock outcrops, roads, or utility corridors. The TPCC classifications for these 6 units were made in 1987. Information was compiled broadly and not based on site-specific field review. Site-specific vegetative community analysis is being assessed during prescription surveys since the area is geologically and geographically very complex. The 0.7 acres of Non Forest represents a forested portion of rocky soils overlaying the end of a road. This piece is included to access a larger 18-acre treatment area below. Timber

harvest could occur on TPCC withdrawn lands to provide more logical logging units and to implement forest health treatments (BLM 1995, p. 72) and are therefore appropriate in both RSW and NF land.

Fragile sites refer to those areas where the timber growing potential is easily reduced due to inherent soil properties and landform characteristics. These are soils having critical soil moisture supplying capacities, severe nutrient problems, critical slope gradients, mass movement potential, severe surface erosion potential, and high groundwater levels.

Fragile Gradient Restricted (FGR) sites consist of steep to extremely steep slopes that have a high potential for debris type landslides. Gradients commonly range from 60-100%+. Classifications are based on geology, geomorphology, physiographic position, climate (especially precipitation), soil types and other factors. These sites are less fragile than the Nonsuitable areas but are subject to unacceptable soil and organic matter losses from surface erosion or mass soil movements as a result of forest management activities, unless mitigating measures (i.e. Best Management Practices - BMPs) are used to protect the soil/growing site. Implementing BMPs and minimizing disturbance of fragile areas would minimize losses. More detailed TPCC classifications for fragile soils and its analysis can be found in Chapter 3.5 Soils – Sedimentation and Erosion.

Soil Compaction

Soil productivity is affected by soil bulk compaction, soil displacement, and by changes in soil nutrients. Soil compaction is the packing together of soil particles by physical pressure at the soil surface that results in an increase in soil density and a decrease in pore space. A decrease in soil pore space results in restricted movement of water, nutrients, air, and plant roots, and generally decreases site productivity in most soil types. Soil compaction increases soil resistance to root growth and penetration, reducing plant growth rates. The most common types of disturbances effecting soils and associated long term soil productivity are displacement and compaction. Litter, humus, soil, wood, and certain key properties of the surface mineral layers of forest soils are most easily and commonly disturbed by yarding activities, yet they are crucial to forest productivity. Minimizing the amount of soil displacement, compaction, and topsoil loss will generally maintain stand development.

Tractor yarding, cable yarding, and helicopter yarding are the harvest methods proposed for use in this project. Tractor yarding causes the most compaction and helicopter yarding, the least. Tractor yarding effects can be mitigated using the PDFs described in Chapter 2.4 causing less than 12% compaction of logged areas. Cable/skyline yarding suspends logs above the ground avoiding most physical abrasion of the forest floor and mineral soil. Utilizing PDFs for cable yarding would cause no more than 7% compaction of logged areas under the Northwest Forest Plan and Medford District RMP. These percentages are based on research by Adams and Froehlich (1981) and Clayton (1981). Helicopter yarding removes logs aerially and greatly reduces soil impacts by minimizing movement of logs along the ground. Chapter 2.3 describes PDFs to limit soil compaction and effects to soil productivity.

The amount of soil compaction and productivity loss is based on percentages per unit. The scale of analysis is per harvest unit, as it is the affected area for soils to support tree establishment and

growth on BLM managed land. Specifically, soil productivity calculations are based on acres of compaction/displacement representing a 35% growth/productivity loss per acre (Productivity losses of 30% and 40% for displaced and compacted acres respectively, are based on the Medford District PRMP vol. 3 calculations, pp.18-20). These two productivity loss factors were averaged at 35% for this analysis, based on estimated percentages of compaction and displacement within each cable yarding corridor and tractor skid trail being in roughly equal proportions. The acres of compaction/displacement were then multiplied by the projected loss of 35% growth divided by the unit area to determine the reduction in productivity. The calculations take into account compaction/displacement associated with temporary routes, landings, skid trails, and cable yarding corridors.

3.4.3 Alternative 1: No Action

Direct and Indirect Effects

On BLM lands, timber productivity and management is closely tied to natural plant series (see Section 3.1) and site productivity. Soil productivity in areas not affected by past disturbance would continue along existing productivity patterns. Soil productivity would decline with the continued decline in growth potential. The yield in productivity diminishes as all the growth factors are tied with high stand densities. The current average of 0.80 RD would remain in, or continue to creep deeper into the zone of imminent competition mortality (further detailed in Chapter 3.1) until the next disturbance. Stands should be managed, for the most of their post establishment development, in the RD range between 0.15 and 0.55 (Drew and Flewelling 1979). Stand densities above RD 0.55 represent a denser forest predisposed to catastrophic fire. Fire would greatly reduce forest productivity and repeated wildfire further accentuates delays in forest regeneration (Franklin et al. 2002).

On non-federal lands in the PA, compaction may increase if the rate of logging and development on private lands increases. However, in the next 20 years compaction levels should remain moderate (<12% of compacted area). Existing compaction/displacement within past harvest areas would continue to ameliorate. Fine roots of current vegetation would continue to loosen compacted soil. Leaf fall and other vegetation would continue to add organic material to the soil. The effects of freeze and thaw and plant growth would continue to reduce compaction in undisturbed areas. However, depending on site conditions, this may take decades instead of years. There would be no increase of compaction in undisturbed areas. However, in areas that remain roaded with regular harvest activity, compaction would not be reduced.

Cumulative Effects

Since there are no indirect or direct effects, there are no cumulative effects from the no action.

3.4.5 Alternative 2: Proposed Action

Direct and Indirect Effects

Alternative 2 proposes 3,371 acres of commercial extraction activities, 5.3 miles of new temporary route construction/reconstruction, 0.32 permanent road construction, and 1.3 miles of private industry land temporary route construction. Best Management Practices (BMPs) in the

Medford District Resource Management Plan (BLM 1995, p. 166) describe the use of designated skid roads within stands to limit horizontal soil compaction to less than 12% of the harvest area. These activities would result in an estimated 201 acres of soil compaction and displacement over new and existing footprints and would reduce soil productivity by an estimated 2.1% in the PA. Total compaction/displacement associated with new and existing temporary routes, tractor skid trails, landings and cable yarding corridors would account for an average of approximately 6.0% per unit (based on horizontal distance). Each proposed Cold Elk Project harvest unit would be below 12% compaction and 5% productivity loss as analyzed in the 1994 Medford District FEIS RMP. Units proposed for Understory Reduction would not contribute to soil compaction or productivity loss, since no extraction is proposed for these units.

With the implementation of Alternative 2, soils would return to the same productivity range within 3-5 years following BMP guidelines. Rehabilitation of skid trails would accelerate restoration of productivity.

In the projects mentioned above, a reduction in either live overstory and/or live understory stand density would show improved growth and residual vegetation vigor. Residual vegetation is expected to respond to the stimulus of increased growing space and to the newly available growth factors necessary for survival (increased availability of water, nutrients, and sunlight) which would help improve site productivity. Decreased stand densities would improve short-term (0-10 years) and long-term (> 11 years) resiliency at multiple scales. Improvements in stand and landscape scale resiliency to fire, climate change, and disturbance processes would likely occur with density reduction and protect site productivity from losses incurred from potential catastrophic fire, whereas soil productivity in untreated areas would be greatly reduced if burned in a severe wildfire. In summary, Alternative 2 best meets the goal of maintaining biological diversity and sustaining forest productivity. The specific elements of Action Alternative 2 that would affect the physical, chemical, or biological properties of soils in proposed harvest units are described below.

Soil Productivity

Timber harvest activities cause forest soil disturbance that have implications for site productivity. The Medford District RMP provides the guidance to apply BMPs during all ground and vegetation-disturbing activities to improve or maintain soil productivity. Implementing BMPs and minimizing disturbance of fragile areas will keep losses in soil productivity to a minimum (BLM 1995, p. 44). Practices incorporating BMP guidelines are listed in Chapter 2.3.

Harvesting is not proposed in lands classified as Nonsuitable Woodland. Nonsuitable Woodland classifications include all fragile nonsuitable forestland and sites that are not biologically and/or environmentally capable of supporting a sustained yield of forest products (BLM 1986a, p. 6).

On TPCC withdrawn lands unavailable for scheduled forest management, timber harvest could occur to meet the needs of non-timber allocations made on these lands (BLM 1995, p. 72). These lands unavailable for planned forest management activities are “withdrawn” from the scheduled timber production base because they lack the physical and biological capability to support and produce a predictable flow of forest products on a sustained yield basis. Timber

harvesting from these lands are not included in the Allowable Sale Quantity (ASQ). Treatments are intended to lower risk of future fire intensities at the stand and landscape scale and are applicable to all land use allocations to reduce risks of large-scale disturbances (BLM 1995, p. 90). The proposed treatments on the reforestation suitable restricted and withdrawn classification would not have effects to productivity beyond those as described in Section 2.3. These treatments would occur in 5 separate units with RSW from 0.9 to 6.8 acres:

- RSW - Reforestation Problem/Surface Rock/Withdrawn (Suitable Woodland)

Table 18: RSW land in the PA

Unit	Unit Acres	Logging System	TPCC Acres	Symbol
03-12	2	GB/C	0.9	RSW
11-03	9	N/A	2.2	RSW
29-04	26	GB/C	6.6	RSW
29-31	7	C	6.8	RSW
32-03	6	C	6.2	RSW

Soil Compaction/Displacement

Roads & Temporary Routes

Temporary routes are not intended to be part of the permanent or designated transportation network system. Temporary route construction would occur on 5.3 miles of BLM administered land, approximately 10.2 total acres. Temporary routes would be decommissioned after completion of harvesting and fuels treatments. Road decommissioning for this project would involve blocking roads, sub-soiling the road surface to allow for water filtration, installing waterbars, and applying seed and mulch. Waterbars would filter water runoff and direct drainage off the road surface and away from streams and into vegetation that is adequate to slow surface water, and allow for deposition of detached soil particles. Mulching helps minimize surface erosion and seeding helps to establish vegetation re-growth. Sub-soiling road surfaces on all BLM managed temporary routes (5.3 miles) would reduce soil compaction to improve soil productivity on these 10.2 acres of land.

There would be some short-term loss of soil productivity where the temporary route was constructed due to displacement of soil organics. Soil productivity would recover within 1-3 years as disturbed sites become revegetated. Sub-soiling road surfaces would occur to aid in site recovery. Manual revegetation with native species may occur to further accelerate rehabilitation. There would be an increase in soil productivity within the unit along these temporary routes in areas where the organics were deposited (e.g., fill-slopes). Sub-soiling road surfaces of temporary routes would ameliorate compaction.

Landings, Skid trails, and Cable Yarding Corridors

Landings, and other areas of exposed soils resulting from this activity, would be winterized by properly installing and/or using water bars, berms, sediment basins, certified weed-free hay bales, wood straw, small dense woody debris, seeding, and/or mulching, as directed by the Authorized Officer. All new landing areas would be rehabilitated to reduce soil compaction, minimize sedimentation, and improve site productivity. Landings outside of existing road prisms would additionally be planted with conifers following use.

Figure 19: Tractor Yarding Corridor with Debris

Existing skid trails would be utilized whenever practical. New skid trails would be pre-designated and approved by the Authorized Officer. Skid trails including turning points would be 12 feet wide on average. Tractors would be equipped with an integral arch to minimize soil disturbance and equipment would walk over as much ground litter as possible to reduce compaction (Figure 19). Utilized skid trails would be rehabilitated upon completion of harvest. Ground based equipment would be limited to slopes less than 35% and yarding equipment would be limited to designated skids. To minimize soil disturbance, blades would not be used while ground-based yarding. At a minimum, one-end suspension would be required on all ground-based and cable units to minimize soil disturbance. Full suspension would be required if yarding is needed to cross unstable areas or stream draws. The figure to the right shows example of a tractor yarding unit where tops and limbs are left for equipment to walk over and mix into soil for nutrient cycling.

The magnitude and extent of soil compaction from all activities associated with the proposed action would be consistent with the impact analysis and conclusions provided in the 1994 Medford RMP/EIS for the above mentioned reasons.

Productivity loss resulting from topsoil disturbance and soil compaction would generally not exceed a combined calculated total of 12% as described within the 1995 Medford RMP. The following measures address standard operating procedures that would generally keep

productivity loss below 5% per unit. Other methods that would achieve the same or higher levels of soil protection may be utilized in place of these standard operating procedures as long as all other PDFs and BMPs for all resources are still met. Alternative procedures would be approved by the Authorized Officer.

Cumulative Effects

The cumulative activities relevant for this analysis are disclosed in Appendix C. Impacts from current and reasonably foreseeable activities to soil productivity and compaction are confined to within the Cold Elk PA. Chapter 3.4.2 describes these actions in detail under the No Action Alternative Cumulative Effects section. Alternative 2 is expected to have a beneficial Cumulative Effect on 3702 acres when considering other projects. In density reduction projects on BLM administered lands, a reduction in either overstory and/or understory stand density would improve conifer growth and contribute to developing habitat conditions. Long term soil productivity benefits where site conditions for residual conifer growth improve.

Future federal timber sale projects may be considered at a later date if stand conditions warrant treatment. In the next 20 years, compaction levels should remain moderate on BLM lands (<12% of compacted area). There would be no increase of compaction in undisturbed areas. However, in areas that would remain roaded and would have regular harvest activity, compaction would not be reduced.

The proposed silvicultural treatments would increase the long-term (after 3-5 years) productivity of residual trees by effectively increasing their access to additional light, water, and nutrients. Thinning would improve or maintain stand vigor and growth rates. Many of these stands are currently showing reduced growth rates as a result of overstocked conditions for light, soil nutrients, and water.

3.5 Soils – Sedimentation and Erosion

The affected environment describes current conditions which include remnants of past anthropomorphic impacts to soil resources such as road building, logging, mining, etc. The biological and physical elements of natural processes and these past activities are the human environment; and are quantitatively described for soil resources in the affected environment when possible. The affected environment serves as the baseline of the analysis against which the potential effects of implementing actions are considered.

Environmental effects for this analysis are based on potential soil effects for the no action alternative and the proposed action alternatives. The no-action alternative (Alt. 1), considers actions that would take place with no decision. The Proposed Action alternative (Alt. 2), assumes that the effects would occur in addition to the specific actions that are proposed. The analysis for the Proposed Action alternative (Alt. 2) will describe only the differences in scale or function from the no-action alternative.

The analysis of the action alternatives will consider the effects related to timber harvest and service work needed to implement the various treatment prescriptions. Actions include cutting trees, yarding trees, burning slash piles, broadcast burning, landing construction for processing

timber, building temporary spur roads and decommissioning them, removal and hauling of timber for treatments described in Proposed Action (Alt. 2).

Cumulative effects are the incremental effects of the action when added to other past, present and reasonably foreseeable future actions. Cumulative effects from activities described in the effects analysis include impacts from other agencies as well as adjacent land management and other potential BLM approved activities influencing soil resources. For this analysis it is assumed that non-federal actions would continue to follow current trends (25,907 acres of non-BLM lands or 46% the PA), and that those actions would be consistent with the Oregon Forest Practices Act, and all state, federal, and local laws.

Methodology

- The soils analysis focuses on accelerated erosion (above natural and/or background levels described for the affected environment) resulting from the implementation of the action alternatives. Accelerated erosion is defined as erosion that is a consequence of human activity and outside of an assumed natural sediment balance. Soil's value for timber productivity is discussed in the silvicultural section as it relates to TPCC assessments (EA Section 3.4).

- Where data are available this analysis will be quantitative and make use of Geographical Information System (GIS) and scientific research. Each proposed treatment unit has been visited at least once by field crews looking at the water and soil resources. Field surveys occurred primarily in November 2015 to March 2016. Typical field crews were three people with extensive field experience directed and supervised by a BLM hydrologist/soils specialist. Field verification of information has occurred in the field by a hydrologist/soils specialist from May 2016 up to the present.

- Due to these complex natural systems and variability of soil resources, the identification and description of potential effects will rely on qualitative analysis when appropriate.

- Proposed treatment units were evaluated for indications of slides or slumps in the field and by using LiDAR imagery (described in the analysis) based on areas that have documented slides nearby. Unstable soils identified during layout (determining unit boundaries) and cruising (marking of trees to be cut or saved) will be avoided.

- Fragile soils from the Timber Production Capability Class (TPCC) layer, Medford District GIS data, and Map 6 from the Medford RMP were used to evaluate the potential for effects to soils. Soils deemed sensitive to fuels treatments (prescribed fire) were evaluated using USDA – NRCS web soil survey (NRCS (Natural Resources Conservation Service) 2015).

Geographic Scale of the Analysis

- The geographic scale of the no-action alternative for soils is the West Fork Cow Creek fifth level HUC and units proposed for treatment. The cumulative effects analysis area for soils is the also the West Fork Cow Creek Watershed.

- The geographic scale of the analysis area for soil direct/indirect and cumulative effects is the PA and units proposed for treatment. The assumed potential disturbance area for soils includes landings, temporary roads with a 30 foot buffer off the centerline to account for cuts and fills, and 15 feet for tractor swing routes and skid trails.

Temporal Scale for the Analysis

- The temporal scale for direct effects for this analysis is short-term (1-2 years) to talk about initial disturbance from proposed treatment activities. The long-term temporal scale (50+ years) will be used to talk about indirect effects such as soil instability, productivity and development of soils.

Assumptions for Analysis

- Logging systems were designed for the units by a BLM forester as part of the project planning and have been included for analysis. An assumption for analysis is that the BLM designed logging systems will be similar to those eventually implemented by contractors. Implementation by commercial harvesters, service, stewardship, or other contracts will include the flexibility to modify the location of these logging systems, but should not result in substantial changes to the methods or intensity described, or the resulting disturbance assumed for this analysis.

- Estimated surface disturbance from proposed treatments is based on GIS analysis. This analysis is assumed to be an over-estimate for soil effects from surface disturbance, since many of the landings will be constructed in existing disturbance as per BMP requirements. Specifically the assumptions used for the GIS analysis include buffers of 30 feet from the centerline of disturbance for temporary route construction, 15 feet from the centerline for skid trails used in ground-based logging systems, and ¼ acre for landing construction. No additional disturbance was assumed for suspension systems that will yard timber to existing roads using partial suspension. Roadside landings with multiple yarding corridors were assumed to need ¼ acre for landing construction, and finally helicopter landings were assumed to require ¼ to 1 acre depending on the anticipated use.

- A natural healthy watershed has an assumed equilibrium between sediment input, routing, and storage. Natural disturbances in the uplands that cause erosion and change hillslope runoff dynamics such as fire, beavers and intense storms (among other things) are part of this natural system balance. This balance plays out on a landscape scale and over a long time. Accelerated erosion describes changes to this balance as well as direct effects that cause soil disturbance and erosion caused by human activities (i.e. accelerated erosion).

- Commercial harvest would require truck hauling of logs or chipped material from the identified landings. The understory reduction treatment would not haul material off-site or need heavy equipment access. All methods may include treatments to address an activity fuel (woody material left on site after the treatment) which includes burning piles and possible broadcast burning.

3.5.1 Affected Environment:

Soils in the PA are derived from sedimentary, metasedimentary, and metavolcanic rock types. Soils associated with metasedimentary rocks tend to be deeper and have more nutrients available. Uplands are generally steep and soils are relatively shallow. Soils developed from metavolcanic rock types tend to be shallow and have less soil nutrients and soil development than the sedimentary. Organic matter plays an increasing role in the productivity of the metavolcanic sites. Some of the West Fork of Cow Creek is dominated by serpentine-derived soils which are low in calcium and high in magnesium and other minerals which produce unique vegetative communities, and preclude many plant species which are adapted to calcium-based soils. Seams of serpentinite can be observed near Mt. Bolivar and Gold Mountain (BLM 2004).

The classifications of soils within the PA are shown in the Appendix J. Of the soils, over 75% are poorly suited for road building. About a third of the soils have a severe rating for soil rutting potential, another third are moderate and the last third are slight or not rated. The soils are generally susceptible to compaction with steep slopes.

Areas of fragile and reforestation limited soils as described in the Timber Production Capability Classification (TPCC) Handbook (BLM 1987). Special mitigating measures (BMPs) are incorporated into management actions for the proposed treatment units. Soils defined in this classification prone to accelerated erosion within this PA include: FGR and FNR. FGR (Fragile Gradient) areas consist of steep to extremely steep slopes. Gradients commonly range from 60 to 100% or more and have a high potential for debris type landslides. FNR (Fragile Nutrient) areas are sites inherently low in nutrients or have a nutrient imbalance that inhibits tree growth. With the lack of vegetative production, the protective duff layer is either minimal or lacking altogether, making these soils more susceptible to rain splash detachment, overland flow, and accelerated erosion. For more information see EA Section 3.1, Silviculture and Appendix G, Silviculture prescription). The acres of fragile soils from the TPCC layer are 1,527 in the West Fork of Cow Creek.

There are no sensitive soils identified in the project area on Map 6 of the 1995 RMP (BLM 1995, D1-6a-93). Soil types that are considered to be fragile or are sensitive to management activities such as broadcast burning are identified in the NRCS soil surveys for the counties. Nearly the entire West Fork Cow Creek watershed (48,062 acres) is classified as highly susceptible to fire damage in the NRCS soil surveys. Fragile soils identified in the NRCS soil surveys include 2,390 acres that are colluvium or residuum weathered or derived from peridotite or serpentinite. General soil properties are shown in Appendix J - Soil Properties. All proposed treatment units were evaluated for soil conditions when considering the prescription and BMPs or PDFs will be employed to address potential effects.

Slide areas (areas prone to mass wasting or slumps due to unstable soils) have been documented North of the West Fork Cow Creek Watershed based on the Statewide Landslide Information Databased for Oregon or SLIDO (Oregon Department of Geology and Mineral Industries 2015). This data source depends on reporting by the public and therefore is not comprehensive and there are likely areas of undocumented mass wasting and slumps in West Fork Cow Creek. Unstable soil areas may create management constraints especially where road construction is concerned. The proposed action limits surface-disturbing activities on lands dominated by these soils (BLM

1995, p. 44).

Proposed treatment units were evaluated for indications of slides or slumps in the field and by using LiDAR imagery (described in the analysis). An inventory of aerial photographs from 1959 to 1972 shows that landslides associated with roads and in clearcuts were 27 and 23 times more frequent, respectively, than in forested areas (Beschta 1983). This same study found that most of the landslides that unloaded sediments directly into the drainage system occurred with landslides that appear to have been initiated during large flood events. The ECA analysis in (Section 3.6: Hydrology) for West Fork Cow Creek indicated two 7th field HUCs that have a high number of clear-cuts on private lands, specifically Gold Mountain Creek and Stanley Creek. However, there are no slides or slumps in these watersheds apparent in LiDAR.

Interpretation based on LiDAR imagery, aerial photography (USDA 2014), and field verification surveys revealed widespread soil compaction from past activities in the PA. In undisturbed soils, soil infiltration capacities are generally high, with saturated conditions during the wet season. For undisturbed soils in the PA overland flow is rare; the movement of subsurface water accounts for nearly all streamflow, similar to what is found in most of western Oregon (Harr 1976). When shallow groundwater or subsurface flow is converted to overland flow by soil compaction, it has the potential to cause accelerated erosion.

Soil compaction is the packing together of soil particles resulting in an increase in density and a decrease in pore space, due to weight at the soil surface. A decrease in pore space results in restricted movement of water, nutrients, air, and plant roots. Compaction generally decreases site productivity and vegetative growth. Reduced pore space also reduces water infiltration, causing an increase in surface runoff and potentially accelerated erosion (Greacen 1980). Many of these compacted areas are old mining sites, skid trails, and primitive roads that are partially or wholly re-vegetated with grasses, brush, and trees. Within previously harvested units in the PA, evidence of past soil compaction is still present along tractor skid trails and landing areas; instances of accelerated erosion are also visible.

Background natural erosion and sedimentation can be evaluated based on scientific studies in Southwest Oregon. These studies can be helpful in predicting a historical background watershed condition to compare current conditions. A study in the Siskiyou Mountains measured episodic sediment deposition based on sediment core samples from Squaw Lake, which was created by a landslide 2,000 years ago (Colombarolia 2010). Lake sediment core samples were analyzed for evidence of fires, pollen and sediment. The soil layers were dated based on carbon dating charcoal in the soils and fire frequency could be determined by charcoal peaks.

The forest vegetation in the Squaw Creek watershed is similar to most of the PA (i.e. Douglas fir, Pacific madrone, Sugar pine and Ponderosa pine). The West Fork of Cow Creek is farther north, in a different watershed and probably has a different development history, but shares characteristics with the Squaw Creek.

The fire history of Squaw Lake is best described as, “alternations between centennial-scale periods of little to no fire with intervals of frequent fires, probably of small size and low severity, punctuated by larger and/or more severe fires that are associated with distinct erosional signatures.” Climate driven changes are the dominant natural background pattern in fire

frequency, vegetation, fuel loading, and resulting erosion sedimentation rates. Some periods with very low or almost no fire activity were twice as long as the 80 years of fire suppression evident in tree-ring records; therefore, these landscapes likely support a non-stationary disturbance regime over a range of time scales (Colombarolia 2010).

Severe erosion measured in the core samples from Squaw Lake during the 20th century falls outside the historical range of variability from natural disturbance. The authors conclude that road building, livestock grazing, land management, logging and broadcast burning of logging slash began in the 1950s, created an unprecedented increase in accelerated erosion. Erosion was then exacerbated by several major flood events. Consequently, sediment loads during 1950s to the 1970s were four times the most severe pre-settlement episodic severe fire and sediment deposition event on record (Colombarolia 2010).

The Cow Creek watershed has had a similar history of developing an extensive road network to facilitate timber harvesting as Squaw Creek. Cow Creek also experienced a couple of periods of extensive flooding occurred in the 1960s and 1970s (See the Affected Environment for Water Resources). Therefore, the fire history and natural background conditions are likely similar to Squaw Creek with pre-settlement episodic severe fire periods that corresponded to drought conditions and extensive modification with settlement and development of timber lands. The West Fork of Cow Creek has likely responded to these impacts and has established or is establishing a new equilibrium for sediment production.

Regardless of the disturbance or history, the dominant natural processes of erosion are: splash action by raindrops, running surface water, and mass wasting. Sediment created from erosion sources can be stored on the hillslope, at the toe of slopes, deltas and in the floodplains of stream channels delivered to a stream channel through rills and gullies. Sediment also comes from stream channel banks during high flow events, as the stream adjusts to increased peak flows or changes in geomorphology. Under natural conditions, stream systems have developed substrate, vegetation and form in response to the amount of fine sediment, coarse bed load sediment, and larger elements of instream structure (i.e. wood, boulders).

Changes in sedimentation due to accelerated erosion, decreased water storage, increased surface runoff and other factors may change with road building and logging and can result in changes in stream processes. The Affected Environment for soils can be summarized as localized areas of soil compaction, unstable soils, high ECA, and erosion; but overall in equilibrium with the road system and other sources of accelerated erosion.

3.5.2 Alternative 1 – No Action -

Direct and Indirect Effects –

Under all alternatives, erosion from land management actions across ownerships within the PA would be expected to remain consistent with current levels, and accelerated erosion due to past and present activities is expected to occur in localized areas and contribute to sediment loads in streams when these areas are hydrologically connected. While some new roads could be constructed based on ROW agreements other roads may be storm proofed and/or fully decommissioned, therefore accelerated erosion from roads is likely to remain at current levels or

similar to that described in the Affected Environment.

There are likely to be some locations with small slumps due to rotational slope failures under the no-action alternative due to road or private timber harvest. Local geology has created hillslopes prone to saturated strata underlain by impervious layers of clay, making them prone to rotational failures. One of these failures is at the junction of Elk Valley Road and the Main West Fork Cow Creek Road. A rotational slope failure at this location has caused road failures on both roads for at least 50 years. Different efforts have been made to de-water the contact point for the rotational failure, stabilize soils and reduce the amount of water concentrated in this area. Under the no-action alternative the repair of systematic slope failures at this site and sites like this would continue.

Although road surfacing on BLM roads is presently in fair to good condition in the West Fork of Cow Creek, natural surface roads have a variety of surface conditions, with some stable and others eroding. Most private roads are natural surface and many are actively eroding. A major portion of the culverts in West Fork Cow Creek have already exceeded or are nearing their life expectancy of 25 years. An inventory of the location, condition, and size of road culverts within the watershed is currently in progress. This analysis is generally the same as what was reported in the Watershed Analysis done in 1997 as well as the conclusion that road conditions will probably decline or be maintained. These conditions indicate the potential for erosion and road failure due to inadequate drainage systems or underlying geology.

Extreme storm events in the short-term are likely to cause localized erosion from these roads with unstable soils and/or drainage problems as well as forested lands with less vegetation due to timber harvest. Extreme storm events are more likely to occur in January-February and in some cases may be part of a rain on snow melt event. The most intense storms are likely to be localized to the sub-watershed or tributary scale (Table 20: Hydrological Unit Code Table).

There are no category 1 sensitive soils (high potential for fire damage as described in the Medford RMP (BLM 1995, p. 168) in the PA proposed for treatment, but the NRCS soils layer cautions to avoid soil impacts during broadcast burning. Direct and indirect effects (at the unit scale) of hazardous fuels reduction, prescribed burning, and activity fuels as they relate to soil productivity and erosion are expected to be negligible and short-term (1-2 years) in most locations. This local erosion would likely be addressed through road maintenance when possible.

Under this Alternative, aggregate and natural surface roads (139 miles) associated with timber haul for this project would not receive maintenance, and therefore may result in more pronounced effects due to failed drainage systems and deteriorating road surfaces. Some maintenance will occur on these roads due to reciprocal agreements with private parties. BLM maintenance on paved and bituminous surface roads used for haul (74 miles) would continue under the no action alternative.

Cumulative Effects

The Cumulative Effects area considered for soils is the BLM administered land within the PA. As described in the Affected Environment, past timber extraction on BLM managed lands within

the PA have left areas of disturbance and compaction that can contribute to localized areas of accelerated erosion and unstable soils. In some cases this may result in higher than background erosion rates, but effects are likely to diminish and may be unmeasurable after vegetation reestablishes or road maintenance fix drainage problems.

Virtually all of the private timber lands have been harvested and are dominated by recent clear-cuts and second growth conifer forests 25-40 years old (BLM 2004). Timber harvest, road use, silvicultural treatments, prescribed burning and other activity fuels treatments would be expected to continue on non-federal lands under the No Action Alternative as well as federal lands as well as Oregon State land.

Timber harvesting on these lands will utilize roads on BLM managed lands and would have some direct effects such as the use of tailhold trees (trees or stumps that are used to anchor suspension lines used for yarding timber harvested on private lands). Most of this use is the result of reciprocal agreements that are often non-discretionary and results in minor effects to soils within the PA. Increases in peak flows and changes in groundwater flow characteristics due to the management of private timber lands have the potential to increase accelerated erosion and sedimentation on BLM administered lands and may contribute to soil erosion.

The Action Alternative proposes to upgrade haul roads. Under the no-action alternative some roads would not receive maintenance and therefore may result in effects due to failed drainage systems and deteriorating road surfaces. Based on field surveys, some of the roads on BLM administered lands in the PA show evidence of surface erosion, inadequate drainage, inadequate surfacing, inadequate stream crossings, or unstable cut-banks and fill slopes, and will require maintenance as part of this project (See Table 19: Unit Specific Effects).

Regular passenger and all-terrain vehicle use of road systems and non-system OHV trails within this PA would be used by the public under all alternatives, and the corresponding erosion from this use would be expected to continue at current rates. Soil erosion effects as a result of all federal projects discussed above are consistent with the effects analysis and conclusions provided in the Medford RMP.

Under all alternatives BLM intends undertake projects to enhance aquatic and riparian habitat on BLM administered lands. BLM aquatic habitat projects may include storm-proofing decommissioned roads, improving aquatic passage in existing culverts, placing large wood in stream channels, removing non-native vegetation, and other actions. These projects may result in soil disturbance over the short-term (1-2 years), but would be designed to improve watershed function and health over the long-term (50+ years). These activities will occur as funding and time allows.

3.5.3 Alternative 2

Direct and Indirect Effects

The road system used for timber hauling would have direct effects to soils, such as accelerated erosion at different levels depending on the surface type, location, design features, maintenance timing and frequency, and moisture levels of the road surface during use. Hauling may be whole logs or chips depending on the material generated by the treatment. Roads modify hydrology

both through interception of precipitation on the road surface, and through interception of subsurface flow. Poorly located roads that channelize flow on hillslopes are recurrent sources of accelerated surface erosion, and in some cases mass wasting (Wemple 2003). Unsurfaced, poorly surfaced, and/or poorly located roads open for use during wet conditions can be chronic sources of erosion and sedimentation.

Although the majority of the road network is in fair to good shape (Affected Environment), some poorly located roads with drainage issues will not be repaired with regular maintenance. Two examples identified during field work are Panther Creek Road (39-0-27.0) and BLM road 31-9-25.3 that goes to the proposed unit 19-3. The Panther Creek Road is not proposed for haul due to the poor soils and failures of the culverts on perennial crossings. Minimal use of the road into 19-3 is planned, but two culverts on the main road (31-9-25.3) are failing and will likely need to be replaced. These roads are in poor locations due to being built on the first bench with saturated soils next to perennial streams. Failing culverts saturate soils in road fills and/or create unnecessary impediments to the movement of water and sediment through the road prism. When this occurs, the possibility for catastrophic road failure and erosion is more likely.

Direct effects from constructing or reconstructing temporary routes are mixing soils types, compaction during use and limiting productivity through these direct impacts. Long term impacts can come from limiting vegetation growth and recovery on sites. Road building changes soil physical properties including depth, density, infiltration capacity, water holding capacity, and gas exchange rate, nutrient concentrations, and microclimate. Although more than 50% of reclaimed temporary routes may be reforested within 8 years, they are likely to have reduced growth rates for trees and lower productivity in general (Gucinski et al. 2001). Limiting vegetation growth and recovery would make soils more prone to erosion in some places.

All roads can contribute to accelerated erosion at different levels. The use of natural surface roads for timber hauling during wet periods generally yields the highest rates of soil displacement and erosion. Even roads with rocked surface types can quickly deteriorate when used under wet conditions. 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.

The Proposed Action assumes that system roads needed for haul will have adequate maintenance before and after use. However, the sale will not fund major infrastructure improvements if crossings are safe for hauling. This means that as described in the affected environment there is the potential for failures on the road system and subsequent soil effects. PDFs and BMPs can reduce haul during wet conditions when road damage and failure is more likely to occur. If weather conditions cause road damage or accelerated erosion, the Authorized Officer (AO) for the BLM would have the authority to restrict road use until conditions improve, regardless of the season. Wet season maintenance would not occur unless drainage systems are failing and intervention would reduce resource impacts.

Direct effects to soils from timber thinning include soil displacement and compaction from forest management activities. Soil disturbance to build landings, skid trails and for temporary roads is estimated to be 148 acres, based on logging systems predicted by a BLM Forester (See Methods Section). Actual locations and amounts of disturbance may be different during implementation,

but should not vary in scope or amounts.

- **VDT with Cable Yarding (Suspension Logging Systems)** *(31.5 acres of surface disturbance for landings in unit and roadside with more than two corridors)*

  The amount of harvest will be determined by the prescription and would include yarding corridors and landings where trees would be delimbed and stacked to be loaded on haul trucks. As required by BMPs, the use of existing disturbance (old landings or roads) will occur to the maximum extent possible; therefore the entire disturbance assumed would not necessarily be new disturbance.

- **VDT with Helicopter Yarding** *(15.3 acres)*

  In general, helicopters need larger areas for landings, but do not require yarding corridors. These same units may include understory reduction at some time in the future. Half of these landings will likely be located on private lands.

- **VDT with Ground Based Equipment** *(73.5 acres for skid trails and 10.5 acres for landings)*

  This activity would only occur on lands that are generally less than 35 percent slope and would require landings, skid trails and the use of temporary roads. These same units may include understory reduction at some time in the future.

- **Understory Reduction** (0 acres)

  This activity does not need hauling and would involve the use of passenger vehicles and ground crews. Therefore no specific locations for disturbance are assumed. Piles made by the removal of less than 8-inch DBH material would be burned in the winter and would result in soil disturbance at the location of the burn piles.

The average percentage of RR in each unit is 46%, of this area a portion is in EPZs and will not have commercial treatment (26%). Proposed commercial treatment in riparian is estimated to be 805 acres, which is 20% of the acreage for all the units. Ecological Protection Zones (EPZs) were utilized for VDT that varies from 50 feet to 120 feet depending on the feature; they are roughly 22% of the unit acre totals. Only Understory Reduction (UR) will occur in EPZs, and will have a 50 foot buffer for perennial streams and a 25 foot buffer for intermittent streams of no treatment. The total acres of UR proposed for this project in the RR is 695 acres

Commercial treatments would utilize a minimum of a 50 foot buffer to protect intermittent streambank stability and a minimum of a 100 foot buffer to protect wetland features. These buffers are designed to protect the root network of typical trees in this area, reduce impacts to hydric soils, and avoid sedimentation. One study found that 95% of the erosion features from timber harvest 32.8 feet from streams delivered no sediment to stream channels (E. B. Rashin 2006). Stream buffers may also intercept and filter sediment from upslope erosion sites, so long as drainage is not concentrated in gullies, channels, or cable-yarding and skid trails (i.e. hydrologically connected, see Table 27). Perennial streams employ a 120 foot buffer to protect

the primary shade zone and allow for course wood recruitment (See Chapter 1: Ecological Protection Zones).

Soil Effects Common to All Harvest Methods *(148 total acres)* – In summary, direct effects to soils from timber thinning include soil displacement and compaction from forest management activities.

Soil displacement can alter hillslope hydrology, increasing the potential for surface erosion (Page-Dumroese et al 2010). Disturbed soils (soil displacement) that are not heavily compacted can display evidence of localized surface erosion over the long term, but this effect greatly diminishes within 1-3 years after disturbance in response to the regrowth of vegetation, and eventually a reduction of erosion from these soils. Where compacted soils are subsoiled and reclaimed they would still experience an increase in erosion due to rills and gullies that form on compacted and unmaintained skid trails. These acres would likely reestablish full hydrologic and soil functions within 40-80 years, depending on soil type and condition (Wert 1981).

Direct effects occur when mechanized harvesting or yarding equipment is driven over soils or when timber is yarded across poorly vegetated, weak, bare, or wet soils. When soil displacement occurs, soil horizons become mixed; essential soil nutrients, water, and soil organisms may be rearranged or removed; and topsoil may become rutted. These alterations to the soil profile or soil characteristics can decrease productivity and may result in accelerated erosion.

This action includes a total of 7.6 miles of temporary route construction or reconstruction. Temporary routes would be utilized primarily on or near ridges. All temporary spur roads would be fully-decommissioned after use.

Temporary route decommissioning for this project would involve installing waterbars and rolling dips, removing ditches and outsloping the tread of the road, sub-soiling the road surface to 18 inches or bedrock to allow for water infiltration, applying seed and mulch and blocking the entrance of the route to the road with boulders, logs and/or soil berms,. Mulching helps minimize surface erosion and seeding helps establish vegetation re-growth. Waterbars are typically a temporary measure to winterize the road or installed during use and rolling dips are constructed to stay in place for the long-term. Waterbars and water dips both divert surface runoff and direct drainage off the road surface in regular intervals to allow infiltration into the hillslope. In general water dips and waterbars will be day-lighted into stable vegetation to allow for infiltration and deposition of detached soil particles. If done properly surface flow can be returned to shallow groundwater flow in forested systems.

If stormproofing or decommissioning is successful in restoring normal hillslope hydrology, soils should return to a long-term stable functioning condition. Soil productivity may increase or decrease along the disturbance of temporary roads depending on changes in nutrient and soil moisture availability. Although more than 50%of reclaimed temporary roads may reforest within 8 years, trees are likely to have reduced growth rates and the reforested area would exhibit lower productivity in general (Gucinski et al. 2001).

The Proposed Action includes 5.6 miles of new temporary route construction and 1.9 miles of temporary route renovation or re-construction to access proposed timber treatment units (Table

1: Summary of Road Activities). Route renovation/re-construction restores an existing road bed for temporary use. All temporary routes will be fully-decommissioned after use which includes sub-soiling (or tilling), seeding, mulching, physically blocking, and/or planting the route to reestablish vegetation. During use the routes may be outsloped or crowned. Temporary routes may have waterbars installed to control water on the route surface during use and before being decommissioned.

All thinning treatments that harvest timber would use system roads for hauling whole log or chips (Currently 214 miles in the PA). There would be no long-term increase in road density under this alternative, but a slight increase in roaded area during harvest (about 0.5% in the West Fork of Cow Creek). With this slight increase in roaded area, the total roaded area for the project area would still be below 4%, and therefore not expected to result in any measureable change in effects beyond baseline conditions.

With the proper waivers and the implementation of applicable BMPs and PDFs, hauling may be permitted on all road surface types in all seasons. Use of poorly maintained roads can cause rutting of the road surface and concentration of surface runoff on the road surface, leading to road failure and localized erosion. If this occurs, any drainage system for roads that are hydrologically connected to perennial waters would have the ability to transport sediment to surface waters. Potential sediment delivery from these areas would be minimized by good road maintenance, management of hauling by the waiver system and project inspection, and the ability to install mitigation measures if needed (See EA Section 2.3, BMPs and PDFs).

The Direct/Indirect Effects on Soil Productivity and Compaction estimates that proposed activities would result in 148 acres of soil compaction and displacement over new and existing footprints and would reduce soil productivity by an estimated 0.3% in the PA. Total compaction/displacement associated with new and existing temporary routes, tractor skid trails, landings and cable yarding corridors would account for an average of approximately 2.1% per unit (based on horizontal distance). Each proposed Cold Elk harvest unit would be below 12% compaction and 5% productivity loss as analyzed in the 1995 RMP (BLM 1995). Productivity loss and compaction both increase the risk of erosion.

Thinning with Suspension Logging Systems – Direct soil disturbance in timber harvest units stem from yarding corridors and landings. Applying appropriate PDFs and BMPs limits the extent of ground affected, and would be dependent on site conditions, such as: timber volume and yarding method over any given cable corridor, as well as topography and operator/equipment factors. The greatest disturbance would occur within 100 to 150 feet of landings where individual yarding corridors merge. A total of 414 acres would utilize thinning with suspension logging systems and require almost 52 landings that would serve three or more yarding corridors.

In general, cable harvest systems would be used on slopes greater than 35% or on soils that have limitations that preclude ground based systems and good access for hauling. Cable yarding systems would maintain a minimum one-end log suspension to minimize surface and soil disturbance. Cable yarding would cause localized disturbance characterized by duff and mineral soil displacement in yarding corridors, and in some instances displacement of the subsoil. Compaction and displacement in yarding corridors would be more extensive when corridors are used with soil moisture levels above 25%. Vegetative buffers adjacent to and below units would

capture and filter soil displaced from these corridors. Rashin (2006) found that 95% of erosional features that were 10 meters (33 feet) away from stream channels did not deliver sediment, well within the minimum buffer of 50 feet proposed under Alternative 2 for all treatment units.

Suspension yarding is expected to result in disturbance around landings to process trees for hauling. One quarter acre disturbance is anticipated for any landings that serve more than three yarding corridors. Whole tree yarding is expected with partial suspension. A limited amount of soil disturbance is expected to occur with greater suspension. A study of various logging methods in Oregon found the most common disturbance associated with suspension logging was mixing of mineral and organic soil horizons. Areas of exposed and rutted soil were small, discontinuous and usually occurred within 150 feet of the landing, which similarly alleviates concerns about potential erosion and sedimentation problems due to the abundance of slash after processing (Allen 1999).

Thinning with Helicopter Yarding– Helicopter logging does not use cable suspension systems instead a strap is placed on the log and it is hoisted from the site with a helicopter and transported to a landing. Typical landing size is larger than cable yarding (0.25 to 1 acres is assumed for analysis depending on the purpose), but is generally more flexible in location, so more likely to use existing disturbance. At the landing, logs would be processed and stacked in a similar way to cable systems, although there is generally less slash and more material is left on-site. Direct effects include damage to other trees during yarding, but in general only hand crews are on site, so therefore the landings and temporary routes are the main disturbance to soils. Landings constructed in undisturbed ground would be drained to stable surrounding vegetation during use and be subsoiled and planted after use reducing soil compaction and beginning the reestablishment of soil productivity according to BMPs and PDFs. A total of 170 acres of treatment with helicopter yarding is proposed.

Thinning with Ground Based Equipment - Ground-based harvest and yarding acres total approximately 610 acres. Some of the Units will be combined yarding methods. There are 2,006 acres of combined ground-based and cable yarding. There is also 172 acres of helicopter, ground and cable combined units. Units identified for ground based harvest would employ BMPs and PDFs to reduce the severity and spatial extent of compaction, displacement, and associated erosion. Ground-based harvesting would use low-impact routes within units (skid trails). In areas where multiple passes are made and especially at pivot points within these routes, soil compaction and/or displacement would occur. Limiting the number of passes, operating upon a mat of slash/litter would be done where feasible, and utilizing these routes during the dry conditions would lessen the effects (see section 2.3, PDF's for ground-based harvest).

Ground-based harvesting would occur in the wet season with a waiver and will require a soils test to determine if soils are below 25% soil moisture before dry condition use is approved. Assuming implementation adheres to this PDF, ground-based harvest could occur during the wet season when soils are moist but not saturated. These wet soils still are more susceptible to compaction and displacement as compared to dry soils with the same use. Extremely dry conditions can also result in proportionally more soil damage and will be identified and mitigated on a case-by-case basis.

In general, soil erosion is likely to be greater when the harvest occurs during the wet season, but the exact magnitude is difficult to determine. It can be assumed there would be an increase in areas with localized erosion.

Compacted skid trails would be ripped when they are within the RR to reduce compaction, native-surface landings free of logging slash, and and/or sub-soiled, except in areas of shallow, skeletal soils with high cobble and gravel content, or rocky soils (i.e. rehabilitated). This would reduce bulk soil density and provide some soil aeration, reduce puddling and runoff, and allow for regeneration of shrubs and trees.

Sub-soiling also helps prevent runoff and erosion by increasing infiltration capacity. Compacted skid trails that are not ripped after use can retain their compaction after 32 years (Wert 1981). Individual skid trails are not likely to be compacted after use due to the amount of passes and types of logging equipment after use. However, trunk lines that feed more than one skid trail and tractor swing roads are likely to be compacted by use and are more likely to need sub-soiling.

Under the Proposed Action (Alt. 2) ground-based harvest could occur during the wet season under dry conditions. Dry conditions are common at the beginning of the wet season (Oct. 15 to Nov. 15), but may occur at any time during the wet season. Contractors would be granted a waiver to implement ground-based operations during the wet-season when a soil moisture test indicates dry conditions. If precipitation changes the moisture content of soils, activities would have to be suspended. Additional disturbance would occur from ground-based activities where site soil moisture is variable or when storms come after disturbance occurs and before reclamation activities occur.

Understory Reduction Treatments (659 acres of treatment) –

Understory reduction treatments include slashing, hand-piling, pile-burning, chipping, lop and scattering, biomass removal, and/or under burning. This work would be done with hand crews and result in minor and localized soil disturbance due to heating under the burn piles. 37 Units will have thinning treatments and understory reduction treatments. This treatment would move these stands toward an ecosystem that can adequately respond to natural disturbance. This treatment is intended to restore the inherent forest structure in dry forest stands and put these stands on a path to develop and retain the vegetation resiliency to the expected disturbance regime. In some locations this treatment may reduce long-term effects to soils from catastrophic wildland fire.

Table 19: Unit Specific Information for Effects to Soils

Unit Numbers	Acres	Prescription+	Unit Specific Effects*
01-05	31.4	VDT (60%)	This unit has portions that were identified as having low yields for timber, but no specific soils problem was identified. Since it is to be helicopter yarded, no impacts are likely.
01-11	13.3	VDT (40%/60%)	This unit is listed in the TPCC layer as having portions that are fragile woodland with gradient problems (FGNW). This will be cable yarded from above and will likely avoid the fragile soils.

Unit Numbers	Acres	Prescription+	Unit Specific Effects*
13-02	22.2	VDT (40%)	This unit is listed in the TPCC layer as having portions that are fragile with reforestation problems (FWR/RTR) and is expected to have groundwater near the surface. Field surveys indicated perennial streams and it is likely the EPZ buffers will limit the scope of harvest
15-18	20.1	VDT (60%)	This unit has lots of old skid trails visible on LiDAR and likely less stable soils.
21-09	14.2	VDT (40%)	This unit is listed in the TPCC layer as being fragile with reforestation problems (FWR/RTR) and is expected to have groundwater near the surface. Field surveys indicated perennial streams and it is likely the EPZ buffers will limit the scope of harvest
27-01	35.3	VDT (40%)	There are potentially unstable soils based on LiDAR and temporary road that would not be entirely on a ridge.
* Only units with specific direct or indirect effects are described. Units not included are expected to have effects similar to those described as common to all. + Abbreviations for prescriptions are Variable Density Thinning (VDT), Understory Reduction (UR) Thinning would be to the percentage canopy cover indicated.			

Cumulative Effects

Effects would be similar to those described for the no-action alternative for soils (alternative 1).

For this project, it was determined that little to no sedimentation would occur from individual units, landings, and crossings along haul routes. In other words, no measureable sedimentation would occur above natural background levels described for the no-action alternative.

No-treatment buffers (EPZs), Best Management Practices (BMPs), and specific associated project design features (PDFs) identified in EA Section 2.3, would result in no direct or long term erosion.

3.6 Hydrology

Methodology

The affected environment describes current conditions, including past anthropomorphic impacts to water resources such as road building, logging, mining, etc. The biological and physical elements of natural processes and these past activities are the human environment; and are described for water resources in the affected environment, quantitatively when possible. The affected environment serves as the baseline of the analysis against which the potential effects of implementing actions are considered.

This analysis bases potential environmental effects on water resources for the no action alternative and the proposed action alternative. The no-action alternative (Alt. 1) considers actions that would take place with no decision. The Proposed Action assumes that the effects described in the no-action alternative would occur in addition to the specific actions that are proposed in each alternative. The analysis for each alternative will describe only the differences in scale or function from the no-action alternative and the Proposed Action.

The analysis of the action alternatives will consider the effects related to timber harvest and service work needed to implement the various treatment prescriptions. Actions include cutting trees, yarding trees, burning slash piles, broadcast burning, constructing landings for processing timber, and removal and hauling of timber for treatments described in Proposed Action (Alt. 2).

Cumulative effects are the incremental effects of the action when added to other past, present and reasonably foreseeable future actions. Cumulative effects from activities described in Appendix C include impacts from other agencies as well as adjacent land management and other potential BLM-approved activities influencing water resources in the West Fork of Cow Creek. For this analysis it is assumed that non-federal actions will continue to follow current trends (12,726 acres of non-BLM lands or 48% of the PA), and that those actions will be consistent with the Oregon Forest Practices Act, and all state, federal, and local laws.

Where data is available this analysis will be quantitative and make use of Geographical Information System (GIS) and findings from scientific research. The analysis will describe watershed dynamics in the West Fork Cow Creek (1710030208) 5th level Hydrologic Unit Codes (HUC).

Field crews looking at soil and water resources have visited each proposed treatment unit at least once. Field surveys occurred primarily from November 2015 to March 2016. Typical field crews included three people with extensive field experience directed and supervised by a BLM hydrologist. A hydrologist conducted field verification of information in most units from May 2016 up to the present. Changes to harvest buffers depending on additional editing from field work are expected to occur at least through August 2016, but could occur any time before harvest.

As directed by the MOU with Oregon DEQ, water quality is monitored by BLM in the PA and generally includes

ongoing stream temperature and water quality monitoring during project implementation. Stream temperature monitoring is coordinated with the Aquatic and Riparian Effectiveness Monitoring Program (AREMP). Monitoring results will be included in the analysis and used to keep track of predicted effects. Due to complex natural systems and variability of water resources the identification and description of potential effects will rely on qualitative analysis, when appropriate.

Commercial harvest would require hauling logs or chipped material using trucks from the landings. The understory reduction (UR) treatment would not haul material off-site or need heavy equipment access. All methods may include treatments to address an activity fuel (woody material left on site after the treatment) which includes burning piles.

Geographic Scale of the Analysis

The cumulative effects analysis area for peak flow enhancement is the West Fork Cow Creek watershed; for water quality it is the South Umpqua subbasin (17100302). This determination is based on an estimate of the equivalent clearcut area (ECA), road densities, roaded area, temperature, and sediment. Road densities and roaded areas were calculated using BLM GIS

base layer for roads in the area by assuming a 40 foot buffer (20 feet on either side of the centerline to allow for vegetation clearing).

ECA determinations provide an estimation of open space within a given catchment area created from recent events such as harvest activities, activity fuels treatments, or fires. Recent thinning and regeneration harvest across all ownerships was analyzed for vegetative cover using the National Agriculture Imagery Program (NAIP) aerial photography (USDA 2014). Areas that exhibited 30% or less canopy cover were considered bare ground for the purposes of establishing the ECA (OWEB 1999, IV-11) in the watershed.

Temporal Scale for the Analysis

The temporal scale for direct effects for this analysis is short-term (1-2 years) when discussing initial disturbance from proposed treatment activities. The long-term temporal scale (50+ years) will be used to discuss indirect effects in relationship to Aquatic Conservation Strategy (ACS) objectives, changes in streamflow timing, water temperature, and other values impacted by the overall health and function of watersheds.

Assumptions for Analysis

The BLM assumes that logging systems as described in the analysis will be similar to those eventually implemented by contractors. Logging systems were designed for each of the proposed treatment units by a BLM forester according to the needs of the prescription. Logging systems include the location of landings, temporary routes, and tractor routes. Implementation by commercial harvesters, service, stewardship, or other contracts would include the flexibility to modify the location of these logging systems, but should not result in substantial changes to the methods or intensity described, or the resulting disturbance assumed for this analysis.

The analysis will focus on accelerated erosion (above natural and/or background levels described for the affected environment) resulting from the implementation of the action alternatives. Accelerated erosion is defined as erosion that is a consequence of human activity and outside of an assumed natural sediment balance.

Estimates for the “roaded area” is based on GIS analysis that assumes a 30 feet buffer from the centerline of disturbance for temporary route construction, 15 feet from the centerline for skid trails used in ground-based logging systems, and ¼ acre for landing construction. No additional disturbance was assumed for suspension systems that yard timber to existing roads using partial suspension. Landings with multiple yarding corridors were assumed to need ¼ acre for landing construction. These assumptions are likely to be an over-estimate for effects from surface disturbance.

A natural healthy watershed has an assumed equilibrium between sediment input, routing, and storage. Natural disturbances in the uplands that cause erosion and change hillslope runoff dynamics such as fire, beavers, and intense storms are part of this natural system balance. This balance plays out on a landscape scale and over a long time period. Accelerated erosion describes changes to this balance as well as direct effects that cause disturbance and erosion caused by human activities (i.e. accelerated erosion).

The water quality analysis will include water quality changes that may occur due to elevated nutrient/sediment loads resulting from accelerated erosion. The affected environment and no-action alternative includes all past human actions in the baseline. Physical and chemical characteristics of soil, combined with past and current land use management, are major contributing factors to accelerated erosion and consequently may alter water quality.

The haul routes for commercial timber extraction (if approved) will use the existing road network. In general this road system was developed in the 1960s and 70s and some of the infrastructure is old, was inadequate, or beyond its original design life. It is likely there are crossing with culverts that are in poor condition. It is assumed that if culverts are failing and beyond load requirements they will be replaced before hauling activities. Priority for upgrading will be based on the potential impact and the ecological value of the riparian resources affected (BLM 1995, p. 28).

Preliminary field assessments indicate there may be 5-10 culverts at stream crossings and maybe another 10-15 cross-drains culverts that will need to be replaced. Of the 5-10 crossings, probably 1-3 may be on fish bearing streams. This is just an estimate of the magnitude of the needs to be used as an assumption for analysis.

The RMP requires that culverts replaced on stream channels pass the 100-year storm and culverts on fish bearing streams simulate natural streambed conditions to allow aquatic organism passage (BLM 1995, pp. 28, 84, 160). BMPs and PDFs (see Section 2.3) will be used to reduce impacts from the installations and hasten reclamation of the sites.

Culvert replacements may occur as a requirement of the timber or stewardship contract, as part of a reciprocal ROW agreement, through a watershed partner, and/or with BLM deferred maintenance funding. Regardless of funding mechanism, culvert replacements in crossings with flowing water will be done during the instream work window for South Umpqua Tributaries (July 1 – September 15) (ODFW 2008) and will use techniques to hydrologically isolate the work area and reduce or eliminate sediment inputs to surface waters. Some culvert replacements will require removal of fill or benching to access the correct placement location. Any excess material will be disposed of at a BLM approved location outside the riparian areas.

Peak flow enhancement refers to an additional increase (timing and/or magnitude) in the flow of a stream or river during a high flow event. Peak flows have the ability to alter stable stream channels and cause additional stream bank erosion. ECA determinations provide an estimation of open space within a given catchment area created from recent occurrences such as harvest activities, activity fuels treatments, or fires. Road density and roaded area are variables that can be evaluated using GIS on a landscape scale and are known factors that can result in changes to peak flows. Both the ECA and roaded area may affect water yield by reducing storage or converting shallow groundwater to surface flow for watersheds. Water yield is the total surface water output for a given watershed.

Loss of riparian vegetation can increase stream temperature by increasing energy inputs due to reduced shading. Riparian vegetation buffers filter sediment from upslope sources as well as stabilize stream banks from erosion. Increased sedimentation can change the geomorphology of stream channels to wider shallower profiles that allow for more efficient water heating and

increased stream temperatures. Nutrient input changes can also affect water quality and aquatic life habitat, by feeding algal blooms that can reduce available dissolved oxygen.

Riparian thinning treatments are designed by a BLM silviculturist to enhance resiliency and sustainability to promote species diversity and forest health objectives (BLM 1995, p. 26). The assumption is that a healthy resilient treated riparian timber stand would better recover from or withstand disturbances, would be more diverse and would therefore meet ACS objectives. Within these stands riparian thinning is expected to benefit perennial and intermittent streams, fish habitat, and habitat for other aquatic species by promoting species diversity and resiliency to disturbance in the riparian forest stands.

Ecological protection zones (EPZs) or "no-cut buffers" have been applied in all riparian zones to protect aquatic resources. Canopy cover in the RR would remain above 40% or 60% depending on the silvicultural prescription, therefore species diversity and forest health would be maintained. Activities in the RR would be designed to improve habitat conditions for the wildlife and plant species that use this zone in the long-term.

Disturbances that change riparian vegetation, increase the rate or amount of overland flow, decrease coarse wood or destabilize a stream bank may increase the rates of stream bank erosion and result in sedimentation increases. Disturbances that change runoff and erosion patterns in the uplands may also cause sedimentation and will be looked at by this analysis.

3.6.1 Affected Environment:

The PA is located in the Umpqua Basin, which comprises about 3.24 million acres; 90% of which is federal, state, and private forestland (2.92 million acres). For a general description of the Planning Area see Chapter 2: *Planning Area Overview*. Forest lands in the Umpqua Basin are generally recovering from drought conditions, settlement and a history of fire suppression and timber harvest that have impacted the vegetation in the PA, generally making it less-resilient to landscape disturbance (See Section 3.1.1 Affected Environment for Vegetation).

The West Fork Cow Creek Watershed is a fifth-field watershed in the Klamath Mountains province, located in southwest Oregon, approximately 20 miles northwest of Glendale. Elevation ranges from 1,000 feet (at the confluence with Cow Creek) to about 4,300 feet (Mt. Bolivar) (BLM 2004). Major tributaries to West Fork Cow Creek include Wilson, Gold Mountain, Elk Valley, Bobby, Panther, Wallace, Stanley, and Bear Creeks. The watershed has four 6th-field watersheds and 22 7th-field watersheds ranging in size from 600 acres to 6,000 acres. The watershed also includes a series of small frontal streams which drain directly into West Fork Cow Creek (BLM 1997).

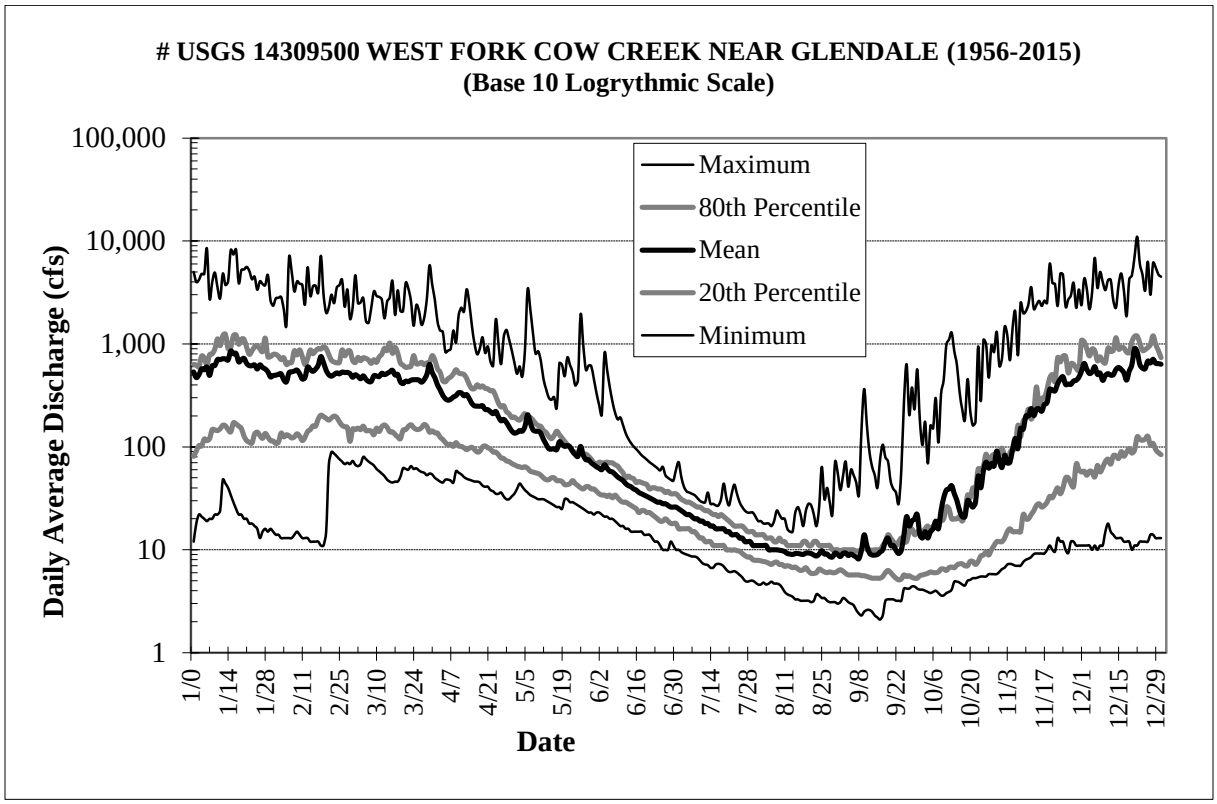
Aerial photos taken in 1953, prior to any major timber harvest on BLM land, show an extensively forested landscape. However, the photos also show areas in the Bear Creek drainage and on serpentine soil areas in Wilson Creek that had relatively sparse tree cover. There is also a history of fire activity with a very large fire from the 1940s in the Panther Creek vicinity. West Fork Cow Creek has been affected by timber harvest and associated road building – most of the private land has been logged as well as many acres of BLM. The first watershed analysis for the

area noted that past logging has adversely affected fish habitat, hydrologic functions, and late-successional habitat; and many streams are lacking in large down wood and shade (BLM 1997).

West Fork Cow Creek has a road density of approximately 4.7 miles per square mile and many of the roads have aging road surfacing and culverts. The road system is likely the largest source of accelerated erosion and sedimentation in the watershed (BLM 1997). Aggregated and natural surface roads are generally in fair condition with the exception of roads that have not been needed for some time. Many of the culverts have exceeded their life expediency of 25 years or will soon. There are many areas of active erosion on the private lands in the watershed from natural surface roads or unstable soils. In summary the road conditions are similar or worse that the Watershed Analysis done in 1997 as well as the conclusion that road conditions will probably decline or at least be maintained.

The seasonal pattern of precipitation does not supply much rainfall between May and September. As a result, stream recharge by ground water is limited during the summer months. Intense rainfall in localized storms can also occur any time, but storm events are more likely in the winter. This results in a hydrograph that peaks in the winter with snow and increased rainfall and shows no discernable snow-melt response (Figure 20).

Figure 20: Surface Water Stream Daily Average Statistics from USGS Data from West Fork Cow Creek near Glendale, OR from 1956 – 2015 (USGS 2016)



As can be seen from the hydrograph from the West Fork Cow Creek streamflow site near Glendale, Oregon (USGS 2016), maximum runoff events or peak flows from excessive rainfall

can occur anytime between November and May (Figure 20). According to USGS records major floods occurred in December 1965, January 1966 (11,000 cfs), and January 1971 (8,250 cfs).

The elevation breaks between the rain, transient snow and the seasonal snow zones for southern Oregon are 2,500 feet, 5,000 feet and >5,000 feet, respectively (Jefferson 2011). A large portion of West Fork Cow Creek is in the transient-snow zone (22,931 acres) and the majority is in the rain zone (32,944 acres). A very small portion of the watershed in the southwestern corner (22 acres) is in the seasonal snow zone.

Table 20: Hydrological Unit Code Boundaries within the Planning Area*

Subbasin (HUC 08)	Watershed (HUC 10)	Subwatersheds (HUC 12)	Subwatershed Tributaries
South Umpqua (HUC # 17100302)	West Fork Cow Creek (55,897 acres)	Wilson Creek (10,973 acres)	Black Creek, Grant Creek, Bear Creek, and Belmar Creek
		Gold Mountain Creek (16,387 acres)	Walker Creek, Wallace Creek, and Slide Creek
		Elk Valley Creek (14,675 acres)	Bobby Creek, Sweat Creek, and No Sweat Creek
		Bear Creek (13,860 acres)	Soldier Creek, Hayes Creek, Slotted Pen, Honeysuckle Creek, Goat Trail Creek, and Jacob Creek
* BLM managed acres in West Fork Cow Creek are 26,452 acres, of this 728 acres is managed by Roseburg BLM. There is also one section of Oregon State land (625 acres), 2,755 acres of Forest land and 25,282 of Private lands (mostly managed for timber harvest and 45% of the watershed) (BLM 2004).			

Riparian vegetation consisting of alder, maple, willows, and cottonwoods have been removed in the floodplains as a result of mining and past logging practices. Floods in 1964, 1974, and 1981 destroyed much of the riparian vegetation along the creeks (BLM 2004). Much of the riparian vegetation has likely recovered from past disturbance or is in the process of recovering.

A limited amount of placer mining has occurred within the watershed primarily above Walker Creek in the upper basin. Placer mining activities have altered and sorted the substrate of stream channels and changed the distribution of sediment vertically and latterly which changes the geomorphology of stream channels. The channels in the areas of active placer mining are likely to be unstable and will continue to erode until channel geomorphology returns to pre-disturbance conditions (BLM 2004).

Road surfacing on BLM roads within the watershed is presently in fair to good condition. The natural surface roads have a variety of surface conditions, with some stable and other eroding. Most private roads are natural surface and many are actively eroding. A major portion of the culverts in West Fork Cow Creek have already exceeded or are nearing their life expectancy of 25 years. An inventory of the location, condition, and size of road culverts within the watershed is currently in progress. This analysis is generally the same as what was reported in the Watershed Analysis done in 1997 as well as the conclusion that road conditions will probably decline or be maintained.

Water quality standards are set by the State of Oregon DEQ and approved by the EPA to achieve characteristics needed to support beneficial uses and values such as aquatic life or drinking

water. Water quality can be based on biological or physical properties in addition to chemical properties. Section 303(d) of the federal Clean Water Act requires states to periodically list waterbodies that do not meet water quality standards ("303(d) list").

Oregon's 2010 303(d) list was finalized in December 2012 and is the currently effective 303(d) list. This list has been reviewed for the PA for past decisions to anticipate potential water quality issues (Table 21). Oregon DEQ periodically reviews the status of water quality in the basins around Oregon.

Table 21: Summary table for 303(d) Listing Status for Stream Segments in the Planning Area (Oregon DEQ 2016).*

Stream or Lake Name	Parameter/ Criteria+	Season	Notes
Bear Creek	Temp. 17.8°C, 7-day max.	Summer	Delisted in 2010, TMDL is approved for salmonid fish spawning-rearing, resident fish and aquatic life
Bobby Creek	Temp. 17.8°C, 7-day max.	Summer	2012 status is Category 2: Obtaining Some Criteria
Elk Valley	Temp. 17.8°C, 7-day max.	Summer	Delisted in 2010, TMDL is approved for salmonid fish spawning-rearing, resident fish and aquatic life. Temperature is still a potential concern.
West Fork Cow Creek	Biological Criteria	Year Around	Cat 5: Water quality limited, 303(d) list, TMDL needed. EPA addition to 303(d) list in 2012 with no identification of the potential impairing pollutant.
West Fork Cow Creek	Flow Modification Habitat Modification Sedimentation Temperature	Year Around and Summer for Temp	Based on an assessment in 2002, delisted for temperature in 2010. Sediment is still a potential concern. Much of the creek is Cat. 3 with insufficient data for chemical parameters such as alkalinity and pH.
Slide Creek	Temp. 17.8°C, 7-day max.	Summer	Delisted in 2010, TMDL is approved for salmonid fish spawning-rearing, resident fish and aquatic life

* This list is not meant to be comprehensive, no segments in the PA are listed on the 303(d) list There are no lakes listed for West Fork Cow Creek.
+ Temperature is in degrees centigrade and represents the maximum temperature in the running average value of the daily maximum water temperature. pH is measure of acidity and alkalinity of a solution with 7 being neutral.

After reviewing the information available from 2010 and 2012 assessments, the most common water quality concerns in the PA is water temperature. Water temperature is critical for aquatic life success but also is an important variable (along with nutrients) in determining the availability of dissolved oxygen. Stream temperatures are based on summer high temperature conditions that can impact fish (e.g., the rolling 7 day average of the daily maximum temperature) for anadromous fish rearing (e.g., temperature exceeds 64 degrees). This temperature threshold also applies to the resident fish and other aquatic life. Some of the information from an assessment in 2012 indicates there is the potential for other water quality problems (i.e. flow or habitat modification and sedimentation).

West Fork Cow Creek was identified in 2012 for macroinvertebrates outside Marine Western Coastal Forest (MWCF) regional criteria. A habitat assessment showed a lack of woody debris in the channel and temperature and sediment are also of concern. There may be other water quality parameters that exceed standards, but there is insufficient data to address this issue.

The PA is in the area covered by the Umpqua Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) (Oregon DEQ 2006) approved by the US Environmental Protection Agency (EPA) in 2007. The WQMP identifies the Designated Management Agencies (local, state and federal government agencies with responsibility for addressing pollution problems), as well as proposed management strategies designed to meet the allocations in the TMDL sufficiency analysis. From this, or along with this WQMP, the BLM has developed WQRPs for the watersheds that include the PA (BLM 2004).

The Affected Environment includes streams that have probably historically and naturally exceeded DEQ standards for temperature. Maximum summer water temperatures have probably always been high, partly because the geology and West Fork Cow Creek which does not allow for a great degree of water storage, uplands are steep and soils are relatively shallow. As a result, recharge of streams by ground water is limited during summer months, causing seasonably low stream flow and high stream temperatures. Stream segments that naturally exceed DEQ standards due to geology or other factors are not considered impaired.

When considering stream temperature it is important to understand the spatial variability in stream temperatures due to surface and groundwater interactions. Oregon DEQ used Thermal Infrared Radiometry (TIR) to provide information for the 2007 Umpqua TMDL. The results showed that tributaries did not have a significant influence on basin scale temperature patterns and in general the South Umpqua is warmer than the North Umpqua. They found that most differences in temperature tend to be related to springs near or in stream channels, This information illustrates the spatial variability of stream temperatures and the importance of these springs as cold water refuge for fish species (Watershed Science 2003).

Both sedimentation and nutrients are generally elevated in the first 2 years after disturbances such as fire, timber harvest, and/or severe storm events, but tends to diminish as vegetation reestablish and precipitation approaches normal values. Some nutrient inputs to surface waters in forests result from erosion and increased surface runoff on public lands. Mining and forest management activities on private lands have also contributed to both sedimentation and nutrients to West Fork Cow Creek. Movement and transport of nutrients and sediment can be complicated by chemistry and physical features such as large woody debris, making downstream water quality a function of all activities in a given watershed.

Poor water quality is typically the result of several different combined factors. For example, nutrients can combine with high seasonal temperature conditions to reduce dissolved oxygen for aquatic life and impact drinking water quality. Also, increased sediment loads can lead to wider and shallower stream that have higher temperatures. An assessment of nutrients in the South Umpqua subbasin was done by USGS for 1990-1992 (USGS 1996). It found that many of the water-quality problems in the South Umpqua River Basin relate to low-flow and warm-weather conditions that generally occur from May through October.

BLM has developed a WQRP for the West Fork of Cow Creek (BLM 2004) to address TMDLs for Stream Temperature. These plans in general advocate the management of riparian areas to achieve ACS objectives as per the NWFP. Specific recommendations for Forest Management relevant to this project include silvicultural treatments designed to promote achievement of site potential hardwood and conifers and to minimize sedimentation with good road management.

When determining effects, it is important to consider that changes to stream conditions may be related to climate changes or may be the result of unrelated actions, making project specific effects difficult to differentiate from background conditions. A recent study in the Deschutes watershed was not able to detect any temperature response within a 35 year record of requiring riparian buffers for timber harvest. Improvements due to buffers may have been masked by warming climatic conditions (Reiter et al. 2015). Other studies have found logging, road construction, and changing forest and riparian management practices and natural hydrologic events (peak flows and associated mass soil movements) tend to obscure specific cause-and-effect relationships in stream temperature (Beschta and Taylor 1988). A study of 20 large watersheds found statistically significant changes in climate could obscure streamflow, nutrients, and total suspended solids loads in as much as 30-40% of study watersheds (Johnson et al. 2015).

To understand the spatial and temporal variability of stream temperature more directly, BLM is monitoring stream temperature at various sites and currently has over twelve monitoring sites that are active in or near West Fork Cow Creek. There are two AREMP monitoring sites; one on the mainstem of West Fork Cow Creek and one on East Fork of Elk Valley Creek. AREMP is a multi-agency effort to monitor the effectiveness of the NWFP.

BLM has maintained two long-term streamflow monitoring stations since 1998 in Bobby Creek. The East Fork of Bobby Creek is in a Research Natural Area (RNA) where timber harvest is restricted. Vegetation treatment is planned in the West Fork of Bobby Creek outside of the RNA. These watersheds, when paired with like watersheds where management activities will occur, will provide baseline information of the effects of management activities on water quality and quantity. Two long-term streamflow monitoring stations were established in East and West Fork of Elk Valley Creek to look at combined watershed effects in mixed ownership and stream restoration. An additional streamflow site was established on Panther Creek and a weather station and additional precipitation gauge was installed in the headwaters of these tributaries to West Fork Cow Creek. Data collected at sites includes precipitation and weather data, streamflow, water temperature, turbidity, water quality, macroinvertebrates, etc.

The PA is located in a West Fork Cow Creek a Key Watershed on BLM administered lands in the Matrix and Riparian Reserves Land Use Allocations. Stands in the matrix can be managed for timber and other commodity production, and to perform an important role in maintaining biodiversity. Riparian Reserves provide an area along all streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. Riparian reserves, matrix, and key watersheds all have specific management direction regarding how those lands are to be managed, including actions that are prohibited and descriptions of the conditions that should occur there. This management direction is known as “standards and guidelines”— the rules and limits governing actions, and the principles specifying the environmental conditions or levels to be achieved and maintained.

The Aquatic Conservation Strategy was developed as part of Standards and Guidelines to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. This conservation strategy employs several tactics to approach the goal of maintaining the "natural" disturbance regime (USFS/BLM 1995, p. B-11).

Key Watersheds contain the best habitat or those with the greatest potential for salmon recovery receive increased protection and the highest priority for restoration programs. BLM has joint restoration projects coordinated with Partnership for the Umpqua Rivers (PUR) to place course wood in stream channels and replace culverts that are an impediment to fish passage in the West Fork of Cow Creek. Riparian reserves, key watersheds, watershed analysis and watershed restoration are the four components of the Aquatic Conservation Strategy and all important to maintain and restore the productivity and resiliency of riparian and aquatic ecosystems in the West Fork of Cow Creek watershed.

3.6.2 Alternative 1 – No Action

Direct and Indirect Effects

Direct/Indirect Effects to Water Resources from the No-Action Alternative

Road use, road maintenance, silvicultural treatments, water source improvement and other activities would be expected to continue on BLM managed lands under the No Action Alternative (see Appendix C for specific actions). These activities are likely to contribute to baseline conditions with accelerated erosion increasing sedimentation and changes in hydrology related to storm response.

The majority of sediment movement in streams occurs with high intensity storm events, especially after disturbances such as wildfires or logging. Often this sediment is stored in the stream channels and floodplains and released downstream in subsequent peak flow events. Therefore, sediment input to stream channels is a result of both natural and anthropomorphic processes. Primary sediment sources include: episodic landslides and slumps usually associated with intense winter storms, hillslope erosion, stream bank erosion, roads, motorized recreation, mining, wildfires, and forest management activities. A primary driver in forest management to increases in sedimentation can be the result of poorly designed and/or poorly maintained forest roads (Wemple 2003).

Right of Way agreements with adjacent landowners would continue to allow private maintenance and use of existing roads on BLM administered lands under all alternatives. The PA has an established road system used for accessing private and public land. The development of this road system has resulted in current and past accelerated erosion and even properly maintained roads alter hillslope hydrology, by intersecting slow-moving subsurface groundwater and convert it to more rapid surface flow. Often this water is returned to the hillslope in relief culverts but in some cases may remain as surface runoff in drainage ditches.

Surface runoff can move rapidly through the ditch- culvert systems and if hydrologically connected to a stream, may be discharged directly into streams. Elevated precipitation and surface runoff leads to enhanced peak flows and reduction in water storage in the uplands (See cumulative effects section).

Roads contribute to stream sedimentation at different levels depending on: road design, surface type, depth and quality road surface aggregate, location of the road, position on the slope, fill material, underlying geology, maintenance frequency, condition near stream crossings, and moisture levels of road material during use. Paved roads in good condition generally produce minimal negative effects. Effects are more likely at stream crossings of aggregate and natural surface roads (Table 22).

Table 22: Number of Stream Crossing from Roads based on BLM GIS Data for all roads in the Planning Area

Stream Type	Bituminous or Paved	Aggregate Surface	Natural or Unknown Surface	Total
Ephemeral	4	41	18	63
Intermittent	67	452	449	968
Perennial	38	204	211	453
Fish Bearing	3	15	21	39
Total*	109	697	678	1,484
* Fish bearing are Presence Verified (PV) or Presence not Verified (PNV) perennial crossing and not included in the sum for the Total				

The condition of riparian areas, channel morphology, and hydrology can be affected by land use activities such as timber harvest or road use and maintenance, and may increase surface water temperatures in streams. Direct effects to elevated summertime stream temperatures may result from the following conditions (Oregon DEQ 2006):

- Riparian vegetation disturbance that reduces stream surface shading, riparian vegetation height, and riparian vegetation density;
- Channel widening (increased width to depth ratios) due to factors such as loss of riparian vegetation that increases the stream surface area exposed to energy processes, namely solar radiation;
- Changes in stream hydrographs that reduce baseflow conditions in the late summer due to increased surface run-off and peak-flows;
- Disconnected floodplains and reductions in wetland function which prevent/reduce groundwater discharge into streams;
- Increases in sedimentation that fills pools and reduces storage capacity in streams systems.

Nutrients contained in soils and forest litter may be transported to streams through near-stream erosion. While a certain amount of this erosion is natural, accelerated erosion resulting from silvicultural practices and road maintenance may increase nutrient loads above background conditions. Nutrient loads from these activities are most likely associated with roads and culverts that are hydrologically connected to stream systems. Under all alternatives private lands would continue to see timber harvest, and silvicultural practices and road maintenance would continue on BLM administered lands.

Cumulative Effects from the No-Action Alternative for Water Resources

The cumulative effects analysis area for considering potential downstream effects to water resources is the South Umpqua subbasin (17100302). Peak flow enhancement, water yield and changes in hillslope hydrology were considered for the West Fork Cow Creek watersheds, the Cold Elk PA, as well as the hydrology response zones.

Peak flow enhancement refers to a changing response (timing and/or magnitude) in the flow of a stream or river during a high flow event. Peak flows have the potential to alter stable stream channel morphology and cause stream bank erosion. Enhanced peak flows and changes in water yield are the result of all activities described in the soils cumulative section for the baseline conditions and can be evaluated by estimating ECA and roaded area by watershed.

Table 23: Equivalent Clearcut Area
ECA is based on Digitizing Canopy Openings based on 2014 Aerial Photography. Openings include other non-treed areas such as recent burn scars.

Analysis Area Name	Analysis Area (Acres)	ECA (Acres)	% Total
West Fork Cow Creek	55,897	4,908	12%
Cold Elk Planning Area	48,911	5,613	12%
Rain-Dominated Zone	32,944	3,545	11%
Rain-Snow Transition Zone	22,931	2,886	13%
BLM Lands in West Fork Cow Creek	27,200	522	2%

Clear-cuts on private lands have the potential for enhancing peak flows (No clear-cuts are proposed under this project on BLM lands). Grant et al. (2008) suggests that the mean response lines are a good predictor of enhanced peak flow from treatments in lower disturbance intensities and the magnitude of potential increases in peak flow generally decreases with the basin size.

Enhanced peak flows in rain-dominated and transient zones are not observed until the ECA plus any proposed treatment exceeds 29 or 15%, respectively (Grant et al. 2008). Only 22 acres of West Fork Cow Creek watershed are in the snow dominated zone. The rain-dominated zone in the West Fork of Cow Creek has only 11% of the area in ECA zones, which is not even half of the 29% threshold that would predict enhanced peak flows. The rain-snow transition zone has 13% of the land area in ECA and is closer to the 15% threshold. Based on this analysis, peak flows are not enhanced by ECA in the PA and would not be enhanced by this project due to canopy removal since all treatments prescriptions would leave at least 40% canopy cover after the harvest.

Roaded area was estimated by applying a 40 foot buffer to the existing road network.

Studies have found enhancement of peak flows can be attributable to changes in flow routing due to roads and in water balance due to treatment effects and vegetation succession (Jones and Grant 1996; Thomas and Megahan 1998). Within the West Fork of Cow Creek, there are approximately 408 miles of existing system roads, based on BLM GIS Data.

Table 24: Road Density and Estimated Road Disturbance of the Existing Road System in the Planning Area.

Analysis Area Name	Analysis Area (Acres)	Analysis Area (mi^2) *	Roads (mi)	Road Density (mi/mi^2)	Road Disturbance+ (Acres)	Percent Roaded Area
West Fork Cow Creek	55,897	87	408	4.69	1,971	3.5 %
Cold Elk Planning Area	48,911	76	362	4.76	1,774	3.6 %
BLM Lands in West Fork Cow Creek	27,200	43	184	4.28	889	3.3 %

* miles = mi
+ Assuming and average disturbance width of 30 feet, calculated in GIS with a 15ft buffer on all roads

Peak flow enhancement is generally more difficult to predict with larger watersheds (> 2,472 acres) and where there is seasonal variance (Grant et al. 2008). Road density is more likely to impact peak flows on small watersheds and impacts diminish with larger watersheds (Gucinski et al. 2001).

The roaded area was calculated for each of the 7th field HUCs in West Fork Cow Creek. The area of these 7th field HUCs are from 46 to 5,740 acres with the mean being 1,189 acres. The maximum percentage was West Fork Cow Creek below Bear Creek and above Jacob Creek, and this HUC has 6.5% roaded area. Some watersheds had 0% roaded area and the mean and median were 3.6%.

The current road density within the PA is approximately 4.76 mi/mi^2 (See Table 24). This road density is likely to be the same or decrease under the no-action alternative, since the basic road network is in place to harvest timber on both private and public lands. As harvest is completed, roads are often storm-proofed and if done properly are unlikely to contribute to peak flows in the future. Any new road construction is likely to be off-set by decommissioning of unused roads, or be so small as to not change the overall road densities in the analysis areas, which are roughly 5 mi/mi^2. The percentage of roaded area for each analysis area is estimated at about 3.5% (Table 24), well below 12%; which is the threshold that may result in observable increases of peak flow according to most studies (Ziemer 1981).

Peak flow enhancement and water yield increases are not identical, but both are influenced by canopy cover, ECA, and roaded area. Water yield refers to the total water produced from a watershed including base flows. Based on numerous paired watershed studies, water yield does not show a measurable increase until 20% of forest canopy is removed. Any measurable enhancement of peak flows evaporates 2-4 years after the initial disturbance as vegetation reestablishes and effective canopy and transpiration increase (Best et al. 2003). The ECA area predicts no measurable change in water yield for the West Fork of Cow Creek. The ECA was evaluated for 7th field HUCs and there were 5 of these HUCs that had over 20% ECA (Table 25).

No measureable difference in enhanced peak flows or annual water yield is expected for the ECA and in West Fork Cow Creek Watershed or the Cold Elk PA, no cumulative effects are expected under the no-action alternative to water yield and watershed response.

There are five subwatersheds (Table 25) that may be experiencing increased water yield and/or enhanced peak flows.

Table 25: Equivalent Clear-cut Area and 7th field HUCs

7th Field HUC Name	Hydro Region	Threshold	HUC Area (Acres)	ECA (Acres)	Percentage
Gold Mountain Creek	56% Rain 44% Transient	29% 19%	4,280	1,821	42.5%
Stanley Creek	56% Rain 44% Transient	29% 19%	1,583	476	30.0%
West Fork Cow Creek below Jacob Creek, above Cow Creek confluence	95% Rain 5% Transient	29% 19%	1,394	370	26.5%
Upper Elk Valley Creek	73% Rain 27% Transient	29% 19%	3,688	920	25.0%
West Fork Cow Creek below undefined point in 31s-10w-36 SE1/4 NW1/4, above Stanley Creek	49% Rain 51% Transient	29% 19%	4,433	948	21.4%

Cumulative Effects

The cumulative effects analysis area for water quality is the South Umpqua subbasin (HUC# 17100302), which has a WQMP (See EA Section 3.6.1: Affected Environment for Water Resources). The major concerns for water quality are nutrients, sediment, and water temperature. These can all be detrimental to the aquatic habitat of salmon species due to the production of algal blooms, loss of dissolved oxygen, high stream temperatures, and loss of physical habitat due to sedimentation. This also applies to the resident fish and other aquatic life, particularly resident cutthroat, which are present in PA streams.

The WQMP for the South Umpqua watershed indicates that maximum summer water temperatures have probably always exceeded the current DEQ standard in some locations. Dissolved oxygen levels and nutrient loading is impacted by upland watersheds such as West Fork Cow Creek, however climate variability, municipal water treatment systems, and industrial and agricultural sources of nutrients probably overshadow any impacts from headwaters from the PA lower in the Umpqua watershed.

3.6.3 Environmental Effects of Proposed Action Alternative 2

Direct and Indirect Effects

The purpose and need of this alternative is to produce wood volume at the present time, increase conifer growth rates for wood volume production in the future, and maintain/improve tree vigor of retained conifers and other vegetation while managing northern spotted owl habitat. Existing forest stand conditions demonstrate there is a need to treat in the West Fork Cow Creek watershed to improve forest resiliency and reduce the long-term risk of disturbances such as disease outbreaks or potential catastrophic wildfire.

The proposed forest management treatments and prescriptions are described in detail in Chapter 2: Alternatives: Alternative 2 (Proposed Action). The treatments are variable density thinning (VDT) and/or understory reduction (UR). Treatments would result in post-treatment canopy covers of 40 to 60% depending on the prescription (See Table 1: Proposed Treatment Summary Table).

Silvicultural treatments can occur in riparian areas and can be described as riparian thinning (20% of the proposed treatments). Riparian thinning has the same goals of promoting species diversity, forest health and improving resiliency to landscape disturbances with the primary goal to achieve ACS objectives. VDT and UR can achieve these goals by reducing competition for desirable species, reducing fuel loading, and putting forest stands on a trajectory to achieve complexity of age and structure.

No treatment is proposed in riparian stands that are meeting Aquatic Conservation Service (ACS) objectives, ACS objectives address the physical integrity of the aquatic system, sediment and in streamflow, floodplain characteristics, health of wetland and riparian systems. Activities that are intended to enhance RR characteristics and attain ACS objectives are authorized under the NWFP following completion of a Watershed Analysis (USFS/BLM 1995, pp. C31-C32).

Yarding of the thinned timber thinned with VDT would be done with suspension systems, helicopter yarding, or ground based yarding. Some units will have only UR and would not have the need for yarding. Effects from yarding timber are described based on the yarding method that is anticipated for each unit (tractor, cable, or helicopter). There can be some cable yarding that would happen in units that are tractor yarded, this would involve track based mobile yarder (sometimes called a yoder) to a high spot and using a skidder to move the logs to the loading area. Typically this will be one end suspension and whole tree, reducing damage to soils from log ends.

As described earlier, EPZs have been employed to avoid adverse effects to aquatic values. For VDT these EPZ buffers are generally 120 feet for perennial streams and 50 feet for intermittent streams. Yarding would not happen extensively in these areas and trees would be generally felled away from these areas. The EPZs for UR are 50 feet for perennial and 25 feet for intermittent streams. No mechanical equipment is needed for UR, this is achieved with hand crews and would not remove trees that are more than 8-inches DBH. As can be seen from the following literature review these buffers are designed based on the best science available to protect and maintain aquatic habitat and function.

A 50 foot no commercial treatment buffer applied to intermittent stream channels is designed to protect the root network of typical trees in this area, reduce potential impacts to hydric soils, and avoid sedimentation. One study found that 95% of the erosion features from timber harvest 32.8 feet from streams delivered no sediment to stream channels (Rashin et al. 2006). In addition to the stabilizing effect of the root network, adjacent trees also dissipate stream energy during high or overbank flows, further reducing bank erosion. Studies have shown that “vegetation immediately adjacent to the stream channel is most important in maintaining bank integrity” (Forest Ecosystem Managment Assessment Team 1993).

A 120 foot no commercial treatment buffer applied to perennial stream channels, exceed the

minimum distance needed to protect the primary shade zone of streams (ICS 2013). Based on a study conducted on the Rogue River Siskiyou National Forest in 2006 a no-cut buffer of 60 feet was found to be effective in maintaining the Angular Canopy Density and therefore the effective stream shade (USFS/BLM 2012). Near-stream microclimate gradients appear to be topographically controlled. Density management or thinning beyond 15 meters (50 feet) does not measurably affect microclimate (USFS/BLM 2012).

A 120 foot no commercial treatment buffer applied to perennial stream channels, should be protective of the primary zone for wood recruitment. Empirical and modeling studies suggest that stream wood input rates decline with distance from the stream and the majority of in-channel wood recruitment comes from within 120 feet of the stream channel (ICS 2013).

Soil disturbance to build landings, skid trails and for temporary roads is estimated to be 148 acres, based on logging systems predicted by a BLM Forester (See Methods Section). Actual locations and amounts of disturbance may be different during implementation, but should not vary in scope.

- **VDT with Cable Yarding (Suspension Logging Systems)** *(31.5 acres of surface disturbance for landings in unit and roadside with more than two corridors)*

  The amount of harvest will be determined by the prescription and would include yarding corridors and landings where trees will be delimbed and stacked to be loaded on haul trucks. As required by BMPs, the use of existing disturbance (old landings or roads) will occur to the maximum extent possible; therefore, the entire disturbance assumed would not necessarily be new disturbance.

- **VDT with Helicopter Yarding** *(15.3 acres)*

  In general, helicopters need larger areas for landings, but do not require yarding corridors. These same units may include understory reduction at some time in the future. Half of these landings will likely be located on private lands. The typical configuration is a service landing (1/2 acre) and a loading landing (1 acre).

- **VDT with Ground Based Equipment** *(73.5 acres for skid trails and 10.5 acres for landings)*

  This activity would require landings, skid trails and the use of temporary roads. Understory reduction may occur in these units at some time in the future.

- **Understory Reduction** (0 acres)

  This activity does not need hauling and would involve the use of passenger vehicles and ground crews. Therefore no specific locations for disturbance are assumed. Piles made by the removal of less than 8-inch DBH material would be burned in the winter and would result in soil disturbance at the location of the burn piles.

The percentage of RR in each unit is 46%, of this area a portion is in EPZs and will not have commercial treatment (26% of the units). Proposed commercial treatment in RR is estimated to be 805 acres, which is 20% of the acreage for all the units.

Ecological Protection Zones (EPZs) were utilized for VDT that varies from 50 feet to 120 feet depending on the feature; they are roughly 22% of the unit acre totals. Only Understory Reduction (UR) will occur in EPZs, and will have a 50 foot buffer for perennial streams and a 25 foot buffer for intermittent streams of no treatment. The total acres of UR proposed for this project in the RR is 695 acres. Stream buffers intercept and filter sediment from upslope erosion sites, so long as drainage is not concentrated in gullies, channels, or cable-yarding and skid trails.

A 100 foot EPZ buffer has been utilized to protect wetland and spring features, identified with field work. Seeps would be protected with a 25 foot buffer. These buffers are designed to protect the root network of typical trees in this area, reduce erosion, direct impacts to wetlands, potential impacts to hydric soils, and avoid sedimentation.

Direct/Indirect Effects to Water Resources from the Proposed Action (Alternative 2)

Roads occupy 3.6% of the watershed area on a landscape scale (Roaded Area, see Table 24). Roaded area was also calculated for 7th field HUCs and the maximum percentage of roaded area was 6.5% for West Fork Cow Creek below Bear Creek and above Jacob Creek. No new permanent roads would be built and all temporary routes would be fully-decommissioned, therefore there would be no long-term increase in road density under this alternative. There would be a slight increase in roaded area during harvest (about 0.5% in the West Fork of Cow Creek); however, the total roaded area for the project area would still be below 4%, and therefore not expected to result in any measureable change in effects beyond baseline conditions. The water quality restoration plan for West Fork Cow Creek as with the policy for Key Watersheds describes a goal of being below 3 mi/mi^2 for road density for sub-watersheds (BLM 2004, p. 29). This density would likely require changes in reciprocal ROW agreements or partnerships with private land owners in the checkerboard ownership patterns to be successful on a landscape scale.

Increases in peak flow have not been found in most paired-watershed studies until roads and other impermeable areas occupied more than 12% of the watershed (Ziemer 1981). Harvest activities would add an estimated maximum of 148 acres to the ECA area during the short-term (1-2) years, but with successful reclamation no long-term increase in the ECA area would occur. The percentages of ECA in the West Fork of Cow Creek would not exceed the 19% or 29% thresholds described for rain-on-snow or rain dominated systems with the additional disturbance (See Section 3.6.2: Effects from No-Action Alternative). Therefore, effects to peak flows are expected to be indistinguishable from background conditions described for the no-action alternative.

BLM has identified Best Management Practices (BMPs) for the protection of water quality under the Clean Water Act in Section 2.3, BMPs are specific to this project and the management actions proposed under the action alternatives. The BLM also developed and implements a WQRP that includes the West Fork of Cow Creek (BLM 2004). Specific passive and active restoration goals are described for Federal Lands and have been incorporated into the project

design. This approach is in conformance with Designated Management Agencies' (DMA) plans as described in the Umpqua WQMP.

Direct and Indirect Effects to Water Resources Common to all Treatments – As discussed in the no-action alternative, the primary effect of the existing road network is the interception of shallow groundwater flow and concentration of subsurface flow in drainage ditches. When drainage ditches have adequate relief culverts or the road is out-sloped, water in drainage ditches has an opportunity to infiltrate into hillslope soils. However, when drainages are routed to cross drains placed in drainages or when cross-drains are inadequate road ditches can become an extension of the natural drainage density and result in effects to water yield or contribute changes in runoff response to storms. A direct effect from the proposed action will be the maintenance and use of this existing road system.

Hydrologic effects of roads and other disturbance are strongly influenced by landscape condition, road design and construction, and storm history. Hydrologically-connected disturbance from roads, trails, landings, and logging corridors have the potential for adverse effects, including sedimentation, surface and groundwater dynamics and changes in flow characteristics (Furniss et al. 2013). Primary linkages that provide this hydrological connection are ditches draining to road-stream crossings and ditches draining to gullies below cross-drains. These can be identified with LiDAR using Geographical Information Systems (GIS). Each treatment unit was evaluated for these connectors that would drain proposed ground disturbance, suspension corridors, and sections of haul routes to stream systems that could transport sediment (Table 27).

Haul routes have been evaluated to determine which road segments may be hydrologically connected to perennial streams. Ten crossings of fish bearing streams on proposed haul routes off of paved roads would be used to haul timber. A total of 218 perennial stream crossings would be used to haul timber with the potential for sediment transportation to surface water. Proper road maintenance, BMPs (See BMPs and PDFs in Section 2.3), and good project administration should reduce the risk of this source being above background conditions for sediment delivery to surface waters.

Table 26: Number of Stream Crossings based on BLM GIS Data for Identified Haul Routes to be used for the Proposed Action

Stream Type	Bituminous and Paved	Aggregate Surface	Grid Rolled	Pit Run	Natural Improved and Unknown	Total
Ephemeral	11	28	18	32	38	127
Intermittent	53	155	32	79	59	378
Perennial	35	84	30	37	32	218
Fish Bearing	3	3	1	1	2	10
Total*	99	267	80	148	129	**723**
* Fish bearing are Presence Verified (PV) or Presence not Verified (PNV) perennial crossing and not included in the sum for the Total						

Small pulses of sediment at stream crossings and hydrologically connected surface disturbances would likely occur during seasonal rain events. These sediment pulses have the potential to briefly increase turbidity, but the amounts are not likely to exceed levels from naturally

occurring erosion and runoff. Intense localized thunderstorms (micro-bursts) may cause more extensive erosion and even debris flows. If an intense storm event happens to occur 1-2 years after treatments, the magnitude of sediment and timber debris would likely be elevated in treated areas relative to untreated areas. However, since the magnitude of increased peak flows due to forest harvest diminishes as peak flows increase in intensity (Jones and Grant 1996) this elevated response would not likely be measurable.

BMPs would be employed for surface disturbance in areas with the potential for transporting sediment to streams. Maintenance activities may include adding cross-drains to inside road ditches to divert surface flow to stable soils and vegetation to re-infiltrate. In some locations sediment basins may be installed to settle out sediment before important stream crossings. More than likely BMPs and EPZ buffers would be effective and no observable increases in sedimentation or turbidly in surface waters would occur. Increases in sediment delivery would likely be indistinguishable from background levels.

Table 27: Units with roads, culverts and/or logging systems that are hydrologically connected to perennial waters

Units or Haul Routes	Description of Hydrologically Connected Activities to Perennial Surface Waters[+]	Stream System (See Table 20)
Road 31-8-31.0 Elk Valley Road	Seven crossing with connected inside ditches.	Elk Valley Creek
Unit 13-02	Ground-based harvest with skid trails and drainage that may be connected to perennial surface waters.	Elk Valley Creek
Unit 13-09	Ground-based harvest with skid trails and drainage that may be connected to perennial surface waters.	Elk Valley Creek
Road 31-08-30 East Fork Elk Valley	There are seven crossing on perennial streams with connected inside ditches.	Elk Valley Creek
Road 31-09-25.3 East Fork Elk Valley	There are two crossing on perennial streams with connected inside ditches.	Elk Valley Creek
Units 19-03, 19-06, 19-08, and 19-09	Ground-based harvest with skid trails and drainage that may be connected to perennial surface waters.	Elk Valley Creek
Unit 20-04	The locations of suspension corridors are likely to be perpendicular to perennial streams.	Elk Valley Creek
Road 32-09-2.0 Switch Finger	There are two crossing on perennial streams with connected inside ditches.	Elk Valley Creek
Road 31-9-35.1 Finger Creek	There are two crossing on perennial streams with connected inside ditches.	Elk Valley Creek
Unit 02-01B, 08-03	Ground-based harvest with skid trails and drainage that may be connected to perennial surface waters.	Elk Valley Creek
Road 31-09-12.0 Elk Valley Road	Four crossing on perennial streams with connected inside ditches.	Elk Valley Creek
Unit 07-03	The locations of suspension corridors are likely to be perpendicular to perennial streams.	Elk Valley Creek
Road 31-08-31.1 Hayes Creek	There are five crossing on perennial streams with connected inside ditches.	Bear Creek
Units 29-04, 20-05, 29-05	The locations of suspension corridors are likely to be perpendicular to perennial streams.	Bear Creek

Units or Haul Routes	Description of Hydrologically Connected Activities to Perennial Surface Waters[+]	Stream System (See Table 20)
Road 32-08-4.2 Honeysuckle Spur	One crossing on perennial streams with connected inside ditches.	Bear Creek
Road 32-08-10.2 Honeysuckle	Four crossing on perennial streams with connected inside ditches.	Bear Creek
Units 09-01, 33-07 and 33-08	The locations of suspension corridors are likely to be perpendicular to perennial streams.	Bear Creek
Unit 03-14	Ground-based harvest with skid trails and drainage that may be connected to perennial surface waters.	Bear Creek
Road 31-9-10.1 Panther Creek Spur	Nine crossing on perennial streams with connected inside ditches.	Panther Creek
Unit 15-19	The locations of suspension corridors are likely to be perpendicular to perennial streams.	Panther Creek
Road 31-9-26 Panther Peak Rd.	Four crossing on perennial streams with connected inside ditches.	Gold Mountain Creek
Unit 23-04	The locations of suspension corridors are likely to be perpendicular to perennial streams.	Gold Mountain Creek
Road 31-9-12.0 Walker Prairie Road	There are two crossing on perennial streams with connected inside ditches.	Gold Mountain Creek
Units 03-05 and 03-08	The locations of suspension corridors are likely to be perpendicular to perennial streams.	Gold Mountain Creek
Road 31-9-35.0 Walker Prairie Road	There are five crossing on perennial streams with connected inside ditches.	Gold Mountain Creek
Units 09-05, 10-05, 16-02	Ground-based harvest with skid trails and drainage that may be connected to perennial surface waters.	Gold Mountain Creek
Road 32-9-10.0 Middle Walker Creek	There are seven crossings on perennial stream that will be used by this road. LiDAR indicates the inside ditches are connected to these streams.	Gold Mountain Creek
Unit 05-06	The locations of suspension corridors are likely to be perpendicular to perennial streams.	Gold Mountain Creek
Road 32-9-4 Walker Creek Spur	There are four crossings on perennial stream that will be used by this road. LiDAR indicates the inside ditches are connected to these streams.	Gold Mountain Creek
Road 32-9-9.1 Middle Walker Spur	There are seven crossings on perennial stream that will be used by this road. LiDAR indicates the inside ditches are connected to these streams.	Gold Mountain Creek
Units 08-05, 08-07	The locations of suspension corridors are likely to be perpendicular to perennial streams.	
Road 32-9-7.0 Wilson Creek	Four crossing with connected inside ditches.	East Fork West Fork Cow Creek
Units 07-28, 18-01, and 18-07	The locations of suspension corridors are likely to be perpendicular to perennial streams.	East Fork West Fork Cow Creek
Road 32-9-7.2 Wilson Head P	Four crossing on perennial streams with connected inside ditches.	East Fork West Fork Cow Creek
Unit 07-07	The locations of suspension corridors are likely to be perpendicular to perennial streams.	East Fork West Fork Cow Creek
Road 32-9-7.1 Wilson Head	Four crossing on perennial streams with connected inside ditches.	Bear Creek
Unit 01-11	The locations of suspension corridors are likely to be perpendicular to a perennial stream.	Bear Creek
Road 32-9-10	There are three crossings on perennial streams that will be used by	Slide Creek

Units or Haul Routes	Description of Hydrologically Connected Activities to Perennial Surface Waters[+]	Stream System (See Table 20)
Middle Walker Crk	this road and there may be a new crossing.	
Unit 08-04	The locations of suspension corridors are likely to be perpendicular to a perennial stream.	Slide Creek
Road 32-9-16.1 Wallace Creek	There are seven crossings on perennial stream that will be used by this road. LiDAR indicates the inside ditches are connected to these streams.	Walker Creek
[+] Hydrologically connected means any road segment that has a continuous surface flow path between any part of the road prism and a natural stream channel. (Furniss, Flanagan and McFadin 2013).		

Proposed haul roads with an aggregate surface generally have fair to good surface conditions (see Affected Environment). Some roads have aggregate that includes pit run or is grid rolled. Roads may have adequate drainage features or they may require maintenance to bring them up to standards (214 miles). Properly maintained roads would be expected to have low levels of erosion unless utilized for hauling under wet conditions. Prior approval from the authorized officer would be required for wet season use of rocked roads (generally October 15 – May 15). Proposed haul roads with a natural surface tend to have weak soil bases vulnerable to excessive erosion, but aggregate roads where the surface has deteriorated can exhibit similar effects.

Approximately 214 miles of haul routes were identified for possible maintenance/renovation. Maintenance/renovation would restore a proper road shape, restore drainage features, restore road surfacing and maintain ditchlines. Restoring road shape would include providing a slope to shed water from the road surface; proper designs include outsloped or an insloped road with grade breaks or crowned and ditched. Restoring drainage features may include: rolling dip structures, building new rolling dip features, installing culverts for cross drains to drain inside ditches, and culverts for crossing surface flow paths. Restoring road surfacing would include adding material depending on soil properties and depending on design, gravel, and aggregate would provide a good travel surface.

There are some locations were culverts are failing. In some cases they would be replaced; in other cases, they would not be replaced if hauling is still possible. Culvert failure can cause road damage, erosion, and sedimentation (when the culvert is hydrologically connected to perennial water).

In some cases pit run may be applied to improve the stability of the aggregate or grid rolled surface, which tends to reduce the potential for sedimentation. If road surfaces and drainage features deteriorate, applied aggregate can contribute to sedimentation instead of preventing it.

Properly functioning ditchlines with adequate water movement and little scour may have brush removed but would not be mechanically cleaned. In areas without properly functioning ditchlines, mechanical treatment during the dry season would occur to restore the function of the ditch for road drainage. Mechanical treatment would include using a backhoe, excavator, or road grader to reshape the ditch. If accumulated sediment needs to be removed it would be hauled to a stable location not hydrologically connected to the stream system. Maintenance activities should occur in the dry season or during dry conditions in the wet season (October 15 – May 15).

Timber hauling from treatment areas is likely to contribute to sedimentation in localized areas along haul routes. One research study found that roads contribute sediment at 7.5 times the rate

with heavy traffic (defined as more than four loaded logging trucks per day) as days when there is no traffic or little traffic with light vehicles on the weekends (Reid and Dunne 1984).

For this sediment to be transported to perennial surface waters it needs to come from roads with ditches that are hydrologically connected to surface waters. Of the proposed haul routes, there are 645 stream crossings and of these there are 215 perennial stream crossings. These crossings have the potential for sediment delivery to surface waters from the use of the road system. BMPs and good road maintenance are likely to reduce the potential for sedimentation due to timber hauling; the magnitude of sedimentation is unlikely be detectable above effects described for the no action alternative.

Timber hauling during the wet or dry season would be stopped when road surfaces become saturated and extensive rutting and ribboning of the road surface occurs. Haul would continue only after roads dry out.

The likelihood of increases to peak flow as a result of proposed actions would be low (Grant et al. 2008), since road density within the PA will be almost identical to pre-disturbance condition (this project will add 27.6 acres of short-term disturbance as compared to 1,774 acres of estimated road disturbance in the PA for the existing road system). Normal road use can lead to deteriorating conditions including localized failures due to concentrated surface runoff. Proper road maintenance would be required, including unclogging culverts during the wet season or rebuilding failing road segments. Road failure could result in increased sediment, but transportation of this sediment to perennial waters is unlikely due to lack of hydrologically connected road segments for this project (Table 27).

UR would occur on approximately 695 acres. On 170 acres UR would be the only treatment, but in other areas UR would occur 1-5 years after treatments as weather and budgets allow. UR would include hand crews with chainsaws cutting trees less than 8-inches DBH and hand piling. Plastic would typically be placed near the top to keep handpiles dry while burned under high moisture conditions in the winter. Soil heating under piles would occur, but due to the high soil moisture, effects are not likely to persist more than 1-2 years.

Although temporary spur roads would be fully-decommissioned, reciprocal ROW holders might improve and use again in the future for harvest. Road density is more likely to impact peak flows on small watersheds than with larger watersheds (Gucinski et al. 2001). Since roads occupy only 5% of each watershed area, they are not expected to cause changes in peak flow response. Harvest activities would add an estimated 148 acres of new disturbance to the ECA area during the short-term (1-2) years, but with successful reclamation no increase in the long-term ECA area would occur. With this additional acreage the percentages of ECA in West Fork Cow Creek (12%) would not exceed the 19% or 29% thresholds described for transient-snow or rain dominated systems described earlier with this additional short-term disturbance.

NWFP recommends that silvicultural practices in these areas should be used to control tree stocking rates in forest stands, reestablish and manage stands, and acquire desired vegetation characteristics. These measures should be applied to achieve ACS objectives. For a stream with a given surface area and stream flow, any increase in the amount of heat entering a stream from solar radiation will have a proportional increase in stream temperature. Solar radiation is the

most important radiant energy source for the heating of streams during daytime conditions and therefore has a strong relationship to seasonal variability of daylight (Beschta and Taylor 1988). Stream shading reduces radiant energy from solar radiation. The primary shade zone is the vegetation that shades the stream during the warmest part of the day (10 am - 2 pm), and therefore most responsible for increases in stream temperature (USFS/BLM 2012).

Changes in bedload that alter channel morphology result from sediment input that exceeds stream transport capability. Sediment deposition can cause channel filling, thereby increasing the width-depth ratio. An increase in channel width can increase the amount of solar radiation entering a stream, thereby heating up faster than a narrow, deeper stream with the same discharge. Sediment input associated with both storm events and management-related activities can increase sediment over natural background levels and contribute to channel widening and subsequent stream temperature increases.

Harvest in riparian areas should enhance the growth of large conifers; in older riparian stands that are unnaturally overstocked (due to fire suppression, planting, and past timber harvest) such harvest should reduce the fire hazard and loss of ecological function. The NWFP recommends these treatments be focused on previously harvested dense stands, unnaturally dense stands of mid- to late-seral trees along wide valley channels or steep ground that are at elevated risk of catastrophic fires and loss of ecological function, or in under-stocked stands that would provide the greatest benefit to streams with severe water temperature problems.

The NWFP directs forest management in Southern Oregon to comply with TMDLs for stream temperature to meet ACS objectives. This can be achieved by designing silvicultural prescription practices that meet ACS objectives (USFS/BLM 2012). The thinning prescriptions described in the Proposed Action are designed to improve forest health and resiliency to disturbances such as fire, drought and insects. This is accomplished by reducing canopy density and improving stand health and diversity.

Studies of pollen found in natural lake sediments indicate that Oregon forests are generally resilient to disturbance. Shade tolerant species in riparian reserves generally maintain their abundance even through periods of drought, severe fire, and moderate erosion events (Colombarolia and Gavina 2010). This resiliency in the West Fork Cow Creek watershed has likely been reduced by road building, logging, and major floods.

Riparian vegetation consisting of alder, maple, willows and cottonwoods have been removed in the floodplains as a result of mining and past logging practices. Floods in 1964, 1974, and 1981 destroyed much of the riparian vegetation along the creeks (Geyer 2003). Much of the riparian vegetation has likely recovered from past disturbance or is in the process of recovering.

Vegetation and hillslope stability of areas with a legacy of logging, recent flooding and severe erosion will likely remain sensitive to subsequent severe fire events for the foreseeable future. Therefore, in some locations fuel reduction in riparian reserves may be necessary to improve the resiliency of these modified stands.

Treating thin but uniform stands can also provide gaps and diversity in stand characteristics. This non-uniformity can have benefits for wildlife, but can also help make timber stands more

resilient to disturbances such as wildfire, insects, or diseases. This improved forest health has benefit for meeting ACS objectives by reducing the likelihood of catastrophic disturbances in riparian reserves.

Objectives for achieving the ACS for the NWFP include maintaining and restoring the composition and structural diversity of plant species, water quality chemistry, flow conditions, physical integrity of stream systems, and aquatic habitats. In some cases this means leaving refugia intact, but in other cases it means active management to restore disturbed systems such as former timber plantations.

As described in (Chapter 1: Riparian Treatments Section) treatments will occur in the riparian reserves when a silviculturist has determined the stand would likely better achieve the LSR objectives with the proposed treatment. Of the 24,820 acres of riparian reserves in the PA, 2,864 acres are proposed for treatment. Treatments (Thinning and/or UR) would be the same in these areas down to the EPZs that have been removed from unit boundaries.

An EPZ buffer of 120 feet is expected to fully protect the primary shade zones for trees 100 feet or taller on hillslopes up to 60% (USFS/BLM 2012, p. 29). In addition to shade, temperatures in the area around the stream form a micro-climate zone that can have significantly lower air temperatures than the surrounding forest, important for maintaining stream temperatures. This micro-climate zone has been estimated at 50 feet.

Site potential tree height for the West Fork Cow Creek is 210 feet; therefore, the 120 foot buffer is expected to fully protect the primary shade zone and micro-climate in riparian areas in the PA.

Thinning in the riparian corridors outside of the 120-foot buffer is expected to reduce some shading during cooler parts of the day. However, healthy riparian stands are more likely to successfully withstand disturbance and provide stability and shade to stream systems. Thinning treatments in the secondary shade zone therefore should improve the ability of the riparian stand to provide long-term shade. Effects from thinning in the secondary zone has a dramatically less impact to stream temperature than does thinning in the primary zone (USFS/BLM 2012, p. 31).

Thinning and UR treatments in the Proposed Action account for 5% of the riparian reserve on BLM managed lands in the West Fork of Cow Creek. Riparian thinning in the secondary shade zones, 120 feet from the stream is unlikely to result in a measureable change in stream temperatures due to the small amount of treatment proposed and the protection of the primary shade zone.

Coarse woody debris is important for maintaining the proper function of stream systems in southern Oregon. Coarse wood provides channel complexity, captures sediment, and creates pools and waterfalls. In addition to oxygenating water, water retention and cycling in and out of the alluvial aquifer cools water and improves water quality. The physical and chemical benefits of coarse wood improve conditions for aquatic life including salmonids. Large woody debris is often more stable and less likely to migrate downstream with flood flows, but moderate and small diameter wood can often provide the same benefits to stream channels.

Coarse wood in streams is primarily recruited through near-stream inputs (e.g. tree mortality and bank erosion) and landslides and debris flows. Empirical studies indicate that 95% of total instream wood (from near-stream sources) comes from distances of 82 to 148 feet (ICS 2013).

For near-stream riparian inputs, empirical and modeling studies suggest that stream wood input rates decline exponentially with distance from the stream and vary by stand type and age (ICS 2013). The Interagency Coordinating Subcommittee (ICS) report compared studies and showed that 90 to 100% of the wood recruitment came from with 35 meters of the stream. A no treatment buffer of 120 feet (36.6 meters) would likely retain at least 95% of the wood available for recruitment to the stream from stands that have been harvested in the past (ICS 2013, p. 31). Treatment of old-growth stands is not proposed under any of the alternatives and a 120 foot buffer on perennial streams was selected to protect this wood recruitment zone.

Coarse wood input benefits water quality by reducing stream temperature, increasing dissolved oxygen, and retaining nutrients and sediments in the physical complexity created by coarse wood.

Intermittent streams contribute sediment to perennial systems, primarily during the wet season. However, perennial streams have the ability to transport sediment year round. Definitions for stream types can vary; however the 1995 RMP specifies that stream channels with "ephemeral" flow conditions are intermittent streams if they show signs of annual scour or deposition (BLM 1995, p. 27). This definition recognizes that these channels may convey sediment to perennial surface waters on an annual basis. Often sediment deposits in these intermittent streams do not make it to perennial streams but are deposited on the surface below subsurface pipes or below areas of erosion in the channel. This sediment is stored for either a more intense localized storm or rain-on-snow event or may move a few yards a year taking many years to reach the perennial stream system.

Units with VDT using Helicopter Yarding (170 Acres) – Thinning with helicopters involves hand crews to fell the trees and attach them to the helicopter cable. Very little disturbance is expected to soils and no effects to water resources are expected beyond those described that are common to all. Direct effects at helicopter landings and road use for timber haul are expected. Of the 35 landings anticipated for supporting helicopter yarding 21 will be for loading logs and 14 will be for servicing helicopters. Of the landings, 24 are expected to be located on BLM Administered lands and 11 will be on private lands.

Unit Specific Effects from Helicopter Landings

Landing Location	Unit Specific Effects*
T31S-R09W Sect. 15 1 for hauling, 1 for service	Both of these landings are located in previous disturbance and are designed to service Unit 15-19.
T31S-R09W Sect. 11 1 for hauling, 1 for service	Both of these landings are located in previous disturbance These landings are designed to serve unit 13-10.

Landing Location	Unit Specific Effects*
T31S-R09W Sect. 23 1 for hauling, 1 for service	Two landings with no visible disturbance at either site, are designed to serve unit 23-38 .
T31S-R09W Sect. 23 1 for hauling, 1 for service	Both of these landings are located in previous disturbance These landings are designed to serve unit 27-01.
T31S-R09W Sect. 23	Landing in existing disturbance designed to serve unit 23-13.
T31S-R08W Sect. 19	Landing in existing disturbance are designed to serve unit 19-06.
T31S-R08W Sect. 15	Landing in existing disturbance, this landing are designed to serve unit 11-6 and 15-19.
T32S-R04W Sect. 23	Landing in existing disturbance, are designed to serve unit 23-10.

VDT with Ground Based Equipment (610 Acres) – Localized erosion within units would persist on skid trails until vegetation became re-established. Vegetative buffers adjacent to and below units would capture and filter sediment from reaching ditches and/or streams at a level that would be similar to that which would occur naturally. In areas where ground based activities allowed sediment to reach road drainage ditches, site specific use of PDFs such as placement of straw bales and/or silt fences would be employed. Table 27 identifies the ground-based units that have the potential for sediment delivery to surface waters. Within these units, temporary routes, landings, hydrologically connected corridors/ skid trails, and other areas of exposed soils that are not already reclaimed or decommissioned would be winterized prior to October 15; skid trails in the riparian reserve would be scarified, seeded, water barred, mulched, and blocked.

VDT with Ground Based Equipment and Cable (2,006 Acres) – Localized erosion within units would persist on skid trails until vegetation became re-established. Vegetative buffers adjacent to and below units would capture and filter sediment from reaching ditches and/or streams at a level that would be similar to that which would occur naturally. In areas where ground based activities allowed sediment to reach road drainage ditches, site specific use of PDFs such as placement of straw bales and/or silt fences would be employed. Table 27 identifies the ground-based units that have the potential for sediment delivery to surface waters. Within these units, temporary routes, landings, hydrologically connected corridors/ skid trails, and other areas of exposed soils that are not already reclaimed or decommissioned would be winterized prior to October 15, skid trails in the riparian reserve would be scarified, seeded, water barred, mulched, and blocked.

VDT with Ground Based, Cable Yarding and or Helicopter (170 Acres) – Localized erosion within units would persist on skid trails until vegetation re-establishes. Vegetative buffers adjacent to and below units would capture and filter sediment from reaching ditches and/or

streams at a level that would be similar to that occurring naturally. In areas where ground based activities allowed sediment to reach road drainage ditches, site specific PDFs such as placement of straw bales and/or silt fences would be employed. Table 27 identifies the ground-based units that have the potential for sediment delivery to surface waters. Within these units, temporary routes, landings, hydrologically connected corridors/ skid trails, and other areas of exposed soils that are not already reclaimed or decommissioned would be winterized prior to October 15; skid trails in the riparian reserve would be scarified, seeded, water barred, mulched, and blocked.

VDT with Ground Based Equipment (407 and 170 Acres) – Most impacts are expected in constructing landings, concentrated disturbance around landings and temporary road construction.

Disease Management (4 acres) – Treatment of laminated root-rot would occur off BLM road 31-8-31.0 and will require the removal of all would remove Douglas-fir and white fir, followed by a subsequent planting of conifer species resistant to infection damage. Removal of all trees will return this parcel to an early seral condition will reduce canopy cover, create limited surface disturbance by ground-based equipment and yarding. The productivity of this site is generally high and with replanting it is likely that effective canopy cover for water resources would be restored with brush and planted trees in 5 to 10 years after treatment. Due to the small size relative to the contributing watershed above the parcel

Roadside Vegetation Management (13.5 miles) - Outside of EPZs, roadside management activities would remove vegetation 15 feet from roadsides. All vegetation greater than 12 inches in height and less than 25 inches DBH within this roadside management area would be mechanically cut and merchantable logs would be removed with the exception of scattered overstory trees. In general these stands have been modified during road construction and maintenance over the years. Removal of trees is unlikely to de-stabilize the cut and fill slopes along the roadways and would likely cause some areas of localized erosion, but not measureable above background rates. No peak flow enhancement is expected due to the limited scope of this treatment. The watershed management plan for West Fork Cow Creek identified the need to reduce fire risk along major travel routes as a way to improve the ability to fight and manage wildfire (BLM 1997).

Cumulative Effects

For this project, it was determined that little to no sedimentation would occur from individual units, landings, and crossings along haul routes. In other words, no measureable sedimentation would occur above natural background levels described for the no-action alternative. Therefore, water quality measures would not be negatively affected. Some short-term direct and indirect effects to water quality were identified due to pulse increases in sediment and turbidity from road work, generally during the first significant storm event of the wet season. While these effects from sediment could potentially occur, it would still remain within acceptable water quality limits for turbidity, and sediment loads would be difficult to distinguish from background levels.

EPZs, BMPs, and specific associated PDFs identified in section (2.3), would result in no direct or long-term sediment input to streams and thus no cumulative effects to water quality. In

addition to sediment filtering, the EPZs would also retain trees that contribute to the primary shade zone for streams, and thus would maintain stream temperatures.

The risk of negative effects to water quality from the proposed actions is low. There would be no changes to current slope stability or risk of slope failure. The potential for periodic slope failures within the range of natural variability would still remain in association with areas exhibiting an historic disposition to soil movement, particularly in the event of a major storm.

Based on the data analyzed, the risk of peak flow enhancement from roads alone would be low. All roads in the PA currently occupy less than 5% of the land base. Statistically significant increases in peak flows have been shown to occur only when roads occupy at least 12% of the watershed, based on an extensive review of the literature of peak flows in western Oregon (Harr, 1976). The proposed action would not increase road densities since all temporary roads would be fully decommissioned after use. However, these same routes could be used as part of a reciprocal ROW agreement, but it is assumed this would be off-set by decommissioning in other locations. Landings constructed in new disturbance would be rehabilitated, therefore no increase in ECA or road densities, and no perceptible increase in peak flows would be expected.

For this project, it was determined that no cumulatively measurable or significant alterations to the hydrologic function of West Fork Cow Creek or tributary systems to the South Umpqua River would occur.

3.7 Fisheries and Aquatics

3.7.2 Affected Environment

The scale of the analysis for the PA totals 26,470 acres (~41 square miles) and includes the West Fork Cow Creek watershed. This PA provides habitat for special status species, including Oregon Coast (OC) Coho Salmon (*Oncorhynchus kisutch*); OC Steelhead (*Oncorhynchus mykiss*); OC Chinook (*Oncorhynchus tshawytscha*), and Umpqua Chub (*Oregonichthys kalawatseti*). In addition, resident Coastal Cutthroat Trout (*Oncorhynchus clarki*) are present in streams of the PA (Table 28). Non-game species such as speckled dace, Pacific lamprey, sculpin, and redside shiner also inhabit streams in the watershed. No streams in the watershed are stocked with hatchery fish. Analysis from scales from Coho salmon spawners by the Oregon Department of Fish and Wildlife (ODFW) indicates that hatchery fish do not spawn in the watershed. This is probably also true for winter-run steelhead. Information on current fish distribution includes historical surveys, Oregon Department of Fish and Wildlife (ODFW) Aquatic Inventory observations, Streamnet, and the West Fork Cow Creek Watershed Analysis (BLM 1997). ODFW surveyed all of the fish streams in the watershed in 1993-1995 and resurveyed two of them in 2011. The BLM surveyed non-fisheries streams and riparian zones in 1994-1995 for information on proper functioning condition.

Table 28: Fish Bearing Streams Located near the Proposed Treatment Units

HUC 10	Stream name	Fish Species
West Fork Cow Creek	West Fork Cow Creek	OC Coho, OC Steelhead, OC Chinook, Umpqua Chub, Cutthroat Trout
	Wilson Creek	OC Steelhead, Cutthroat Trout
	Gold Mountain Creek	OC Coho, Cutthroat Trout
	Slide Creek	OC Coho, OC Steelhead, Cutthroat Trout
	Wallace Creek	OC Coho, OC Steelhead, Cutthroat Trout
	Walker Creek	OC Coho, OC Steelhead, Cutthroat Trout
	Panther Creek	OC Coho, OC Steelhead, Cutthroat Trout
	Steelhead Creek	OC Steelhead, Cutthroat Trout
	West Fork Elk Valley Creek	OC Coho
	East Fork Elk Valley Creek	OC Coho, OC Steelhead, Cutthroat Trout
	Elk Valley Creek	OC Coho, OC Steelhead, Cutthroat Trout
	Bobby Creek	OC Coho, OC Steelhead, Cutthroat Trout
	Slotted Pen Creek	OC Coho, Cutthroat Trout
	Goat Trail Creek	OC Coho, OC Steelhead
	Bear Creek	OC Coho, OC Steelhead, Cutthroat Trout

Federally Threatened Species

Salmon are listed under the Endangered Species Act (ESA) by evolutionarily significant units (ESU). An ESU is a stock of Pacific salmon that is 1) substantially reproductively isolated from other specific populations units, and 2) represents an important component in the evolutionary legacy of the species. The southernmost extent of the federally listed threatened OC Coho Salmon is the Umpqua Basin. See Table 29 below for a list of treatment units and their proximity to fish bearing and Coho Critical Habitat (CCH).

Oregon Coast Coho

On June 20, 2011, the National Oceanic and Atmospheric Administration (NOAA) Fisheries Service published a final determination to retain OC Coho Salmon as a threatened species under ESA (Federal Register Vol. 76, No. 118). Designation of Critical Habitat became effective on February 11, 2008 (Federal Register Vol. 73, No. 28). OC Coho Salmon are present throughout West Fork Cow Creek HUC 10 watershed in proximity to proposed units and haul routes.

Table 29: Distance from Proposed Treatment Units to Fish Bearing Streams and Coho or CCH

Nearest Fish Bearing Stream	Units in Proximity	Distance to Fish Bearing Stream	Distance to Coho or Critical Habitat
West Fork Cow Creek	Sections 31, 5, 9, 11	120 feet - 0.5 miles	120 feet - 0.5 miles
Wilson Creek	Sections 1, 7, 8, 17, 18	0.5 -1.0 miles	3.0 - 3.5 miles
Gold Mountain Creek	Section 21	200 feet - 0.75 miles	200 feet – 1.25 miles
Slide Creek	Sections 5, 6, 7, 8	0.25 -1.5 miles	1.25 – 2.5 miles
Wallace Creek	Sections 5, 8	120 feet - 0.5 miles	1.0 - 1.5 miles
Walker Creek	Sections 3, 4, 9, 10, 16, 33	120 feet - 1.0 miles	0.1 – 1.5 miles
Panther Creek	Sections 11, 15, 23, 27	120 feet - 1.0 miles	120 feet - 1.0 miles
Steelhead Creek	Section 13	200 feet – 0.25 miles	0.5 - 0.75 miles
West Fork Elk Valley Creek	Sections 7, 13	1.0 - 2.0 miles	1.0 - 2.0 miles
East Fork Elk Valley Creek	Sections 19, 20, 25, 29	120 feet - 0.25 miles	120 feet - 0.25 miles
Elk Valley Creek	Section 25	120 feet - 0.25 miles	120 feet - 0.25 miles
Bobby Creek	Sections 2, 3, 10, 11, 15	0.1 – 1.0 miles	0.1 – 3.0 miles
Slotted Pen Creek	Sections 20, 29, 33	0.1 – 2.25 miles	0.25 – 2.5 miles

Special Status Species (SSS)

OC Steelhead and OC Chinook are both Bureau Sensitive Species and listed as Sensitive Species by the State of Oregon. OC Steelhead are located throughout the West Fork Cow Creek watershed with habitat preferences similar to those of other salmonids. OC Steelhead tend to occupy streams with higher gradients than do OC Coho Salmon, and their distribution is similar to resident cutthroat trout, where access is not blocked by manmade or natural barriers. OC Chinook are found in the West Fork Cow Creek main stem within the PA.

The Umpqua Chub is a Bureau Sensitive Species found in the main stems of the North and South Umpqua Rivers and several larger tributaries (Simon 2008). Umpqua Chub are found in the main stem of Cow Creek and were recently recorded in West Fork Cow Creek.

Aquatic Habitat, Coho Critical Habitat, & Essential Fish Habitat

Spawning Substrate

The availability of spawning substrate is an important factor in fish productivity. The quality of spawning habitat varies according to the amount and quality of the spawning substrate. Gravel and small cobble substrate that is relatively free from embedded fine sediment provides ideal spawning substrate for resident and anadromous salmonids (Bell, Fisheries Handbook of Engineering Requirements and Biological Criteria 3rd ed. 1990). During incubation of eggs and

alevins, survival and emergence rates can be reduced when sediment exceeds 15 percent of the area (T. C. Bjornn 1991).

According to ODFW Aquatic Habitat Inventory Surveys, sand and fine organics made up a moderate portion of the substrate area in riffle units, as illustrated in Table 30. The area of riffle substrate that was characterized as fine sediment averaged approximately 14 percent with a range of 5 percent to 28 percent.

Table 30: Selected Habitat Index Values for Streams in the PA

Stream	Reach #	Length (m)	Gradient (%)	LWD-Key pieces/100m	Silt/ Sand (%)	Residual Pool Depth	Active Erosion	Pool Area (%)	Pool Freq.
Steelhead	1	2165	3.5	0.5	17	0.7	4	25	14
Bobby	1	8765	5.3	1.4	14	0.6	0	25	10
Panther	1	3158	3.6	1.2	16	0.6	10	44	5
	2	1164	3.7	1.5	18	0.5	9	24	11
Goat Trail	1	380	4.5	0	9	0.5	0	13	9
	2	925	8.1	0.1	5	0.5	0	11	15
Elk Valley	1	2792	2.5	0.5	14	0.7	0	35	7
	2	1819	3.1	0	19	0.7	0	52	8
	3	2069	1.0	0	22	0.5	8	36	9
E. Fk. Elk Valley	1	5139	5.0	0.2	16	0.6	0	16	24
W. Fk. Cow	1	3259	0.9	0	14	0.8	0	39	9
	2	10295	1.0	0	8	1.3	0	56	6
	3	5737	1.1	0.1	9	1.2	0	49	7
	4	4064	1.6	0.1	11	1.0	0	34	9
	5	2884	0.7	0.1	16	0.9	0	50	13
	6	3320	1.4	0.5	12	0.8	0	29	14
	7	2452	1.6	1.2	13	0.7	1.1	26	14
Wilson	1	1337	3.7	1.0	8	0.8	0	31	8
	2	2889	4.2	3.4	10	0.7	1.7	21	10
Bear	1	4695	3.4	0.2	11	0.7	0.1	23	10
	2	1992	4.6	0.1	10	0.5	0	14	19
	3	661	7.1	8.5	17	0.5	0	18	10
Gold Mt.	1	6302	2.1	0	28	0.3	0.8	37	10
Walker	1	434	2.1	0.9	15	0.5	0	49	3
	2	3551	6.7	3.6	19	0.5	0	31	6
Wallace	1	1987	10.9	3.2	11	0.3	0	14	10
Slide	1	1778	6.1	2.8	12	0.4	0.2	17	12

Stream	Reach #	Length (m)	Gradient (%)	LWD-Key pieces/100m	Silt/ Sand (%)	Residual Pool Depth	Active Erosion	Pool Area (%)	Pool Freq.
	2	869	16.9	3.3	11	0.6	0	18	11

Pool Habitat

Pools are important habitat features for juvenile rearing during summer months, when lower water levels and higher stream temperatures add to stress, and during high flow events when off-channel habitat provides refuge. Salmonids are typically larger and found in greater numbers in deeper pool habitats (Rosenfeld, Porter, & Parkinson, 2000) . Surveyed stream reaches (see Table 30) had an average of approximately 30 percent pool habitat by area, which is desirable.

Large Woody Debris

Large woody debris is important in the formation of deep scour pools and off-channel habitat, and retention of gravel substrate (Bilby & Ward, 1989). The pools and off-channel habitat provide refuge for salmonids during high flow events and reserves of cool water during low flow months when water temperatures may become elevated.

Stream channels in the PA have extremely low levels of large woody debris. On average, there are 0.1 key pieces of large woody debris per 100 meters of stream. Foster et al. (2001) describe key pieces as those greater than 33 feet in length and 24 inches in diameter.

In the West Fork Cow Creek Watershed Analysis (BLM, 1997), BLM biologists assessed stream productivity. Stream Productivity is defined by a stream's ability to sustain insect populations and diverse species, rearing habitat for fish species (cobble size), and the presence of pools, large woody debris, and fine sediment. Available data from habitat surveys were used to evaluate the Properly Functioning Condition (PFC) of the streams and assign a rating, as listed in Table 31. The same habitat attributes that are presented in Table 30 for the West Fork Cow Creek Watershed streams were used in the PFC ratings assigned to streams in the Upper Cow Watershed (for methodology, see Appendix C of the Upper Cow Watershed Analysis (BLM, 2005).

Table 31: Fish Habitat Condition in the West Fork Cow Creek Watershed for Streams Within the Planning Area

Stream	Condition[1]	Factors Limiting Potential Stream Productivity[2]	Ownership
Bobby, Walker, Wallace, Slide, Wilson Creeks	PFC	T, R	BLM
W. Fork Cow, W. Fork Elk, Bear, Stanley Creeks	FAR	T, R,	
Goat Trail, E. Fork Elk, Panther, Gold Mtn, Slotted Pen Creeks	FAR	T, R	

[1] PFC = Properly Functioning Condition, FAR = Functioning At Risk

[2] T = Timber harvest-related (i.e., timber harvest near streams, soil erosion from roads or from tractor logging), R = Road location or density

Habitat Access

Steelhead Creek has a culvert which may limit the access of coho, steelhead, and resident cutthroat trout to upstream reaches. Panther Creek has a culvert which is a passage barrier for coho and steelhead. The BLM has constructed several stream simulation crossings to replace culverts which had been identified as fish passage barriers.

Coho Critical Habitat

As previously discussed, CCH for OC Coho salmon was designated in the final Federal Register listing which also designated OC Coho salmon as threatened (Federal Register Vol. 73, No. 28). CCH is not designated in the West Fork Cow Creek watershed upstream of the confluence of Walker Creek. However, OC Coho are present in streams in the PA where no CCH is designated. See Table 29 Distance From Proposed Treatment Units to Fish Bearing Streams and CCH.

Essential Fish Habitat

Streams and habitat currently or historically accessible to Chinook and coho salmon are considered Essential Fish Habitat (EFH), designated for fish species of commercial importance by the Magnuson-Stevens Fishery Conservation and Management Act of 1996 50 CFR, Part 600, Subsection J, EFH.

Streams within the PA designated as Essential Fish Habitat (EFH) include: West Fork Cow, Gold Mountain, Slide, Wallace, Walker, Panther, Elk Valley (including West Fork, East Fork, and mainstem), Bobby, Slotted Pen, Goat Trail, and Bear Creeks.

3.7.3 Alternative 1 – No Action

Direct/Indirect Effects

Under the No Action Alternative, there would be no vegetation treatments or associated activities within the PA. There would be no road maintenance, road renovation, or road construction associated with harvest.

Cumulative Effects

The following activities have been previously analyzed and approved as projects that may still occur within the PA in the near future: Partnership of the Umpqua River (PUR) Watershed Restoration, Water Source Maintenance, Medford Road Maintenance CX, and Hazardous Fuels Reduction CX.

Actions under the Medford Road Maintenance CX include ongoing scheduled and emergency road maintenance activities. Road maintenance activities benefit the hydrologic function within the PA that will benefit habitat for fish and aquatic species.

The potential for incremental impacts created by private land practices was considered in the Water Resources Analysis (EA Section 3.6). No changes to peak flows or water yield would be anticipated.

Under the No Action Alternative, there would be no project-related road maintenance activities. Road maintenance activities improve the function of system roads and decrease non-point source pollution that may emanate from unmaintained roads. Thus, under the No Action Alternative, there would be no decrease to non-point source pollution within the PA associated with project activities.

Additionally, under the No Action Alternative, Riparian Thinning would not occur, thus there would be no benefit to ACS objectives or aquatic species associated with this Alternative (for more information on ACS, see Appendix A).

Alternative 2

Direct/Indirect Effects

Federally-Threatened Species

Stand treatments, yarding, landing construction and rehabilitation, temporary route construction and reconstruction (including route decommissioning), road maintenance, hauling, and activity fuels treatments would have no effect on OC Coho Salmon (ESA-Threatened) and designated Coho Critical Habitat (CCH). For the PA, the closest CCH to any proposed treatment units is on Elk Valley Creek, East Fork Elk Valley Creek, Panther Creek, Walker Creek, and adjacent to the West Fork Cow Creek mainstem. Treatments in these units would be 120 feet from the watercourses, consistent with the EPZ established for treatments on any fish-bearing stream. The PA haul routes cross fish bearing streams at several locations (Table 32). OC Coho and CCH are present at all the listed crossings except those on Steelhead and Walker Creeks. Sediment would likely not enter CCH from hauling or maintaining haul roads because implementation of PDFs such as dry condition haul, properly functioning cross drains, and installation of sediment barriers would help to prevent sediment delivery into CCH. Project activities would follow all provisions of the CWA (40 CFR Subchapter D) and Oregon DEQ's provisions for maintenance of water quality standards. Table 32 Haul Route Crossings at Fish Bearing Streams

Table 32: Haul Route Crossings at Fish Bearing Streams

Road	Stream name	Fish Species	Crossings
32-8-9.2	West Fork Cow Creek	OC Chinook, OC Coho, OC Steelhead, Cutthroat Trout	1
32-8-1.1	Slotted Pen Creek	OC Coho, Cutthroat Trout	1
31-9-34.0	Walker Creek	OC Steelhead, Cutthroat Trout	2
32-8-1.1	West Fork Cow Creek	OC Chinook, OC Coho, OC Steelhead, Cutthroat Trout	1
31-8-31.0	East Fork Elk Valley Creek	OC Coho, OC Steelhead, Cutthroat Trout	1

Road	Stream name	Fish Species	Crossings
31-9-25.1	West Fork Elk Valley Creek	OC Coho, OC Steelhead, Cutthroat Trout	1
31-8-30.0	East Fork Elk Valley Creek	OC Coho, OC Steelhead, Cutthroat Trout	1
31-8-31.0	Steelhead Creek	OC Steelhead, Cutthroat Trout	1

Special Status Species (SSS)

Within the PA, SSS are present adjacent to proposed treatment units on Steelhead, Elk Valley, East Fork Elk Valley, Panther, Walker, and main stem West Fork Cow Creeks. Treatments in all of these units would be at least 120 feet from the watercourses, consistent with the EPZ established for treatments on any fish-bearing stream. The PA haul routes intersect SSS habitat at all the listed crossings except those on Steelhead, and Walker Creeks (Table 32).

Proposed vegetation treatments would have no effect on OC Steelhead, Umpqua Chub, and OC Chinook. Dry condition haul, properly functioning cross drains, and sediment barriers installed, where needed, would help prevent sediment from entering SSS habitat during haul or maintenance of haul roads. Project activities would follow all provisions of the CWA (40 CFR Subchapter D) and Oregon DEQ's provisions for maintenance of water quality standards. Fish species are listed as SSS by ESUs. See Chapter "3.7.1: Affected Environment: Federally-Threatened Species" above for the definition of ESUs.

Aquatic Habitat, Coho Critical Habitat, and Essential Fish Habitat

Spawning Substrate

Stream spawning substrate is not expected to change from the Affected Environment description because the proposed activities would occur outside EPZs. BMPs and PDFs implemented in upslope areas and along haul routes would greatly reduce the likelihood of harvest-related sediment entering spawning substrate.

Pool Quality

Pool quality would not be affected by proposed harvest and road-related activities. Activities would occur outside EPZs; BMPs and PDFs implemented in upslope areas and along haul routes would greatly reduce the likelihood of harvest-related sediment affecting pool quality.

Large Woody Debris (LWD)

EPZs would be 120 feet on either side of non-fish bearing perennial streams and perennial springs, and intermittent streams would have EPZs of 50 feet per side. Fish bearing streams would receive a 120 foot buffer on either side of the stream. Restricting harvest to outside of the 120 foot EPZs would be sufficient to keep LWD at current levels, resulting in no effect from proposed harvest and road-related activities.

Habitat Access

Habitat access would remain unaltered under Alternative 2. Fish passage culverts or bridges are not proposed to be replaced or upgraded under this project.

Essential Fish Habitat

Streams within the PA designated as Essential Fish Habitat (EFH) include: West Fork Cow, Gold Mountain, Slide, Wallace, Walker, Panther, Elk Valley (including West Fork, East Fork, and mainstem), Bobby, Slotted Pen, Goat Trail, and Bear Creeks.

Within the PA, EFH is present adjacent to proposed treatment units on Elk Valley Creek, East Fork Elk Valley Creek, Panther Creek, Walker Creek, and the West Fork Cow Creek mainstem. In these areas, EFH is contained within the CCH analyzed for OC Coho. Treatments in all of these units would be consistent with the 120 foot EPZ established for treatments on any fish-bearing stream. The PA haul routes intersect EFH at all the listed crossings except those on Steelhead and Walker Creeks (Table 32).

Proposed vegetation treatments would not adversely affect EFH. With dry condition haul, properly functioning cross drains, and sediment barriers installed, where needed, to prevent sediment delivery into EFH streams, sediment would not be expected to enter EFH as a result of haul or maintenance of haul roads. Project activities would follow all provisions of the CWA (40 CFR Subchapter D) and Oregon DEQ's provisions for maintenance of water quality standards.

Aquatic Conservation Strategy Assessment

The Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them 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 (USFS/BLM 1994, pp. B-6).

A site/project scale and HUC 10 assessment was performed for the Cold Elk Project. Proposed activities in Alternative 2 would meet, and are consistent with, ACS goals and objectives at the site and watershed scales. The detailed ACS assessment to support this determination can be found in Appendix A.

<u>Cumulative Effects</u>

No additional effects were identified as a result of Alternative 2 when considered with the effects of other ongoing or reasonably foreseeable actions in the PA. The direct and indirect effects to fish and aquatic resources anticipated as a result of implementing the actions proposed in Alternative 2 are expected to be negligible due to the implementation of BMPs and PDFs. Some examples include: the use of variable sized EPZs, directional felling away from aquatic features, installing and/or using water bars, berms, sediment basins, gravel pads, straw bales, straw

waddles, small dense woody debris, seeding and/or mulching, to reduce sediment runoff and divert runoff water away from aquatic features.

3.8 Cultural and Paleontological Resources

3.8.1 Background Information

Cultural and paleontological resources are tangible links to our past, and are an important part of the fabric of our national heritage. The Grants Pass Field Office is committed to safeguarding their scientific and educational values for the benefit and enjoyment of the public we serve.

For purposes of this analysis, cultural resources are defined as the physical remains of past human activities including objects, features, sites and landscapes, as well as historic buildings and structures. Elements of natural landscapes which may be associated with the cultural practices or beliefs of Native Americans are also considered cultural resources. Humans relate to their environment through their culture. Because of this, cultural uses of the natural environment, the built environment and human social institutions are an important part of any NEPA analysis. Paleontological resources are defined as the fossilized remains or imprints of past organisms. They provide information about the history of life on earth, and teach us about the interrelationships between ecosystem components over time.

Issues and Concerns

Activities associated with the Proposed Action have potential to directly or indirectly affect:

1. cultural resources that are eligible for the National Register of Historic Places (NRHP),
2. properties of traditional religious and cultural significance to contemporary Native American groups, and
3. paleontological resources as defined by the Paleontological Resources Protection Act (PRPA).

3.8.2 Methodology

Issues and Concerns

Activities associated with the Proposed Action have potential to directly or indirectly affect:

1. cultural resources that are eligible for the National Register of Historic Places (NRHP),
2. properties of traditional religious and cultural significance to contemporary Native American groups, and
3. paleontological resources as defined by the Paleontological Resources Protection Act (PRPA).

3.8.4 Affected Environment

For the purpose of analysis, cultural resources are divided into three categories: prehistoric and historic archaeological sites and tribal traditional cultural resources. While this division does not necessarily alter the way in which the BLM manages a given tract of land, it does provide a better understanding of properties that require protection.

Archaeological sites – primarily historic – are expected to occur within the project area. The cultural resource sensitivity of lands therein is considered to be high due to the area's rich mining history. Paleontological resource sensitivity within the project area is considered to be low, and to date, no known paleontological resources are known to exist in the area.

The following is a broad historical overview of the human or cultural mechanisms that have influenced the project area. Ecosystem models based solely on biological and physical elements often disregard the complex interaction between humans and their environment. More than any other phenomenon, cultural landscapes provide a unique opportunity to interpret the history of the effects humans have had on the environment. Together, natural and cultural influences have shaped the overall character of the project vicinity.

Prehistoric

Southwestern Oregon is located within the homelands of several contemporary cultural groups with ancestral ties to the land including the Cow Creek Band of Umpqua Tribe of Indians, the Confederated Tribes of the Siletz Indians, and the Confederated Tribes of the Grand Ronde Community of Oregon.

Archaeologically documented occupation of southwestern Oregon dates back at least 10,000 years. The majority of prehistoric sites recorded in the region date to the late Holocene period, often referred to as the Late Archaic Period, which spans from approximately 1,500 years before present. The few archaeological excavations conducted near the project area have been at lower elevations, along major stream terraces, and tend to date to the late Holocene (Late Archaic) period.

Settlement and subsistence patterns of the late Holocene centered around small permanent villages typically located on the terraces of major waterways. Seasonal rounds into the surrounding uplands provided other resources not available in the lowlands. While fish, especially salmon, came from the valley streams, the uplands provided a variety of other food resources including deer and elk, and plants such as acorns, pine nuts, camas, tarweed, sunflower seeds, manzanita berries, huckleberries, and blackberries (Gray 1985; LeLande 1991; Tveskov et al. 2006). Abundant small game animals, birds, eggs and grasshoppers also made up a portion of the diet (Gray 1987).

Various tools were utilized in gathering and preparing food resources including baskets, digging sticks, hopper mortar bases, stone pestles and boiling stones (Gray 1987). Game was killed with stone or bone tipped arrows and spears, and butchered with stone knives. Fish were caught using dip nets, basketry, fish traps, hook and line, and weirs made of vine maple poles.

Today contemporary Native people take an active role in the management of their ancestral lands and the BLM works with tribal governments to identify and address Native American concerns and traditional uses of BLM administered land.

Although prehistoric use of the project area most certainly occurred, no prehistoric sites have been recorded to date.

Historic

The first European travel into the region began in the 1820s. The Rogue Valley was first visited in the historic period by Hudson Bay Company trappers in 1827, led by Peter Skene Ogden. By 1846, increased travel and settlement led to the establishment of the Applegate Trail by Jesse and Lindsay Applegate. An associated route from Fort Vancouver, through the Rogue Valley, to the Sacramento Valley in California, became known as the Siskiyou Trail which became a well-established travel route by 1830 (Mackie 1997, p. 28). Traffic on the Applegate/Siskiyou trail system increased with James Marshall's discovery of gold at Sutter Mill in 1848 and the corresponding discoveries in the Rogue and Illinois River basins (Ericson 2013).

The influx of foreigners into southwest Oregon in the 1850s devastated local native communities largely through the introduction of disease, loss of subsistence areas, and later on, full scale conflict. Violent encounters started as small-scale raids and skirmishes on both sides, but as western migration into the area increased, the violence escalated into warfare. The Rogue River Indian War of 1855 to 1856 ended with a forced march of the remaining native peoples to reservations far from their traditional lands.

Despite conflicts between settlers and native populations, mining continued to expand into southwestern Oregon. The earliest mining techniques required little more than a mining pan or sluice box, and miners could work alone as they panned along the rivers and creeks, picking up the free placer gold, also known as "easy" gold. However, by the 1870s, most of the easily accessed gold-bearing placer deposits along the streams had been depleted.

The early gold rush, along with other economic activities, including ranching and farming, gave rise to substantial settlements in the area. By the 1860s, settlers using donation land claims to acquire blocks of land had populated all of the bottomlands along Cow Creek, Grave Creek, and Wolf Creek.

The construction of the Oregon and California Railroad into Douglas County in 1883, and its connection with the Southern Pacific line in Ashland in December 1887, ushered in a new era of movement, exchange, flow and circulation of materials, people and information throughout southwest Oregon (Walling 1884, p. 450). It also gave local farmers access to new markets where they could sell their produce, thus helping to develop and expand farming occupations in the valleys. Solomon Abraham and W.R. Willis platted the city of Glendale to service the railroad being built along Cow Creek.

The introduction and use of hydraulic mining techniques in the latter 19th century and into the early 20th century started a second 'boom period' of mining in the region. Hydraulic mining technology developed in California was quickly accepted in southwestern Oregon and allowed miners to work the rich bank deposits along and above the rivers and creeks (Kramer 1999).

Although hydraulic mining required more capital investment and better organization on the part of the miners, it also allowed larger areas to be systematically mined with less effort, thereby increasing the possibility of extracting more riches.

Along with hydraulic mining, decreased options for small-scale placer mining after the 1860s facilitated the move into lode mining which involved freeing or extracting heavy metals such as gold deposits trapped or locked inside native rock. Lode mining was historically less appealing, and required significantly higher amounts of labor and capital to turn a profit when compared with the working of alluvium deposits through placer or hydraulic methods. Still, in some instances large veins of free standing gold were discovered and some miners "struck it rich."

Both placer mining and lode mining were abundant and central to the local economies of the various communities in southwest Oregon into the 20th century, between 1900 and 1950 (Ramp and Peterson 1996). This was aided in part by the Great Depression era, which saw many people returning to mining with hopes of making a living.

With the advent of the Second World War, mining of gold was halted by order L-208 issued by the War Production Board. This order mandated that "all non-essential mining efforts be halted in order to provide more men and equipment to mine metals essential for the war" (Kramer 1999). After World War II, commercial gold mining in the region never recovered, even after the order was repealed in mid-1945. This was due to increases in the labor expenses related to mining, the increase in overall national prosperity and the availability of employment in the post-war world. By that time it is estimated that Oregon produced 5.9 million ounces of gold, with about 60% of that extracted prior to 1900 (Gold and Silver in Oregon). Gold mining lost its allure and declined as a commercial activity in the area but continues to this day in the form of small scale-independent operations.

With the decline of mining as a significant economic activity, logging started to play a larger role in the development and economy of southwestern Oregon. The timber industry's most active and productive period extended from the 1960s to the 1980s to meet the demand of the economic boom of the post-war era (Stepp 2001). This sector continues to be a very important part of the local economy, although it has seen a steady decline since the 1980s due to more strict environmental regulations and a decline in quality timber due to previous overexploitation.

The Leipold Placer mine is located within the Area of Potential Effect (APE) for the proposed project. The mine is part of the Galice Mining District which has seen significant mining activity from the 1950s to the present.

Paleontology

No paleontological resources have been documented within the project area, although their presence is not outside of the realm of possibility. In 1995, fossils confirming Paleocene strata were reported from the Tyee basin near Roseburg in Douglas County, and Jurassic-age fossilized plants have been recorded in Douglas County as well. In addition, Eocene mollusks as well as pelecypods and gastropods can be found in Lookingglass exposures at the mouth of the Little River near Glide in Douglas County, and shallow water nearshore sands of Jurassic plant locales in Douglas County may eventually yield the bones of dinosaurs (Orr and Orr 2009, p. 84).

3.8.5 Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects

Under the No Action Alternative, the exclusion of fire and other treatments across the landscape would lead to continued natural accumulation of organic litter (duff, branches, and large branches). This may result in the production of more intense burning through cultural sites in the event of a wildfire. Thus, the No Action Alternative would not benefit cultural resources.

Alternative 2

Direct and Indirect Effects

An extensive literature search and intensive field inventories identified a number of archaeological resources within the larger boundary of overall project area, including prehistoric lithic scatters, and mining related features and sites.

Of the five previously recorded cultural sites located within the project area, none are near any project units, helicopter landing sites, or prosed temporary routes. To ensure protection of possibly undetected sites during project implementation the IDT designed PDFs that direct operators to cease all operations immediately and contact the project archaeologist if unidentified cultural or paleontological resources are encountered. If cultural resources are discovered during project implementation, the project would be redesigned to protect the cultural resource values present, or evaluation or mitigation procedures would be implemented based on recommendations from the Resource Area Archaeologist with input from federally recognized Tribes, approval from the Field Manager, and concurrence from the State Historic Preservation Office. Because of cultural resource surveys and PDFs the treatments proposed under the Action Alternatives would have no direct or indirect effects on heritage resources.

The proposed action alternative would not have any direct or indirect effects on cultural resources. There are no eligible properties located within the APE as defined by Section 106 of the NHPA

Cumulative Effects

Reducing fuel loads within the PA reduces the likelihood of a catastrophic fire event, leading to the better management and protection of cultural resources in the long term.

3.9 Botany

3.9.1 Methodology

- Information pertaining to T&E, S&M, and ISSSSP plant sites was obtained from the Medford District BLM Geographic Biotic Observation (GeoBOB) database and hardcopy site reports.

- GIS was utilized to query BLM-managed acreage and stand age.
- Noxious weed species and their respective locations reported within the Planning Area were obtained from hardcopy survey reports.
- The Planning Area boundary was determined, for this resource, as the upper ridgelines encompassing the West Fork Cow Creek 10th field watershed.

3.9.2 Assumption

Private land will continue to be harvested and re-planted, and will be subject to requirements listed within Oregon's Forest Practices Act (ODA 2016).

3.9.3 Affected Environment

Due to the combination of fire return intervals, climate, unique soil types (frequent serpentine and serpentine-influenced soils), and geographic location, the Klamath Ecoregion – which encompasses the Planning Area – has rich biological diversity. This area hosts multiple botanical species, including several endemic species, many of which are associated with serpentine soil (Sleeter and Calzia 2014).

Land within the Cold Elk project area contains special status plant and fungi species; however, 'uncommon' plant sites occur at lower densities as compared to other regions within the Klamath Ecoregion, such as the Illinois Valley (USDI 2016). 'Uncommon,' as used in the context of this report, is a broad definition encompassing all species included in the three basic designations guiding BLM plant species conservation efforts;

- Federal Threatened or Endangered (T&E), governed by the Endangered Species Act (ESA);
- Interagency Special Status/Sensitive Species Program (ISSSSP), governed by BLM Special Status Species (BSS) policy, as outlined in BLM Manual 6840; and
- Survey and Manage (S&M), governed by the Northwest Forest Plan (NWFP).

Plant and fungi species found within final proposed unit boundaries are broken out into their respective designations/categories – T&E, BSS / ISSSSP species, and S&M – discussed in more detail below.

T&E Plants – NOT PRESENT, NOT AFFECTED

Of the three federally listed plants on the Medford District (*Fritillaria gentneri, Limnanthes flocossa* ssp. *grandiflora*, and *Lomatium cookii),* only *Limnanthes flocossa ssp. grandiflora* does not have a range that extends into the Grants Pass Resource Area. Final units within the Cold Elk Project Area do not fall within the range of any of Medford District's listed T&E plants as determined by the 2004 US Fish and Wildlife Service (USFWS) Biological Opinion. Final units were surveyed according to the USFWS's protocol; vascular plant surveys were conducted in the

springs of 2015 and 2016, and no new T&E plant sites were found. There would be no anticipated effect from the Proposed Action on any federally listed plant.

Bureau Special Status & Survey and Manage Plants – PRESENT, NOT AFFECTED

Background

On July 26, 2007 a new Special Status Species list went into effect (USDI 2007), coupled with a new Interagency Special Status Species Policy (ISSSSP). This new list has two categories: (ISSSSP) Sensitive and Strategic. The former categories of Bureau Assessment and Bureau Tracking no longer exist. Sensitive species require a pre-project clearance and management to prevent them from trending toward federal listing. There is no pre-project clearance or management required for the Strategic Species at the BLM District level, thus Strategic Species will not be analyzed in this document.

In addition to the aforementioned Special Status Species policy, S&M requirements were reinstated as of April 2013. Direction regarding S&M has morphed over the last several years. On December 17, 2009, the U.S. District Court for the Western District of Washington issued an order in *Conservation Northwest, et al. v. Sherman, et al.*, No. 08-1067-JCC (W.D. Wash.), granting Plaintiffs' motion for partial summary judgment and finding NEPA violations in the *Final Supplemental to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* (USDA and USDI, June 2007). In response, parties entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. According to that direction, projects that are within the range of the northern spotted owl were subject to the S&M standards and guidelines in the 2001 ROD, as modified by the 2011 Settlement Agreement.

A subsequent lawsuit was filed in April 2013, and the 2011 list was rescinded. Interim guidance directed projects to be analyzed under the 2001 list without Annual Species Reviews (ASRs), unless the project met one of the four Pechman exemptions.

In the most recent S&M direction, communicated in IM-OR-2014-037, the District Court vacated the 2007 RODs on February 18, 2014, which resulted in returning the BLM to the status quo in existence prior to the 2007 RODs. The prior status quo includes the use of the 2001, 2002, and 2003 Annual Species Reviews (except the change/removal made for the red tree vole) and the "Pechman exemptions".

The Cold Elk 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.

For vascular and nonvascular species, this project utilizes the 2003 species list, as pre-disturbance surveys occurred under the most recent direction.

Similarly, for fungi surveys occurring from fall of 2014, spring and fall of 2015, through the spring of 2016 (as per the 2-year protocol outlined in Survey & Manage Category B Fungi Equivalent-Effort Survey Protocol, Version 1.0, February 2012), this project utilizes the

December 2003 species list, which 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.

In addition, for the following fungi species, based on our discretion to determine the location, timing and intensity of timber harvest, and discretion to provide additional project design features (PDFs) to reduce impacts, we are incorporating the following design features for these species:

- Complete equivalent effort surveys for project work in old-growth forests for *Clavariadelphus truncatus* (outside Jackson County Oregon). Known site management is already required using the 2003 Annual Species Review category.

- Complete equivalent effort surveys for project work in old-growth forests and manage known sites for *Galerina atkinsoniana* and *Phaeocollybia olivacea.*

Proposed activities encompassed in the Cold Elk project do not fit the criteria of any of the Pechman exemptions, but the project is consistent with the Medford District Resource Management Plan/Forest Land and Resource Management Plan as amended by the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (2001 ROD).

Survey Results

Vascular and nonvascular plant surveys were conducted in the springs of 2015 and 2016.

Professional botanists surveyed the Project Area units using intuitive controlled methodology, wherein areas supporting high potential habitat were surveyed more intensively. Surveys were also conducted in compliance with the 2001 S&M protocol, which requires surveys for Category A and C species. S&M protocol requires managing known (documented) sites of Category A, B, C, and E species, managing 'high-priority' Category D species, and no site management requirement of Category F species. Surveys will be completed by September 2016, and Table 33 is anticipated to be updated by November 2016.

In addition to surveys completed for the Cold Elk project, Medford District's rare plant database, GeoBOB (Oregon/Washington Geographic Biotic Observation (GeoBOB)), was referenced to locate sites found during previous surveying efforts which overlapped into final Cold Elk units. Past survey results revealed the following sites which require mitigation measures; (3) *Illiamna latibracteata* (California wild hollyhock), (11) *Bensoniella oregana* (Oregon bensoniella), (1) *Phaeocollybia attenuata*, (1) *Phaeocollybia olivacea*, and (1) *Ramaria stunzii*.

All sites – with the exception of sites found during spring of 2016 vascular, nonvascular, and fungi surveys – whether historic or resulting from the most recent surveys, have been compiled and listed in Table 33.

Table 33: Bureau Sensitive and Survey and Manage Plant Sites in Cold Elk

Species	Common Name	Sensitive	S&M Category	Number of Sites	TRS
Bensoniella oregana	Oregon bensoniella	Yes	NA	11	32-9-9; 32-9-16; 31-9-27
Chaenotheca chrysocephala		No	B	1	32-8-9
Clavariadelphus occidentalis		No	B	9	32-10-13; 32-10-1; 31-8-29; 31-8-33; 31-9-23
Illiamna latibracteata	*California wild hollyhock*	Yes	NA	2	32-9-3; 32-9-16
Phaeocollybia attenuata		No	D	12	31-8-20; 31-8-33; 31-9-23; 32-9-16; 32-9-7; 32-9-17
Phaeocollybia californica		Sen	B	2	31-8-20; 31-8-33
Phaeocollybia fallax		No	D	2	31-8-20; 31-8-33
Phaeocollybia olivacea		No	F	1	32-9-10
Phaeocollybia piceae		No	B	1	32-9-16
Phaeocollybia pseudofestiva		No	B	1	31-8-33
Ramaria rubribrunnescens			B	2	32-10-1; 32-9-7
Ramaria rubrievanescens			B	3	32-9-16; 32-9-7; 32-10-1
Ramaria araiospora		No	B	1	32-9-16
Ramaria stunzii		No	B	1	32-9-10
Rhizopogon truncatus		No	D	2	31-8-20; 31-8-33
Spathularia flavida		No	B	1	32-9-7
Tremiscus helvelloides		No	D	1	32-9-16
Tricholoma venenatum		No	B	5	31-8-33

Recommended Plant Site Protection

Vascular species, including *Bensoniella oregana* and *Illiamna latibractiata* would receive a protection buffer ranging from 5-200 feet in diameter, depending on site specific conditions and unit prescription(s).

For S&M species, S&M protocols state Category A, B, and E species are under a “manage known sites” requirement. Therefore, the Category A, B, and E species in the above table would receive a 5-200 foot buffer, depending on site specific conditions and unit prescriptions.

Category C and D species are 'manage high-priority site' species. The *2001 Survey and Manage Standards and Guidelines*, p 10 states that "high priority sites will be managed according to the Management Recommendation for the species," and if there aren't any Management Recommendations for the species, then "a combination of professional judgment, Appendix 12 in the Northwest Forest Plan final SEIS, and appropriate literature will be used to guide individual site management." Most importantly, "until a Management Recommendation has been written addressing high priority sites, either assume all sites are high priority," or commence determination of high-priority sites on a case-by-case basis with the following formula:

1) Obtain guidance from the Interagency S&M Program Manager;

2) Obtain local interagency concurrence (BLM, USFS, USFWS);

3) Document consideration of the condition of the species on other administrative units as identified by the Program Manager – typically adjacent units as well as others in the species range within the province; and,

4) ID in ISMS (now GeoBOB)

In the case of this EA all S&M Category C species are assumed 'high-priority,' and would be buffered to ensure species persistence at each site. As such, buffers may range from 5-200 feet, depending on site-specific conditions and unit prescription(s).

The actual buffer may be comprised of either a physical buffer made from flagging, or a virtual buffer provided on a map. In either case, the intent of the buffer is to provide awareness of the site, and to prevent any activity from occurring within the buffer radius that would jeopardize species persistence.

Bureau Special Status & Survey and Manage Fungi – PRESENT, NOT AFFECTED

Special Status Fungi

Approximately 373 acres within the Cold Elk proposed units were surveyed for ISSSSP and S&M fungi. For more information about these surveys, please refer to the S&M Fungi section (below) for more information.

The majority of Cold Elk proposed project units occur in stands less than 180 years old and, with the exception of incidental fungi sites reported by contractors, units less than 180 years old were not surveyed for ISSSP Sensitive fungi. Pre-disturbance surveys for Special Status fungi are not practical, nor required per BLM – Information Bulletin No. OR 2004-121, which states "If project surveys for a species were not practical under the Survey and Manage standards and guidelines (most Category B and D species), or a species' status is undetermined (Category E and F species), then surveys will not be practical or expected to occur under the Special Status/Sensitive Species policies either" (USFS/BLM 2004a). Current special status fungi were previously in the aforementioned S&M categories which did not consider surveys practical, and are therefore exempt from survey requirements (See Table 34). The ISSSP states that 14 species of fungi are designated as Sensitive; 4 of which have been documented, and the other 10 are

suspected to occur on the Medford District (Table 33). As mentioned above, none of these species require surveys.

Table 34: Bureau Sensitive (ISSSP) Fungi Documented or Suspected on Medford BLM

Species	S&M Category	ISSSSP / Bureau Status	Suspected or Documented on Medford District?
Arcangeliella camphorate	B	SEN	S
Boletus pulcherrimus		SEN	D
Chamonixia caespitosa		SEN	S
Dermocybe humboldtensis	B	SEN	S
Gastroboletus vividus	B	SEN	S
Gymnomyces fragrans		SEN	S
Helvella crassitunicata	B	SEN	S
Phaeocollybia californica	B	SEN	D
Phaeocollybia oregonensis	B	SEN	S
Psuedorhizina californica		SEN	S
Ramaria spinulosa var. *diminutiva*	B	SEN	S
Rhizopogon chamaleontinus	B	SEN	S
Rhizopogon ellipsosporus	B	SEN	D
Rhizopogon exiguus	B	SEN	D

Of the 4 documented species, two (per the Oregon/Washington Geographic Biotic Observation (GeoBOB) database), *Phaeocollybia californica* (PHCA40) and *Rhizopogon ellipsosporus* (RHEL3), have been found in the Grants Pass Resource Area. The closest *Phaeocollybia californica* sites are within the Cold Elk project area in T31S-R8W-Sections 20 and 33, and the closest *Rhizopogon ellipsosporus* site is approximately 22 miles southeast from the project area. The sites were found during predisturbance surveys for the Cold Elk project and will receive protection buffers as previously described under the S&M Fungi section of this report.

For *Rhizopogon ellipsosporus*, dispersal via spore transport and/or mycelia network are improbable, as these sites and the Project Area reside within different HUC 10 watersheds (the RHEL3 site is in Jumpoff Joe Creek, whereas the Cold Elk project is in West Fork Cow Creek Watershed) and West Fork Cow Creek Watershed is separated from Jumpoff Joe Creek Watershed by steep ridges, several ravines, several creeks, and Interstate 5. There are no documented sites of *Rhizopogon ellipsosporus*, where the Cold Elk Planning Area is located.

While it is possible that this project occurs within potential habitat for some species, there is limited information available describing the *exact* habitat requirements or population biology of these species (USFS/BLM 2004c). The *2004 FEIS to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* addresses this type of incomplete and/or unavailable information (pp. 108-109). However, the *2004 Record of Decision* (ROD) *to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* offers a broad scale prospective of this current situation in stating:

> "Any discussion of risk based on rarity and likelihood of disturbance must recognize that, for many species, only a small percentage of potential habitat has been surveyed. Reserves have not been surveyed to the same degree as Matrix and Adaptive Management Area land use allocations (LUA). The Reserves were not surveyed because there has been little management-induced disturbance there. The vast majority of pre-disturbance surveys have been located in the Matrix and Adaptive Management Area LUA (19% of the NWFP area), so that is where many of the known sites have been found. This does not mean that a disproportionate amount of their habitat is located in Matrix. If these species are truly closely associated with late-successional or old-growth forests, we can reasonably expect that the large amount of federally managed lands in Late-Successional and Riparian Reserves which provide the most amount of this type of habitat (86% of currently existing late-successional forests is in reserves) would also provide, at a minimum, its proportionate share of the habitat to support populations of these species" (*2004 ROD to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines*, p. 11).

It is likely that one or both of these species occurs within the project area. However, based on the above information – coupled with the outcome of the Likelihood of Occurrence Key (USDI, Bureau of Land Management 2004) – the likelihood of a sensitive fungi occurring within a single unit(s) encompassed in the Project Area is low. As such, BLM contends that the likelihood of contributing toward the need to list is not probable.

<u>Survey and Manage Fungi</u>

Approximately 373 acres of potential Cold Elk units exceeded 180 years old and exhibited stand complexities as described in the 2001 S&M Standards and Guidelines, and as such, were surveyed for both S&M and ISSSP Sensitive fungi. Sites recorded as a result of the fall 2014, fall 2015, and spring 2015 visits are reflected in this report, but since surveys will not be completed until after this EA is scheduled for release, results of the spring 2016 surveys will be communicated through an EA amendment in the Fall/Winter of 2016. Until survey results are received, no project implementation will ensue.

Like vascular and nonvascular surveys, professional botanists surveyed the 373 acres for fungi within Project Area units using intuitive controlled methodology, wherein areas supporting high potential habitat were surveyed more intensively. Surveys were also conducted in compliance with the 2001 S&M protocol, which requires surveys for Category A and C species. S&M protocol requires managing known (documented) sites of Category A, B, C, and E species, managing 'high-priority' Category D species, and no site management requirement of Category F species. Surveys pertaining to units surveyed in 2015-16 revealed the following new sites (see

Table 1-1); (2) *Ramaria rubribrunnescens*, (1) *Spathularia flavida*, (1)*Tremiscus helvelloides*, (3) *Ramaria rubrievanescens*, (1) *Ramaria araiospora*, (1) *Phaeocollybia piceae5*, (1) *Phaeocollybia pseudofestiva*, (5) *Tricholoma venenatum*, (10) *Phaeocollybia attenuata*, (2) *Phaeocollybia californica*, (2) *Phaeocollybia fallax*, (2) *Rhizopogon truncatus*, (13) *Clavariadelphus occidentalis*.

Aside from the 373 acres and incidental fungi findings located during vascular and nonvascular surveys, final units within the Cold Elk project area were not surveyed for fungi to S&M protocol standards. For NEPA decisions signed in fiscal year 2011 and beyond for habitat-disturbing activities in old-growth forests, the 2001 S&M ROD (USFS/BLM 2001) gives direction to conduct equivalent effort surveys for Category B fungi species if strategic surveys have not been completed for the province encompassing the project. The S&M Standards and Guidelines defines old growth forest as an ecosystem distinguished by old trees and related structural attributes that are typically at least 180 to 220 years old (USFS/BLM 2001, S&G-79). Strategic surveys have not been completed for Category B fungi for the province containing the Cold Elk project area, and with the exception of the 373 acres and incidental fungi findings, equivalent effort surveys have not been completed as units do not exceed 180 years of age and exhibit structural attributes associated with old growth (such as multiple canopy layers, numerous large snags, and heavy accumulations of downed woody debris) to trigger fungi surveys.

Site management of the fungi sites will mirror those described for vascular and nonvascular special status species; special status fungi sites would receive a protection buffer ranging from 5-200 feet in diameter, depending on species, site specific conditions, and unit prescription(s).

3.9.4 Alternative 1 – No Action

Direct and Indirect Effects

T&E, ISSSP Sensitive, & Survey and Manage Vascular Plants

There would be no direct or indirect effects to ISSSP Sensitive or S&M vascular plants under Alternative 1 because no physical disturbance would occur that could impact them.

ISSSP Sensitive & Survey and Manage Nonvascular Plants

No direct or indirect effects would occur to ISSSP Sensitive or S&M nonvascular plants resulting from Alternative 1 because no activities would occur that could impact them.

ISSSP Sensitive & Survey and Manage Fungi

There would be no direct or indirect effects to ISSSP Sensitive or S&M fungi under Alternative 1 because no physical disturbance would occur. There would be no loss of late-successional forest which may provide suitable habitat for the 10 suspected and 4 documented Medford District BLM Sensitive fungi.

Cumulative Effects

With the exception of fuels treatments, Alternative 1 would not contribute additional cumulative effects to ISSSP or S&M vascular, nonvascular, or fungi species. The amount of mid-seral and late-successional forest on BLM-managed lands would remain unchanged.

Past, present, and reasonably foreseeable activities within the Cold Elk project area are broken out into their respective categories for further review.

Past activities –

Timber Harvest on private land

Information is not available about rare plant populations in the Cold Elk Project area prior to BLM botanical surveys, which began during the last 35 years. However, past activities, particularly timber harvest on private lands, likely affected Special Status plants and populations by damaging or destroying individuals or reducing or degrading suitable habitat.

Past Harvest on BLM Managed land

Past sales which have occurred within the last 10 years within the current Planning Area include; Farout Timber Sale, Elk Valley Roadway Clearing, Rogue Cow Timber Sale, and Anaktuvik Thin Timber Sale. BSS and S&M plants and fungi found during pre-disturbance surveys for each of those projects were entered into the GeoBOB database, and sites which merited protection received 'no treatment' buffers.

Present and Reasonably Foreseeable activities --

Discretionary Activities

The following activities are ongoing and foreseeable management actions that are occurring and may have effects within the West Fork Cow Creek watershed include: Plum Creek roads, Cow Creek Highway Improvement Project, West Fork Cow Creek Road Improvement, Hazard tree removal, In-stream Log Placement in Panther and Elk Valley Creeks, Young Stand Management Project, and Medford Road Maintenance Categorical Exclusion. For more information, please reference Appendix C of the Cold Elk EA for a brief description of each project.

- Plum Creek roads – A possible road decommissioning project occurring within the Panther Creek road system. Cumulative effects to botanical resources include possible short-term (0-3 years) disturbance of rare plant sites that may have established since the road prism was initially disturbed.

- Cow Creek Highway Improvement Project – This project, involving Federal Highways as the lead agency, includes upgrading the Cow Creek Highway, and includes culvert replacements and shoulder expansion for public safety. Cumulative effects to botanical

resources include possible short-term (0-3 years) disturbance of rare plant sites that may have established since the road prism was initially disturbed.

- West Fork Cow Creek Road Improvement – A project to address chronic road stability issues along a <2 mile section of West Fork Cow Creek Road. Cumulative effects to botanical resources include possible short-term (0-3 years) disturbance of rare plant sites that may have established since the road prism was initially disturbed.

- Hazard Tree Removal – Includes both discretionary and non-discretionary actions to remove hazard trees along public road systems within the Planning Area. Cumulative effects to botanical resources include possible short-term (0-3 years) disturbance of rare plant sites that 1) may have established since the road prism was initially disturbed, and 2) reside within the immediate vicinity (within 150 feet of where the tree lands) of the felling activity.

- In-Stream Log Placement – A restorative project which includes placing logs within stream systems to improve downed woody material within the stream channel. Cumulative effects to botanical resources include possible short-term (0-3 years) disturbance of rare plant sites that may have established since the road prism was initially disturbed and are potentially within the small footprint (approximately <100 square feet) of ground disturbance resulting from the process of log placement.

- Young Stand Management Project CX – Approximately 500 acres of planting/pruning will occur on within the Grants Pass Resource Area on Medford District in association with this CX. Cumulative effects to botanical resources would be neutral to beneficial, because botany sites receive protection during the course of project implementation.

- Medford Road Maintenance CX – Actions under this project include ongoing scheduled and emergency road maintenance activities. Cumulative effects to botanical resources include possible short-term (0-3 years) disturbance of rare plant sites that may have established since the road prism was initially disturbed.

Timber Harvest and Reforestation on private land

Although specific logging plans for private industrial forest lands are not available, industry has been actively logging and replanting within the Cold Elk project area and will continue to do so. BLM assumes commercial harvest will occur in the future on relatively short rotations, and that privately-owned forests will remain in early to mid-seral stages. Sensitive and S&M species do not receive protection on privately-owned lands, but will continue to be protected and conserved on federal lands, according to BLM policy (USDI 1990).

Non-Discretionary Actions

Reasonably foreseeable activities within the Cold Elk project area include non-discretionary Reciprocal Right-of-Ways where certain private timber companies can request access into their lands via building a new road across BLM managed lands.

These actions may occur in Matrix, Riparian Reserves, 100 acre NSO activity centers, nest patches, etc. Aside from the Endangered Species Act, and /or other federal laws, there is no requirement for Reciprocal ROW actions to be consistent with ISSSSP or S&M policy. As such, BLM assumes there is a possibility of Bureau Sensitive or S&M plant/fungi site degradation if a site were within this project area. Since the actual locations, extent, and magnitude of this action is not known, the impacts associated with this action cannot be assessed.

Future wildfire events

As naturally-ignited wildfires have occurred in the Klamath-Siskiyou Ecoregion in the past, BLM assumes future fires will occur. Current trends as a result of fire suppression/exclusion would continue. Stands within the Cold Elk project area would likely burn at severe intensities given current stocking levels. The potential for intense, stand-replacing fires and the risk of direct mortality or damage to Special Status plants or fungi and/or loss of suitable habitat from high severity wildfire would remain unchanged from current conditions.

Alternative 1 would not contribute additional cumulative effects to ISSSSP vascular / nonvascular plants, or fungi. The amount of mid-seral and late-successional forest on BLM-managed lands would remain unchanged.

3.9.5 Alternative 2

Direct and Indirect Effects

Direct and Indirect Effects

T&E, ISSSSP Sensitive, and S&M Vascular Plants

There would be no direct or indirect effects to ISSSSP or S&M vascular plants under Alternative 2 because sites requiring protection within final planning units (Table 33) would receive protection buffers.

ISSSSP Sensitive and S&M Nonvascular Plants

No direct or indirect effects would occur to nonvascular ISSSSP Sensitive or S&M species under Alt 2 because sites requiring protection within final planning units (Table 33) would receive protection buffers.

ISSSSP Sensitive & Survey and Manage Fungi

ISSSSP Sensitive and S&M Fungi

While the effects of soil disturbance (resulting from mechanized equipment and green tree removal) to above-ground plants have been well documented, much less information pertaining to below-ground fungi and their associated mycelial network is available. Addressing direct and indirect effects to ISSSSP Fungi species is further complicated, because official fungi surveys

were only performed for ISSSSP Sensitive fungi within 373 acres of the Cold Elk final proposed units – because units, with the exception of those aforementioned, are less than 180 years old and do not exhibit stand complexities typically associated with ISSSP fungi.

Even if surveys had been conducted, surveys address only fruiting bodies, or sporocarps, not the mycelial network. This fruiting body and mycelial situation is analogous to looking for a flowering plant which reproduces from a bulb, but does not produce flowers every year. In any given year, the plant may not flower, but the underground bulb is still present. Thus, even if surveys were conducted and no sites were found, it does not ensure that Sensitive fungi are absent in treatment units.

While forest management activities (tree-felling, tractoring and/or yarding, prescribed/pile burning, etc) can damage fruiting bodies and/or the shallow portions of mycleial networks, management activities do not decimate mycelial networks – especially when green trees are left within the unit (Luoma et al. 2004; Luoma et al. 2006). Such trees serve as "hubs" for mycelial networks, from which the surrounding underground vicinity is re-populated with respective fungi species as the mycelial networks expand and radiate outward, thereby interfacing with root systems of new conifers (Luoma et al. 2006).

Potential habitat for many of the 20 Sensitive species exists in portions of the Project Area, as specific areas of the project area exhibit a predominant Douglas-fir component (generally considered an indicator species, but recorded sites commonly have white fir as well). However, predicting presence of Sensitive fungi is difficult because habitat requirements are poorly understood. Because of their rarity across the NWFP area, it is unlikely that populations are present in the final treatment units. However, if present, they could be directly or indirectly adversely impacted by the proposed actions in Alternative 2, detailed after the Survey and Manage Fungi Direct/Indirect effects discussion.

In the short term (0-3 years), proposed management actions would result in soil displacement and erosion, potentially affecting fungi species recolonization efforts within treatment units and along roads.

Survey and Manage Fungi

Addressing Direct and Indirect effects to S&M Fungi species is complicated because fungi surveys were only performed for S& Manage fungi within 373 acres of the Cold Elk final proposed units because the majority of units, with the exception of those aforementioned, are less than 180 years old and do not exhibit the stand complexities as described in the 2001 Survey and Manage Standards and Guidelines, and therefore do not trigger fungi surveys.

Historic sites documented and listed in Table 30 and would be buffered, as would sites found during the 2014-2016 surveys within the aforementioned 373 acres. In addition, BLM assumes at least half of the harvest activities would likely occur when the species are dormant and the ground is drier (typically after June 1) thereby reducing compaction so possible effects to sites would be further minimized.

Thinning/Commodity Extraction

Harvest can have varying degrees of adverse impacts on fungi, depending on the level of tree removal and ground disturbance. Removing, disturbing, or compacting the top layer of organic material and mineral soil via ground-based logging systems could negatively impact fungi because the main and most extensive part of the fungus consists of a below-ground mycelia network that resides in the top few inches of mineral soil. Mycelia networks are often connected to multiple trees through their root systems. In one study, fungal mycelia networks ranged in size from 1.5 - 27 square meters (Dahlberg and Stenlid 1995). Disruption of mycelia networks could occur during timber harvest, construction or ripping of roads or landings, removal of host trees that sustain the ectomycorrhizae, or burning post-harvest slash piles (Amaranthus et al. 1996).

Although the effect of these activities on fungi could result in loss of species diversity and abundance, more recent studies indicate fungi species persist under a variety of management regimes (Gordon 2012). Additionally, a timber harvesting project study by Jennings et al (2011) suggests "that nutrients critical to soil productivity were reduced by mechanical applications used in timber harvesting, yet soil bacteria and fungi, essential to mediating decomposition and nutrient cycling, appeared resilient to mechanical disturbance."

Alternative 2 presents a potential short term (0-3 years) risk of impacting Sensitive/S&M fungi, if present, because it proposes permanent and temporary roads, and tree harvesting – which involves soil disturbance, and therefore, mycelium disturbance, if present. However, green trees will be left intact, and root systems associated with green trees serve as refugia for many ectomycorrhizal (EM) fungi mycelia (Luoma et al. 2006). Thus, the BLM assumes that although a Sensitive/S&M species may incur a short term setback, the species would re-colonize the area over the long term (3-100 years).

Road / Landing Construction

Potential direct and indirect effects to fungi resulting from road/landing construction are similar to effects of logging, albeit on a smaller scale. While roads do not typically involve as much affected acreage as units, they have a period of heavy use by log trucks and logging equipment, resulting in concentrated soil compaction.

Jennings et al. (Jennings et al. 2011) demonstrated that roads which are sub-soiled after use are colonized by EM fungi which, in addition to other findings, suggests disturbance on the forest floor has less of an effect to soil microbial communities (including mycelial networks) than overstory removal. In addition, as mentioned in the logging effects discussion, green trees are present and are typically within 10 feet of the roadside. Therefore, BLM assumes there is refugia for fungi mycelia – including ISSSSP and S&M fungi species – and although there may be short term (0-3 years) effects to mycelia networks, there would not be effects that threaten persistence of ISSSP/S&M in the long term (3-100 years).

Treatment of Activity Fuels – Lop and Scatter, Piling, and/or Pile Burning

Radiant heat could also directly impact fungi during post-harvest slash pile burning. Effects of pile burning include damage or death of mineral soil fungi including the mycelia and spores; loss of litter, organic matter and large wood, resulting in reduced moisture retention capability; loss of nutrient sources; and changes in fungal species diversity and abundance. Implementation of Alternative 2 threatens to damage fungi from burn piles because the trees would be harvested. However, commercial thinning activities do not produce as much slash as regeneration harvesting, and the area impacted by burn piles would be a small percentage of acreage compared to the total amount of acres in the planning area.

Cumulative Effects

Cumulative Effects for ISSSP Sensitive/S&M Vascular, Nonvascular, and Fungi

Information is not available for rare plant populations in the Cold Elk Planning Area prior to BLM botanical surveys, which began during the last 35 years. However, BLM assumes that past activities, described in the affected environment, likely affected Sensitive / S&M plants and fungi populations by damaging or destroying individuals or reducing or degrading suitable habitat.

Although information is not available for logging plans on private industrial forest lands, BLM assumes commercial harvest will occur in the future and that privately-owned forests will be in early to mid-seral stages. Sensitive species do not receive protection on privately-owned lands, but will continue to be protected and conserved on federal lands, according to BLM policies and federal regulations.

Sensitive and/or S&M plants would not be directly impacted by the activities proposed in Alternative 2 because surveys have been conducted and the Sensitive/S&M plants located would receive protection buffers. PDFs would reduce the risk of introducing or spreading noxious weeds during project implementation, which could potentially impact Sensitive vascular plant habitat. No Sensitive Status or S&M vascular or nonvascular plants would trend toward listing (ISSSSP) or cease persisting (S&M) as a result of implementing the activities proposed in Alternative 2.

3,702 acres of rare populations of Sensitive Fungi on could be cumulatively impacted during timber harvest, thinning, and fuels reduction treatments. However, the proposed harvest would occur on Matrix lands, which are designated for timber production and harvest. Across the NWFP area, approximately 14 percent of the 8 million acres of late-successional forest are in Matrix and are available for harvest, while 86% are designated as late-successional reserves, congressionally reserved, administratively withdrawn areas, and Riparian Reserves. BLM estimates that over the next 50 years, late-successional forest will develop at 2.5 times the rate of loss through stand-replacement fires and harvest (USFS/BLM 2004c, pp. 107-111). This reserve system spread across the landscape is intended to provide protection and development of late seral habitat for the protection and expansion of late-successional associated rare plants. Under

the NWFP, at least 15% late seral (80-plus years old) conifer forest must be maintained in each 5th field watershed (USFS/BLM 1994, p. C-44).

Because of their rarity across the NWFP Area, it is unlikely that Sensitive fungi are present in the Cold Elk timber harvest units. The risk is low that they would be impacted. The same holds true for S&M A & C fungi. Protection of species at the landscape level ensures that Sensitive species will not trend toward listing and S&M species will persist. The BLM assumes that protecting known sites (current and future found) of these Sensitive and S&M (categories A-E) fungi, and conducting large-scale inventories throughout the Pacific Northwest, will be adequate in ensuring that this project and future projects do not contribute to the need to list them (USDI 2004, 5-2) or jeopardize their persistence (USFS/BLM 2001).

3.10 Noxious Weeds

3.10.1 Methodology

- GIS and past survey reports were utilized to query BLM-managed acreage and weed species reported within the project area.
- For this resource the project area boundary was determined to be upper ridgelines encompassing the West Fork Cow Creek 10th field watershed.
- Noxious weed population calculations include populations located within proposed and final units, directly adjacent to proposed and/or final units (along the roads, landings, etc.), and along suspected haul routes.

3.10.2 Assumptions

BLM assumes that there are noxious weeds present on private lands within the project area, and that although industry is treating a subset of noxious weeds within selected areas, other private landowners are not.

3.10.3 Affected Environment

Over the last 150 years activities such as motor vehicle traffic, recreational use, rural and urban development, timber harvest, road construction, and natural processes have introduced and transported noxious weeds into the Rogue Valley. Noxious weeds are defined as plants that are "considered by a governmental agency to be injurious to public health, agriculture, recreation, wildlife, or property" (ODA 2013). Noxious weeds are spread by the wind and by seed via attachment to vehicles and vectors such as humans, animals, and birds, and are able to grow on suitable habitat – generally considered as any newly disturbed ground and/or an influx of light due to canopy removal.

Since the 1970s, recognition that weeds cause environmental damage resulted in the passage of State noxious weed laws, the Carson-Foley Act of 1968 – Plant Protection Act of 2000, and Presidential executive orders like Invasive Species E.O. 13112, which directs federal agencies to combat noxious weeds on federal lands. Additional direction is provided by the Medford District RMP, which states the district is to "contain and/or reduce noxious weed infestations on

BLM-administered land" (BLM 1995, 92), and "survey BLM-administered land for noxious weed infestations" (BLM 1995, 93). However, these activities are funding dependent.

The RMP directions for weed management are intended to be met at a landscape level; whether the direction is achieved is not intended to be measured at the site-specific level nor with the implementation of each project. Thousands of acres of weed treatments have occurred on federal (and non-federal) lands over the last decade across the Medford District with the RMP-driven objective of containing or reducing – not eradicating – noxious weed populations (Budesa 2006). In an effort to continue to contain and/or reduce noxious weeds on federal land, the BLM annually treats known weed populations within the Grants Pass Resource Area.

Due to the checkerboard nature of land ownership as discussed in Chapter 3, noxious weed management is challenging because seed sources are scattered throughout the project area and across all ownerships. In 2015, over 500 acres of BLM land in the Grants Pass RA were treated. Several roadsides within the Cold Elk project area have been treated for noxious weeds since 2012 and are scheduled for monitoring/re-treatment in 2016.

Pre-Project Clearance – Noxious Weed Survey Results

All final Cold Elk units were surveyed for noxious weeds from 2015 to 2016. In addition, several historic sites located along roadsides within the project area have been treated (not all in the same year) annually since 2010. Documented sites within the project area include *Cytisus scoparius* (Scotch Broom), *Senecio jacobaea* (Tansy ragwort), *Lathyrus latifolius* (perennial peavine), *Rubus armeniacus* (Himalayan blackberry), *Rubus laciniatus* (Cutleaf or Evergreen blackberry), *Centaurea pratensis* (Meadow knapweed), *Centaurea maculosa* (Syn: *Centaurea biebersteinii*) (Spotted knapweed), *Cirsium arvense* (Canada thistle), *Chondrilla juncea* (Rush skeletonweed), *Centaurea nigra* (Lesser knapweed), and *Hedera helix* (English Ivy).

Based on population sizes, per noxious weed reports provided by professional botany contractors, the Grants Pass botanist estimates that approximately 0.11 acres, or 0.003% (using 3,702 as final acreage) of the thinning units / fuels reduction units / road renovation / improvement / temp route construction acreage harbor noxious weeds. One of the species reported, Himalayan blackberry, is commonly found throughout our region; although small isolated patches might be treated, it is not practical to target for priority treatment due to its predominance across the landscape.

Table 35: 2012 and 2015 Plant Surveys Revealing Noxious Weed Species in the Cold Elk Project Area Units

Location in Township (T), Range (R), Section (S)	Species	Coverage in Square Feet	Oregon Department of Agriculture Designation	Plant Description / Habitat Requirements
T32S-R8W-S9 T32S-R8W-S11 T31S-R8W-S31 T31S-R8W-S19 T31S-R9W-S23 T31S-R9W-S25	Himalayan Blackberry	280 20 310 100 10 170	B*	Himalayan blackberry is a robust, clambering or sprawling evergreen shrub that grows up to 9.8 feet (3 m) tall (Munz 1974). Himalayan blackberry typically grows in open weedy sites, such as along field margins, railroad right-of-ways, roadsides, and riparian areas (Hitchcock and Cronquist 1973), (Laymon 1984), and, (Roberts 1980).
T31S-R8W-31	Cutleaf blackberry	100		Cutleaf blackberry is a nonnative perennial plant very similar to Himalayan blackberry, but not as robust or as invasive. Vegetative characteristics are similar to Himalayan blackberry, but the compound leaves of Cutleaf are deeply serrated (OSU Extension Cutleaf blackberry 2008).
T31-R8W-S19 T31-R8W-S33 T31-R9W-S23 T31-R9W-S25	Tansy ragwort	150 30 70 730	B*	Tansy ragwort is a biennial herb that requires sunlight and a disturbed site to establish. It is often found on roadsides, contributing to the spread of new infestations. Tansy ragwort will establish in disturbed sites including roadsides, pastures, and forested areas recently harvested for timber (Sweeney, Neiman, Jr. and Lakey 1992). The cinnabar moth (*Tyria jacobaeae*) is the biological agent effectively used to control tansy ragwort in Oregon, California, and Washington (Rees et al. 1996).
T31S-R8W-S19 T31-R8W-S31 T31-R9W-S35	Canada thistle	50 390 20	B*	Generally, Canada thistle establishes and develops best on open, moist, disturbed areas, including ditch banks, overgrazed pastures, meadows, tilled fields or open waste places, fence rows, roadsides, and campgrounds; and after logging, road building, fire and landslides in natural areas

Location in Township (T), Range (R), Section (S)	Species	Coverage in Square Feet	Oregon Department of Agriculture Designation	Plant Description / Habitat Requirements
				(Romme et al. 1995). Canada thistle is an early seral species, susceptible to shading, and grows best when no competing vegetation is present (Donald 1994). Canada thistle growth may be discouraged in disturbed natural areas if suitable native species are seeded densely enough to provide sufficient competition (Haber 1997).
T31-R8W-S33 T32-R8W-S11 T32-R8W-S9 T31-R8W-S31 T31-R9W-S25	Knapweed note: because many knapweeds share similar biological characteristics, they are grouped together in this report.	20 200 50 560 1630	B*	Meadow knapweed, a hardy biennial/perennial, favors moist roadsides, sand or gravel bars, river banks, irrigated pastures, moist meadows, and forest openings. Prefers full sun and well-drained soils. Many infestations start on rights-of-way or from infested gravel or fill. Seeds are often transported by automobiles, contaminated fill and gravel, and by wildlife (King County Noxious Weed Control Program 2004).
T32-R8W-S9 T31-R9W-S25	Scotch broom	30 10	B*	Scotch broom is a long-lived, brushy, early seral colonizer which does not grow well in forested areas, but invades rapidly following logging, land clearing, and burning (Mobley 1954). Scotch broom is generally intolerant of shade and will not grow in heavily shaded places (DiTomaso 1998), and is typically shaded out once native species are established (Bossard, Randall and Hoshovsky 2000), (P. A. Williams 1983) or forest canopy closes (Sawyer, Sillett and Popenoe 2000).
T31S-R4W-S29 T31S-R4W-S31	Rush skeletonweed	10 1000	B*	Rush skeletonweed is a long-taprooted biennial/perennial which prefers two soils types found in the pacific northwest: the sandy to gravely and well drained soils, and the shallow soils over bedrock, typical in the channeled scablands (Old 1981). Rush skeletonweed is primarily a species of disturbed roadsides although it is also found on river banks, dry river beds, degraded coastal dunes, and eroded

Location in Township (T), Range (R), Section (S)	Species	Coverage in Square Feet	Oregon Department of Agriculture Designation	Plant Description / Habitat Requirements
				ground (McVean 1966). Seeds are commonly transported via wind currents, and are often carried up to 20 miles from the original seed source (McLellan 1991).
Total Sq. feet		4930 sq ft = 0.11 ac		

* "B" designation: a weed of economic importance which is regionally abundant but which may have limited distribution in some counties. Where implementation of a fully integrated statewide management plan is not feasible, biological control shall be the main control approach (Oregon Department of Agriculture 2005).

3.10.4 Alternative 1 – No Action

Direct and Indirect Effects

Under the No Action Alternative, noxious weeds within the Planning Area would continue to spread into suitable habitat at an unknown rate. The rate at which noxious weeds spread is impossible to quantify, as it depends on a myriad of factors including, but not limited to, logging on private lands, motor vehicle traffic, recreational use, rural and urban development, and natural processes (BLM 1985). The following table (36) illustrates how each of these activities affects noxious weed dispersal.

Table 36: Factors Affecting the Determination of the Rate of Noxious Weed Spread

Activity	Role in Potential Noxious Weed Seed Dispersal
Private Land	Private lands host a perpetual source for noxious weed seed, which can be dispersed when seeds attach to tires, feet, fur, feathers, or feces; or when natural processes such as wind and/or flooding events transport the seed from its source to another geographical vicinity.

Activity	Role in Potential Noxious Weed Seed Dispersal
Logging on Private Lands	Logging activity presents a key dispersal opportunity for noxious weed seeds per 1) attachment to tires/tracks of mechanized logging equipment, tires of log trucks, and various other logging-related substrates which subsequently transport the seed from its source to another geographic vicinity, 2) creation of openings for potential noxious weeds colonization and 3) a lack of PDFs – such as equipment/vehicle washing, etc. – which attempts to reduce the activity's spread of noxious weed seeds.
Motor Vehicle Traffic (including Log Trucks)	Roads on public land include public use, which results in a plethora of seed-dispersing activities occurring on a daily basis. Private landowners use public roads to haul logs, undertake recreational pursuits, and/or access their properties. This transportation often occurs along BLM-administered roads, which are situated within a checkerboarded ownership arrangement. How or when seed detachment occurs is a random event that could take place within feet or miles from the work site/seed source, presenting a high likelihood of detachment on public lands.
Recreational Use	The public often recreates on BLM-managed public lands, and can spread seed from their residences to public land in a variety of ways such as attachment to vehicle tires; hikers' sox, shoes, or other clothing; the fur of domesticated animals, etc.
Rural and Urban Development	Rural development occurring within the checkerboard land arrangement often requires public landowners to acquire a Right-of-Way (ROW) from the BLM to legally access their parcel(s). These ROWs, or use of BLM-administered roads is often granted. Please refer to 'Motor Vehicle Traffic' and 'Private Land,' for clarification of how this affects the spread of noxious weeds from private to public lands.
Natural Processes	Wind, seasonal flooding, and migration patterns of birds/animals are a few natural processes that potentially spread noxious weeds, especially from private land to public land. Wind carries seeds, and deposits them at random intervals. High water caused by flooding reaches vegetation (often harboring a noxious weed component) growing on the banks of rivers/creeks/streams, and deposits seeds downstream.

The abovementioned activities contribute to noxious weed spread and can degrade some elements of the environment. To predict the rate of this degradation would be highly speculative, as the extent of weed expansion is dependent on so many factors that it is considered impossible to quantify. The degree of degradation would depend on the noxious weed species, as some, such as scotch broom and meadow knapweed, are more intrusive and/or have a higher tolerance to heat generated from wildfires, than others.

Across the Grants Pass Resource Area, the more aggressive species are prioritized and slated for treatment under Medford District's *Integrated Weed Management Plan and Environmental Assessment OR-110-98-14* as a separate project. However, the success of implementing the weed management plan would be temporary, as logging on non-federal lands, recreational use, rural and urban development, natural processes, and vehicle traffic will continue to spread noxious weed populations into the Project Area regardless of extraction activities proposed in this document.

Cumulative Effects

Under the No Action Alternative, noxious weeds within the Planning Area would continue to spread into suitable habitat at an unknown rate. The rate at which noxious weeds spread is impossible to quantify, as it depends on a myriad of factors including, but not limited to, logging on private lands, motor vehicle traffic, recreational use, rural and urban development, and natural processes (BLM 1985). The following table (37) illustrates how each of these activities affects noxious weed dispersal.

Table 37: Factors Affecting the Determination of the Rate of Noxious Weed Spread

Activity	Role in Potential Noxious Weed Seed Dispersal
Private Land	Private lands host a perpetual source for noxious weed seed, which can be dispersed when seeds attach to tires, feet, fur, feathers, or feces; or when natural processes such as wind and/or flooding events transport the seed from its source to another geographical vicinity.
Logging on Private Lands	Logging activity presents a key dispersal opportunity for noxious weed seeds per 1) attachment to tires/tracks of mechanized logging equipment, tires of log trucks, and various other logging-related substrates which subsequently transport the seed from its source to another geographic vicinity, 2) creation of openings for potential noxious weeds colonization and 3) a lack of PDFs – such as equipment/vehicle washing, etc. – which attempts to reduce the activity's spread of noxious weed seeds.
Motor Vehicle Traffic (including Log Trucks)	Roads on public land include public use, which results in a plethora of seed-dispersing activities occurring on a daily basis. Private landowners use public roads to haul logs, undertake recreational pursuits, and/or access their properties. This transportation often occurs along BLM-administered roads, which are situated within a checkerboarded ownership arrangement. How or when seed detachment occurs is a random event that could take place within feet or miles from the work site/seed source, presenting a high likelihood of detachment on public lands.
Recreational Use	The public often recreates on BLM-managed public lands, and can spread seed from their residences to public land in a variety of ways such as attachment to vehicle tires; hikers' sox, shoes, or other clothing; the fur of

Activity	Role in Potential Noxious Weed Seed Dispersal
	domesticated animals, etc.
Rural and Urban Development	Rural development occurring within the checkerboard land arrangement often requires public landowners to acquire a Right-of-Way (ROW) from the BLM to legally access their parcel(s). These ROWs, or use of BLM-administered roads is often granted. Please refer to 'Motor Vehicle Traffic' and 'Private Land,' for clarification of how this affects the spread of noxious weeds from private to public lands.
Natural Processes	Wind, seasonal flooding, and migration patterns of birds/animals are a few natural processes that potentially spread noxious weeds, especially from private land to public land. Wind carries seeds, and deposits them at random intervals. High water caused by flooding reaches vegetation (often harboring a noxious weed component) growing on the banks of rivers/creeks/streams, and deposits seeds downstream.

The abovementioned activities contribute to noxious weed spread and can degrade some elements of the environment. To predict the rate of this degradation would be highly speculative, as the extent of weed expansion is dependent on so many factors that it is considered impossible to quantify. The degree of degradation would depend on the noxious weed species, as some, such as scotch broom and meadow knapweed, are more intrusive and/or have a higher tolerance to heat generated from wildfires, than others.

Across the Grants Pass Resource Area, the more aggressive species are prioritized and slated for treatment under Medford District's *Integrated Weed Management Plan and Environmental Assessment OR-110-98-14* as a separate project. However, the success of implementing the weed management plan would be temporary, as logging on non-federal lands, recreational use, rural and urban development, natural processes, and vehicle traffic will continue to spread noxious weed populations into the Project Area regardless of extraction activities proposed in this document.

3.10.5 Alternative 2

Direct and Indirect Effects

In the short term (approximately 1-5 years), proposed activities within the Project Area – including road construction, landing construction, lop-and-scatter and/or piling and burning of activity fuels, and associated hauling – could result in spreading noxious weeds. However, the rate at which this potential spread would occur is unknown due to the indistinguishable causal effect of other activities and factors listed in table A6-2 on the spread of noxious weeds. The outcome of the following activities would provide suitable habitat and/or plausible vectors associated with noxious weed colonization;

- openings caused by landing construction, 1.92 miles of temporary road reconstruction 5.64 miles of temporary route construction.

- increased vehicle traffic which could increase, or at least perpetuate, weed infestations along road systems via seed dispersal.

Openings and disturbance provide the greatest opportunity for the establishment of noxious weeds. Project Design Features (PDFs) have been included in the project design in an effort to decrease the potential spread of weeds associated with the Proposed Action. PDFs include washing equipment prior to moving it on-site, mulching with certified weed-free straw, and seeding and/or planting newly created openings with native/approved vegetation. These PDFs are widely accepted and utilized as Best Management Practices (BMPs) in noxious weed control strategies across the nation (Thompson 2006). Table 38 delineates the PDFs and their expected implementation results.

Table 38: Project Design Features and Expected Implementation Results

Project Design Feature (PDF)	Result of Implementing PDF
Washing vehicles / equipment	Removes dirt that may contain viable noxious weed seeds, thereby reducing the potential for noxious weed spread
To the maximum extent possible, operate vehicles/equipment during the dry season	Reduces the potential for viable noxious weed seed to be transported and dispersed via mud caked on the undercarriages/tires/tracks of logging equipment.
Seeding and/or planting newly created openings with native/approved seed.	Introduces native/approved vegetation to the site prior to noxious weed seed recruitment, allowing native/desirable plants an advantageous jump-start in reestablishment, reducing the potential for noxious weed infestation.
Covering disturbed soil with certified weed-free straw	Reduces the potential for erosion and suppresses potential annual weed invasion by covering soil to prevent soil/seed contact needed for germination (C. A. Wilen n.d.). When combined with seeding with native/approved species, increases the potential for desirable vegetation to germinate and outcompete noxious weeds.

Implementing the suite of PDFs that reduce the potential spread of noxious weeds associated with the Proposed Action, and using native species for seeding/planting newly disturbed

openings is expected to result in a similar potential of noxious weed expansion as associated with the No Action Alternative.

In the long term (5-100 years), tree canopies would eventually expand and reduce light levels, creating a less desirable growing site, thus discouraging weeds from growing and expanding within treated areas, because populations typically decline as the amount of light reaching the plants diminishes. Consequently, remaining weed populations would be confined to the road prism and adjoining (private) disturbed land as canopy re-establishes in treated areas over time.

The effect of implementing Alternative 2 could possibly result in the establishment of new noxious weed populations. Although the *immediate* potential for weed spread would be less with the No-Action Alternative than for the Proposed Action, the potential for the spread of existing noxious weeds and the introduction of new species is considered similar for both alternatives, because of the inclusion and implementation of all PDFs in Alternative 2, and the fact that under the No Action Alternative, populations would continue to establish and spread due to seed transport by vehicular traffic, wildlife, and other natural dispersal methods listed in Table 38.

Indirect effects associated with noxious weed population enlargement are similar to those mentioned in the No Action Alternative, and are known to include: declines in the palatability or abundance of wildlife forage (Rice and Toney 1997), declines in native plant diversity (Forcella and Harvey 1983; Tyser and Key 1988; Williams 1997), reductions in the aesthetic value of the landscape, encroachment upon rare plant populations and their habitats, potential reductions in soil stability and subsequent increases in erosion (Lacey et al. 1989), and an overall decline of ecosystem health.

There are three main reasons why potential weed establishment that might be caused by the Proposed Action is not expected to result in a detectable effect to overall ecosystem health. First, surveys indicate that a very small percentage – 0.07% of acreage within the Project Area units – are affected by noxious weeds. Second, these sites located in units proposed for treatment have been reported during pre-disturbance surveys, and some (depending on how aggressive the species is) already received treatment in 2014 under Medford District's *Integrated Weed Management Plan and Environmental Assessment OR-110-98-14*; this means that the acreage in the Planning Area affected by noxious weeds is now even closer to 0% than before. However, it is possible that noxious weeds could be reintroduced in the Planning Area due to ongoing activities listed in Table A8-2. Third, as mentioned, PDFs would minimize the rate at which project activities might potentially spread noxious weed seed from outside/adjacent sources.

Cumulative Effects

In order to address the cumulative effects of the Proposed Action on the spread of noxious weeds, the condition of non-federal lands must be considered. However, there is limited available data regarding noxious weed occurrence on local non-federal lands. Therefore, for purposes of this analysis, BLM assumes that 1) there is a perpetual source of noxious/invasive weeds on non-federal lands that can spread to federal lands, especially when the land ownership is checkerboarded, as within the Project Area, and 2) conversely, that noxious weeds are not established on these lands, and therefore there is a need to reduce the risk of spread of noxious weeds from the federal lands to the adjoining non-federal lands. Seeds are spread by the wind,

by animal/avian vectors, natural events, and by human activities – in particular through soil attachment to vehicles. BLM's influence over these causes of the spread of noxious weeds is limited to those caused by human activities. Additional human disturbance and traffic would increase the potential for spreading noxious weed establishment, but regardless of human activity, spread of these weeds would continue through natural forces. Thus, the BLM cannot stop the spread of noxious weeds; it may only reduce the risk or rate of spread.

Given the unpredictable vectors for weed spread, such as the vehicle usage by private parties, wildlife behavior, and wind currents, it is not possible to quantify with any degree of confidence the rate of weed spread in the future, or even the degree by which that potential would be increased by the Proposed Action.

Foreseeable activities within the Project Area are listed under the No Action Alternative, and are expected to be similar to past and current activities: motor vehicle traffic, recreational use, rural and urban development, timber harvest, road construction, and firewood collection. These types of activities could result in new disturbed sites available for colonization by existing noxious weed populations, and they do offer the possibility of introduction of new noxious weed species to the Project Area under any alternative, including the No-Action Alternative. As stated above, there is no available data concerning the rate of weed spread occurring on either federal or non-federal lands as a consequence of these specific types of activities. Additionally, there is no information on what, if any, increase in the rate of weed spread the Proposed Action would cause, and hence, it is not possible to quantify with any degree of confidence what the incremental effect of the Proposed Action on the spread of noxious weeds would be when added to the existing rate of weed spread caused by past, present, and future actions.

PDFs exist to reduce the potential that the Proposed Action would contribute to the spread of weed seed and establishment of new populations. PDFs are not intended or expected to completely eliminate any possibility that the Proposed Action would contribute to the spread of weed seed and establishment of new populations; however, PDFs ensure that any incremental contribution of the Proposed Action to the spread of weeds, when added to the rate of weed spread caused by past, present, and future actions, would be so small as to be incapable of quantification or distinction from background levels.

Data collection would not reduce the inherent speculation in predicting incremental effects of the proposed action on the spread of weeds because of (1) the unpredictable natural factors that largely determine whether weeds would spread after project activities, (2) the unlikelihood that future data collection would be able to detect or measure any difference between background rates of weed spread and the rate of weed spread as affected by the Proposed Action and correspondingly reduced by PDFs, and (3) the PDFs that would reduce, if not eliminate, any project effects on the rate of weed spread that would make the already undetectable effects of the Proposed Action even more undetectable. Finally, further data collection on the rate of spread would not alter the PDFs already being applied to reduce that rate of spread. It cannot be over emphasized that under the "No Action" Alternative, noxious weeds are likely to spread over time regardless of whether or not the Cold Elk project occurs, and that rate would not be altered to any detectable degree by the Proposed Action.

3.11 SocioEconomics

3.11.1 Affected Environment

The proposed project area is located within Coos and Douglas Counties and a small portion of Curry County. Table 1 shows selected characteristics of these counties compared to the State of Oregon (Headwaters Economics 2016). The county populations range from 22,000 in Curry to 107,000 in Douglas. The median age in all three counties is considerably higher than the statewide average, so it is not surprising that a higher proportion of household earnings comes from retirement sources compared to the statewide proportion. All three counties have unemployment rates higher than that for Oregon as a whole, and depend much more on the timber industry as a source of private employment.

The percent of individuals that are considered minorities due to race and/or ethnicity is lower in each county than for the State as a whole. Coos and Douglas counties have a higher percentage of people living below the poverty level than the statewide proportion, while Curry's percentage is just below the State's.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires Federal agencies to identify and address any disproportionately high and adverse human health or environmental effects of its actions on minority populations and low-income populations. Based on the above data, none of the three counties are considered environmental justice populations due to their minority status, but Coos and Douglas counties are considered environmental justice populations due to their low-income status, given poverty rates higher than that of the State as a whole.

Table 39: Selected Social and Economic Characteristics. Data from Headwaters Economics (2016); all numbers are 2014 unless noted

Area											
Coos	62,678	13.8	18	48	19	28	7.8	9.2	25	16	11
Douglas	107,156	10.9	19.7	47	16	27	13.2	9.4	53	20	36
Curry	22,341	12.1	15.4	54	22	28	11.4	10.4	69	6	30
State of Oregon	3,900,343	22.4	16.7	39	30	19	2.4	6.9	54	25	.8

Curry County contains a greater percentage of Federal lands (69%) than that present statewide (54%), while Douglas County contains about the same percentage as the State (53%) and Coos County contains much less (25%). Douglas County contains the highest percentage of BLM-managed lands (20%); Coos County follows with 16% but is the only one of the three counties where the majority of Federal lands are managed by the BLM.

All three counties rely on Federal payments as a significant proportion of revenue (Table 1). The Draft RMP/EIS for Western Oregon described how, given the precipitous decline in O&C payments to counties as Federal timber harvests declined, Congress provided payments to counties, currently through the Secure Rural Schools program. The Counties have been using SRS payments as they used O&C payments for services such as public safety, county roads, and education (Tuchmann and Davis 2013).

In 2012, Coos, Curry, and Douglas counties relied more on SRS payments than any of the other O&C counties, as measured by the proportion of county revenue provided through SRS funds. Federal payments are especially valuable to counties because they are part of the counties' discretionary or general fund; in 2012 SRS payments constituted 25 % of the general fund in Curry County, 70% in Douglas County, and 82% in Coos County.

The State of Oregon Business Development Department conducts economic assessments to determine which counties, cities, communities, or other geographic areas qualify as distressed, taking into account unemployment rates, per capita personal income, change in average covered payroll per worker over 3 years, and other data (Business Oregon 2014). Coos, Curry, and Douglas

counties are among the 24 of Oregon's 36 counties considered to be distressed. In 2012, the Oregon Secretary of State identified eight counties, including Coos, Curry, Douglas, whose financial condition may indicate a higher risk of distress than other counties (Oregon Secretary of State 2012).

3.11.2 Alternative 1 – No Action

Direct and Indirect Effects

The primary effect of not taking action would be the lack of socioeconomic benefits. The market and non-market benefits described below would not be realized.

3.11.2 Alternative 2 – Proposed Action

Direct and Indirect Effects

Two timber sales are anticipated to be generated from this project. The volume and type of timber that would be produced are not described as part of the alternatives, so it is not possible to quantify the social or economic benefits. However, it is reasonable to assume that some level of employment and income would be created, as well as O&C payments to the counties. This would be a benefit especially given the presence of environmental justice populations due to low-income status and the counties' distressed economic condition. As reflected by one of the public comments, some would prefer to see these economic benefits increased through use of regeneration harvest, which was not considered due to other environmental consequences. The planned project may be more socially acceptable to some given the multiple goals and lack of regeneration harvest, increasing the likelihood that any planned sales would actually occur.

The benefits (or at least lack of negative effects) of the proposed action to fisheries and wildlife resources within the planning area, the long-term benefits to spotted owl habitat, and reduction of fire hazard, are described in the other resource sections of the EA. Although there is not a market where such services are bought and sold, these benefits nonetheless provide non-market values, contribute to ecosystem services, and, indirectly, could benefit some economic sectors. As such, the proposed action could provide economic value to the public. In the present situation there is not a need to quantify this value given the lack of negative economic consequences.

Chapter 4 Preparers, Consultation and Coordination

4.1 IDT Members

Table 40: List of Preparers

List of Preparers		
Bob Lange	Hydrologist	Hydrology/Water Resources/Soil Erosion
Cindy Wedekind	Engineer	Road Specification/Engineering
Leah Schofield	Environmental Coordinator	NEPA Compliance/Project Lead
Marlin Pose	Wildlife Biologist	Wildlife
Julie Arwood	Archaeologist	Cultural Resources
Jon Raybourn	Fish Biologist	Fisheries
Mike Main	Fuels Specialist	Fire and Fuels/Air Quality/Safety
Rachel Showalter	Botany	Plants/Noxious Weeds
Sarah Queen-Foster	Forester	Harvest Systems & Road Design
Sean Gordon	Silviculturist	Vegetation/Soil Compaction and Productivity
Brian Lawatch	Writer/Editor	Editing/Document Preparation

4.2 Consultation and Coordination

4.2.1 Northern Spotted Owl and Marbled Murrelet, Section 7 Consultation USFWS

The Medford District prepared a biological assessment on the effects for proposed actions included in the Cold Elk Forest Management Project and submitted it to the US Fish and Wildlife Service on June 7, 2016. The USFWS is reviewing the document, and the resulting determination from the Biological Opinion will be included in the Cold Elk Decision Record.

4.2.2 Tribal Coordination

The BLM sent the Cold Elk Forest Management Project scoping letter to local federally recognized Tribes interested in Medford District Bureau of Land Management proposed projects, including the Cow Creek Band of Umpqua Tribe of Indians, Confederated Tribes of the Grand Ronde Community of Oregon, and Confederated Tribes of the Siletz Indians of Oregon.

4.2.3 State Historical Preservation Office

The BLM Medford Districts is party to the State Protocol between the Oregon-Washington State Director of the Bureau of Land Management and Oregon State Historic Preservation Office (Protocol). The Protocol provides a streamlined Section 106 review process for most undertakings, including the proposed project. As per Section VI. C (10) of the Protocol, where no historic properties are present within the Area of Potential Effect, the BLM may proceed with the undertaking without further consultation.

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Appendix A – Compliance with Aquatic Conservation Strategy

Aquatic Conservation Strategy Assessment

"The Aquatic Conservation Strategy was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands. The strategy would protect salmon and steelhead habitat on federal lands managed by the Forest Service and Bureau of Land Management within the range of the Pacific Ocean anadromy" (1995 Medford District RMP pg. 22).

The four components of the Aquatic Conservation Strategy (ACS) are Riparian Reserves, key watersheds, watershed analysis, and watershed restoration. The ACS was designed to meet the nine objectives discussed below.

This ACS consistency analysis evaluates the Cold Elk Forest Management Project EA on BLM land.

Analysis of the Four Components of the ACS:

Riparian Reserves: The proposed project is consistent with the actions and directions within Riparian Reserves as described in the Medford District RMP. The Action Alternatives would result in thinning and understory treatments to promote forest health and the development of large woody debris (LWD) within Riparian Reserves outside the Ecological Protection Zone (EPZ). Thinning would be designed to expedite the development of late successional, multi-story habitat conditions and restore the species composition and structural diversity of the plant communities, needed to achieve ACS and Riparian Reserve objectives (Medford RMP, p. 22 and p. 26 respectively). Riparian Reserves within the proposed units are currently dominated by Douglas-fir and some hardwoods. Most riparian stands are lacking large wood debris, downed logs, and large tree structure. Thinning of dense Riparian Reserves would reduce competition on the retained trees for light, nutrients, water and growing space, allowing trees to develop larger canopies, display better vigor and put on diameter growth faster than if left untreated.

The project is also consistent with the Best Management Practices (BMP) within Appendix D of the 1995 Medford RMP.

2. Key Watershed: The Planning Area is located in West Fork Cow Creek Tier 1 Key Watershed (RMP, p. 22-23) which provides refugia crucial for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species. These refugia include areas of high quality habitat and areas of degraded habitat. Key watersheds overlay other land use allocations and place additional management requirements and/or priorities on these land use allocations.

3. Watershed Analysis: The BLM completed the West Fork Cow Creek Watershed Analysis in 1997. The proposed activity is consistent with the Watershed Analysis.

The Watershed Analysis found that management directions in the Northwest Forest Plan and the 1995 RMP including the Aquatic Conservation Strategy, Best Management Practices, and Riparian Reserve management would be adequate at protecting, maintaining and improving

aquatic and riparian ecosystems. The Watershed Analyses recommended reducing road densities which are not needed for future management.

The Watershed Analysis discussed restricting road construction or considering alternatives to constructing new roads in sensitive soil areas. Permanent road construction is not proposed under the Cold Elk Forest Management Project. Many of the roads in the Planning Area are not public roads and are under reciprocal Right-of-Way agreements with private landowners because of the checkerboard ownership pattern. The BLM does not have the option to close these roads due to the reciprocal Right-of-Way agreements.

4. Watershed Restoration: Though the Cold Elk Forest Management Project is not an aquatic watershed restoration project, it would aid in the improvement of watershed health through the following proposed activities: thinning and activity fuels reduction in Riparian Reserves.

Analysis of the Cold Elk Forest Management Project for consistency with the Aquatic Conservation Strategy objectives:

The ACS gives direction to maintain and restore ecosystem health at watershed and landscape scales. For the purposes of this analysis the watershed scale will be discussed in terms of site or project scale and will be at the HUC 12 and 14 watersheds. The landscape scale will be at the HUC 10 watershed level.

Appropriate consideration of potential cumulative effects is a critical element in determining a project's consistency with the ACS. The minimal effects at the HUC 14 scale would not reach a magnitude detectable at the HUC 12 or HUC 10 scales. Because there would be no detectable cumulative effects caused by the Action Alternatives, cumulative effects will not be discussed in the individual ACS objectives.

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.

The watershed and landscape-scale features which protect species, populations, and communities dependent on aquatic systems would be maintained and in some cases enhanced in the short term and long term. The distribution, diversity, and complexity of watershed and landscape-scale features needed for the protection of aquatic systems would be maintained. Proposed activities such as road decommissioning and riparian thinning would restore watershed features in the short and long term.

Riparian Reserves

One key component of watershed and landscape scale features needed for the protection of aquatic systems is Riparian Reserves. Riparian Reserves would be maintained at the site and watershed levels in the short and long term. Riparian vegetation treatments (thinning) would enhance riparian characteristics. Riparian thinning would result in a reduction in stand densities and would allow for the development of late successional riparian characteristics. One of these characteristics is multi-level canopy cover which helps to maintain cool water temperatures. Late successional characteristics in riparian areas also include downed coarse woody debris and

large woody debris (LWD) which increases channel complexity, and diverse species composition which provides a variety of chemical and biological inputs to streams. Riparian thinning would also reduce the spread of disease and the risk of a high intensity or severity fire in Riparian Reserves. Such a fire could result in tree mortality and a reduction in shade, which could negatively affect fish habitat by causing an increase in water temperature, a reduction in future recruitment of LWD, and an increase in soil erosion and sediment entering streams.

Roads

The project would include some temporary route construction and existing temporary route renovation/reconstruction to access timber in units proposed for thinning. These routes would be decommissioned after use. This action would not lead to stream sedimentation due to the predominately ridgetop location of these roads which are hydrologically disconnected.

Project Design Features (PDFs) would be expected to minimize sediment routing to streams through restrictions on ditch blading, use of cross drains, and the use of temporary sediment control measures. A small amount of sediment may enter streams without fish habitat during log haul and existing road maintenance where roads are hydrologically connected. All sediment producing actions would result in negligible sediment inputs which would not be observable or distinguishable from background levels. Sediment would not be expected to enter fish-bearing streams as a result of haul or maintenance of haul roads, with dry condition haul, well-vegetated ditch lines, properly functioning cross drains, and existing filter strips, or sediment barriers installed, where needed, to prevent sediment delivery into fish-bearing streams.

This project would not increase the number of permanent roads within these sub-watersheds, since permanent road building is not part of the proposed project.

Peak Flows

The Action Alternatives would not affect the timing, magnitude, duration, and spatial distribution of peak, high and low flows. See Chapter 3.6, Hydrology, for more information.

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

The spatial and temporal connectivity within and between watersheds would be maintained in the short and long term at the site and landscape scales. Chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species would be maintained.

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

The physical integrity of aquatic systems, including shorelines, banks, and bottom configurations would not be affected at the site or landscape scale in the short or long term. The proposed

activities would not manipulate or affect shore lines, banks, or bottom configurations.

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.

Water quality necessary to support healthy riparian, aquatic and wetland ecosystems would be maintained. Water quality would remain within the range that maintains biological, physical, and the chemical integrity of streams.

Harvesting, yarding, landing construction and rehabilitation, temporary route construction and reconstruction (including route decommissioning), road renovation/improvement, road maintenance hauling, and fuel treatments would have no effect on Oregon Coast (OC) coho salmon (ESA-Threatened), coho critical habitat (CCH), or any other fish habitat. There are six haul road segments where BLM-maintained roads cross over coho bearing streams; four via culverts, and two over bridges. There are two additional haul road crossings on steelhead and cutthroat trout streams, both via culverts. Sediment would not be expected to enter CCH or other fish habitat as a result of haul or maintenance of haul roads, with dry condition haul, well-vegetated ditch lines, properly functioning cross drains, and existing filter strips, or sediment barriers installed, where needed, to prevent sediment delivery into fish-bearing streams.

Slight increases in turbidity may occur in the short term in localized areas as a result of road use activities near streams without fish habitat. Best Management Practices (BMPs) would be implemented to minimize the amount and duration of sediment entering these stream channels. Such increases in turbidity would not measurably alter the biological, physical, or chemical integrity of streams. Aquatic and riparian dependent species' survival, growth, reproduction, and migration would be maintained.

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

The sediment regime under which aquatic ecosystems evolved would be maintained at the site and landscape scales in the short and long terms. Some of the proposed activities such as road reconstruction and road maintenance would reduce sediment input in the short and long term. Streams within the Planning Area evolved with sediment input. Sediment input can result from natural disturbances such as landslides, slumps, wildfires, bank erosion, and channel scour.

Road Related Activities

Dry condition haul on proposed routes would result in negligible amounts of sediment entering streams without fish habitat because the roads are either bituminous surface treatment (BST) or crushed aggregate (rocked) or are hydrologically disconnected due to ridgetop location of timber harvest units.

Dry condition hauling on proposed routes could result in sediment entering stream channels without fish habitat, but because of PDFs the amount would be minimal. Sediment would not be

expected to enter CCH or fish-bearing streams as a result of haul or maintenance of haul roads, with dry condition haul, well-vegetated ditch lines, properly functioning cross drains, and existing filter strips, or sediment barriers installed, where needed, to prevent sediment delivery into CCH and fish-bearing streams.

Changes in channel embeddedness, interstitial spaces, and pool depth would not be measurable.

Road maintenance would result in a minimal amount of sediment reaching stream channels without CCH or other fish habitat. Increased sediment levels from road maintenance would not be detectable above background levels, and sediment input would be undetectable and short term. Changes in embeddedness, interstitial spaces, and pool depth would not be measurable.

Harvest Activities

All other soil disturbing activities are located outside the EPZ, and would be implemented using BMPs that minimize the quantity and transport of soil erosion. Since the EPZ is designed to filter out sediment produced during upslope activities that are implemented using BMPs, these activities would not result in any sediment entering streams.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

The Cold Elk Forest Management Project would not affect the timing, magnitude, duration, and spatial distribution of peak, high and low flows. See Chapter 3.6, Hydrology, for more information.

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

The timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands would not be affected by any of the proposed activities. There are no wetlands, as defined on page 117 of the 1995 RMP, in the Planning Area.

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 species composition and structural diversity of plant communities in riparian areas would be maintained at the site and landscape scales in the short and long term. There are no wetlands, as defined on page 117 of the 1995 RMP, in the Planning Area. Vegetation treatments proposed for the Action Alternatives were designed to enhance riparian conditions in the short and long term. Plant communities in riparian areas would be maintained and enhanced through silvicultural prescriptions and no treatment buffers in order to provide for 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.

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

Habitat for riparian-dependent plant, invertebrate and vertebrate species would be maintained at the site and landscape scales. Vegetation treatments proposed were designed to enhance riparian conditions in the short and long term. There would not be a reduction of habitat needed to support riparian dependent species in the short term or long term.

CONCLUSION:

Based on this analysis at both the site and landscape scales of the proposed activities in the Cold Elk Forest Management Project, it was determined that the actions are consistent with the nine objectives and the four components of the ACS. This determination was based on the small spatial and temporal disturbances associated with the proposed activities, and the implementation of Best Management Practices, and Project Design Features.

Appendix B – Definitions

Abiotic – Nonliving basic elements and compounds of the environment.

Activity Fuels – Slash created from forest management activities such as timber and vegetative cutting. To reduce the fuel loading, activity slash within units may be machine or hand pile/burned, chipped, or lopped and scattered based on a post-harvest assessment of fuel loading.

Biological Assessment (BA) - Document prepared by or under the direction of BLM concerning listed and proposed species and designated and proposed critical habitat that may be present in a project area(s) and contains the BLM's determination of potential effects of the action on such species and habitat. Biological assessments are required for formal consultations and conferences on "major construction projects." They are recommended for all formal consultations and formal conferences and many informal consultations where a written evaluation of the effects of an action on listed or proposed species and on designated or proposed critical habitat is needed.

Burn Severity – A qualitative assessment of the heat pulse directed toward the ground during a fire. Burn severity relates to soil heating, large fuel and duff consumption, consumption of the litter and organic layer beneath trees and isolated shrubs, and mortality of buried plant parts.

Low burn severity – Litter is charred to partially consumed; upper duff layer may be charred but the duff is not altered over the entire depth; surface appears black; soil is not visibly altered; woody debris is partially burned; logs are scorched or blackened but not charred; foliage and smaller twigs are partially to completely consumed; branches are mostly intact.

Moderate burn severity – Litter is mostly to entirely consumed, leaving coarse, light-colored ash (ash soon disappears leaving mineral soil); duff is deeply charred, but not visibly altered; woody debris is mostly consumed; logs are deeply charred and burned out stump holes are evident; foliage twigs and small stems are consumed; some branches are still present.

High burn severity – Litter and duff are completely consumed, leaving fine white ash (ash disappears leaving mineral soil); mineral soil is charred and/or visibly altered, often reddish; sound logs are deeply charred and rotten logs are completely consumed; all plant parts are consumed, leaving some or no major stems or trunks, any left are deeply charred.

Canopy Base Height – The average height from the ground to a forest stand's canopy bottom. Specifically, it is the lowest height in a stand at which there is a sufficient amount of forest canopy fuel to carry fire vertically into the canopy.

Cable yarding - Removes logs by use of wire cable(s) and tower for full or partial suspension log removal from harvest units.

Canopy Cover – Commonly expressed as a percentage of total ground area; for example, at 50% canopy cover, half of the total ground area is covered by the vertical projection of tree crowns (Scott, J. H. 2007).

Coarse Woody Debris - Portion of trees that have fallen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter.

Compaction - Refers to soil becoming consolidated by the effects of surface pressure often from heavy machinery or vehicle and pedestrian traffic.

Critical Habitat Unit - Under the Endangered Species Act, (1) the specific areas within the geographic area occupied by a federally listed species on which are found physical and biological features essential to the conservation of the species, and that may require special management considerations or protection; and (2) specific areas outside the geographic area occupied by a listed species when it is determined that such areas are essential for the conservation of the species. For further information see (Federal Register (57):1796-1838) for the 1992 CHU designation and Federal Register (73): 47326-47522 for the 2008 CHU designation.

Crown scorch – A measure of the proportion of foliage that has been killed by the fire relative to the entire amount of foliage present before the burn (SWOFIDSC 2001).

Decay Class – Any of five stages of log deterioration in the forest. Stages range from essentially sound (decay class 1) to almost total decomposition (decay class 5).

Diameter Breast Height (DBH) – Tree diameter, measured 4.5 feet above ground on the uphill side of the tree.

Dry Condition – Hauling on hydrologically connected natural surface or rocked roads would only be allowed during dry conditions as described any time where these following conditions are not present: water is flowing in the ditchlines of hydrologically connected natural surface or rocked roads, surface displacement such as rutting or ribbons; continuous mud splash or tire slide; fines being pumped through road surfacing from the subgrade and resulting in a layer of surface sludge; road drainage causing a visible increase in stream turbidities; or any condition that would result in water being chronically routed into tire tracks or away from designed road drainage during precipitation events. Hauling on natural surface or rocked roads would not resume for a minimum of 48 hours following any storm event that results in ½ inch or more precipitation within a 24-hour period, and until road surface is sufficiently dry to prevent any of the above conditions from reoccurring.

Early Seral Condition (Early Successional Stage) – A stage of development of an ecosystem from a disturbed, relatively un-vegetated state, to a plant community that is up to about 30 years old. Stand structure is seedling and sapling size shrubs and trees.

Early Seral Stage – The first of five seral stages in a series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage; the period from disturbance to the time when crowns close and conifers or hardwoods dominate the site. Under the current forest management regime, the duration is approximately zero to ten years. This stage may be dominated by grasses and forbs or by sprouting brush or hardwoods. Conifers develop slowly at first and gradually replace grasses, forbs, or brush as the dominant vegetation. Forage may be present; hiding or thermal cover may not be present except in rapidly sprouting brush communities (BLM 1995, 112).

Erosion - Detachment or movement of soil or rock fragments by water, wind, ice, or gravity. Accelerated erosion is more rapid than normal, natural, or geologic erosion, primarily resulting from the activities of people, animals, or natural catastrophes.

Evolutionary Significant Unit - The National Marine Fisheries Service (NMFS, NOAA Fisheries) definition is as follows: a population must satisfy two criteria to be considered an ESU: (1) it must be substantially reproductively isolated from other conspecific population units; and (2) it must represent an important component in the evolutionary legacy of a species. 69 Fed. Reg. at 31355

Fine Fuels – Fast-drying dead or live fuels, generally characterized by a comparatively high surface area-to volume ratio, which are less than 1/4-inch in diameter and have a timelag of one hour or less. These fuels (grass, leaves, needles, etc.) ignite readily and are consumed rapidly by fire when dry.

Fire Behavior – The manner in which a fire reacts to the influences of fuel, weather, and topography.

Fire duration – The length of time that combustion occurs at a given point. Fire duration relates closely to downward heating and fire effects below the fuel surface as well as heating of tree boles above the surface.

Fire Fighter Safety – a work environment where foreseeable risks have been minimized through the mitigation of known hazards associated with wildfire suppression.

Fire Intensity – The measure of the amount of heat generated or energy released by an active fire; it can be measured or mathematically calculated, and is usually expressed as heat per unit area of flaming front or simply as flame length. Fire Intensity is usually what kills or damages the above ground portion of live vegetation.

Fire-Injured Tree – Portion of the tree crown is scorched. Crown is not entirely scorched and retains green needles. Also includes trees with cambium damage, bark char, and potentially girdled or partly girdled by fire.

Fire-Killed Tree – 100% of the crown is scorched with brown needles or the crown is black with no needles.

Fire Regime – Description of the patterns of fire occurrences, frequency, size, severity, and sometimes vegetation and fire effects as well, in a given area or ecosystem. A fire regime is a generalization based on fire histories at individual sites. Fire regimes can often be described as cycles because some parts of the histories usually get repeated, and the repetitions can be counted and measured, such as fire return interval.

Fire Return Interval – Number of years between fires at a specified location.

Fire Risk – The probability or chance of fire starting. A rating of high, moderate, or low is assigned based on the concentration and/or frequency of human presence and on historic lighting occurrence.

Fire Severity – A qualitative assessment indicates the degree of environmental change caused by fire. Is the effect of a fire on ecosystem properties, usually described by the degree of soil heating or mortality of vegetation. Fire Intensity + Fire Duration = Fire Severity

Flame Length – The distance between the flame tip and the midpoint of the flame depth at the base of the flame (generally the ground surface), an indicator of fire intensity (NWCG 2012). Wildfires with flame lengths less than four feet can be controlled by hand. Flame lengths greater than four feet are considered too intense to attack by hand and should be controlled with mechanical equipment.

Fuels – Comprised of living and dead vegetation that can be ignited. It is often classified as dead or alive and as natural fuels or activity fuels (resulting from human actions). Fuels components refer to such items as downed dead woody material by various size classes, litter, duff, herbaceous vegetation, live foliage etc.

Fuel Bed Depth – The average height of surface fuel that is contained in the combustion zone of a spreading fire front.

Fuel Hazard – A fuel complex defined by kind, arrangement, volume, condition, and location that presents a threat of ignition and resistance-to-control.

Fuel Loading – The amount of fuel present expressed quantitatively in terms of weight of fuel per unit area. This may be available fuel (consumable fuel) or total fuel and is usually expressed as dry weight (i.e., tons per acre, pounds per acre, or kilograms per square meter).

Fuel Models – A set of surface fuel bed characteristics (load and surface-area-to-volume-ratio by size class, heat content, fuel moisture and depth) organized for input to a fire model (Anderson 1982, Scott and Burgan 2005).

Fuel Moisture (Fuel Moisture Content) – The quantity of moisture in fuel expressed as a percentage of the weight when thoroughly dried at 212 degrees Fahrenheit.

Hand Pile/Burning – Prescribed fire used to remove man-made or natural collections of concentrated woody debris.

Ladder Fuels – Flammable vegetation (live and dead) that forms a continuum that can carry fire from the surface fuels to the canopies of trees. Consist of small trees and shrubs, needles, vines, mosses, and any other combustible material located between the top of the surface fuels and the crowns of the trees.

Intermittent Stream - Any nonpermanent flowing drainage feature having a definable channel and evidence of scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

Lop and Scatter – Scattering of tree limbs and small diameter logs to facilitate its decomposition.

Matrix - Designated under the 1995 Medford District Resource Management Plan, Matrix lands were identified as areas where timber harvesting would occur and comprise approximately 20% of the total 24 million acres of federal lands identified in the Northwest Forest Plan. There are additional management restrictions, such as for Riparian Reserves that overlap Matrix lands and retaining at least 15% of the watershed in late successional forest patches. The desired condition in Matrix lands on the Medford Bureau of Land Management is a patchwork of different aged forests created by thinning younger forest stands to assure high levels of volume production and regeneration harvesting older forest stands on an approximate 100 year rotation length.

Mixed Severity Fire (Mixed Severity Burn) – A mixed severity fire exhibits a wide range of effects on the dominant vegetation. Some areas of a mixed severity fire exhibit low fire severity, having experienced little damage to the overstory vegetation; other areas exhibit moderate fire severity, having experienced considerable overstory mortality but not complete replacement; and yet other areas exhibit high severity, having experienced complete overstory mortality (Scott, J. H. 2007).

National Environmental Policy Act of 1969 (NEPA) - This law requires the preparation of environmental impact statements for every major Federal Action which causes a significant effect on the quality of the human environment.

No-Action Alternative - The No-Action alternative is required by regulations implementing the National Environmental Policy Act (NEPA) (40 CFR 1502.14). The No-Action alternative provides a baseline for

estimating the effects of other alternatives. When a proposed activity is being evaluated, the No-Action alternative discusses conditions under which current management direction would continue unchanged.

Non-attainment - Failure of a geographical area to attain or maintain compliance with ambient air quality standards.

Noxious Weeds - Rapidly spreading plants that can cause a variety of major ecological or economic impacts to both agriculture and wildland.

Peak Flow - The highest amount of stream or river flow occurring in a year or from a single storm event.

Percent Crown Scorch – A measure of the proportion of foliage volume that has been killed by the fire relative to the entire amount of foliage that was present before the burn (scorched foliage should be obvious to the naked eye as yellowish brown or red needles) (SWOFIDSC 2001).

Perennial Streams - Streams that flow continuously throughout the year.

Rate of Spread (ROS) is the speed the fire travels through the surface fuels. The ROS is the spread rate of the head of the fire spreading uphill with the wind blowing straight uphill. The ROS predictions use the Rothermal (1972) surface spread model, which assumes the weather, topography and fuels remain uniform for an elapsed period of time. Measured in chains/acre. One chain equals 66 feet.

Resistance-to-Control – An estimate of the suppression force required for controlling a unit of fire perimeter.

Road Definitions –

- Open, No-Restrictions – These roads should be left in a well maintained condition appropriate for the future use. In most cases, this would require maintenance, leaving all drainage features and improving aggregate surfacing to achieve the same or better road condition as when the project began. Roads may still have seasonal restrictions for activities and use is predicated on good maintenance conditions.

- Open with Administrative Conditions – Temporary, seasonal and/or limited access would be allowed; typically closure is achieved with a gate. This may include measures to reduce erosion, such as installation of water bars, outsloping, constructing drainage dips and/or the removal of culverts; appropriate for the limited use expected in the future.

- Decommissioned – Closed to vehicles on a long-term basis and left in an erosion-resistant or "storm-proofed" condition. Typically this would require the removal of culverts and some drainage features, installation of rolling dips and/or outsloping and stabilizing the road prism.

- Fully Decommissioned – Permanent closure of roads determined to have no immediate need such as temporary roads. These roads would be sub-soiled (or tilled), seeded, mulched, physically blocked, and/or planted to reestablish vegetation.

- Obliteration (full site restoration/permanent) – Roads receiving this level of treatment have no future need and would be returned to the original contours or a stable condition that approximates the original topography.

Salvage – The removal of trees either killed or severely injured from a disturbance event such as fire, disease, insect infestation, or wind.

Slash – The residue left on the ground after forest management activities or left after a storm, fire, or other event. Slash includes unused logs, uprooted stumps, broken or uprooted stems, branches, bark, etc.

Sediment - Any material carried in suspension by water, which would ultimately settle to the bottom. Sediment has two main sources: from the water channel itself and from disturbed upland sites.

Snag - A standing dead tree usually without merchantable value for timber products, but having characteristics of benefit to cavity nesting wildlife species.

Soil Compaction - An increase in bulk density (weight per unit volume) and a decrease in soil porosity resulting from applied loads, vibration, or pressure.

Soil Productivity - Capacity or suitability of a soil for establishment and growth of a specified crop or plant species, primarily through nutrient availability.

Surface Fuels – Fuels lying on or near the surface of the ground, consisting of leaf and needle litter, dead branch material, downed logs, bark, tree cones, and low stature living plants (NWCG 2012).

Succession – A series of dynamic changes by which one group of organisms succeeds another through stages leading to potential natural community or climax. An example is the development of series of plant communities (called seral stages) following a major disturbance (USDI 1995, 115).

Timber Productivity Capability Classification (TPCC) - Classification of BLM lands based on the physical and biological capability of the site to support and produce forest products on a sustained yield basis.

Threatened Species - Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range, and which has been designated in the Federal Register as such. In addition, some states have declared certain species in their jurisdiction as threatened or endangered.

Tree Fragmentation – The breakage and falling of stems, branches, limbs, and treetops of burned trees onto the forest floor; strongly associated with larger snags.

Wildfire – Any wildfire not designated and managed as a prescribed fire with an approved prescription.

Wolf Tree – A large older tree with heavy branching or poor form

Appendix C – Projects Considered for Cumulative Effects Analysis

An assessment was performed to determine which projects would be considered in the cumulative effects analysis for the project. Each resource analysis determined if any of the projects below would, when considering the effects Alternatives 1, 2 or 3 would have a cumulative effect. Cumulative effects resulting from the alternatives proposed in this project, if any are described in the resource sub-sections of Chapter 3.

Medford District BLM/Grants Pass Resource Area

Cold Elk Forest Management Cumulative Effects Project List

Project Name	Past/Present/Foreseen (or year?)	Description of Action (i.e. 500 acres Matrix Thin, 1 mile temp rd)
Farout Timber Sale	Past. Awarded in 2012. Finished operations in 2014.	381 ac. commercial thin/riparian thin, 24 ac. roadway clearing. Constructed 0.57 miles temp. routes, reconstructed 0.22 miles temp. routes, and renovated 0.57 miles temp. routes; all temp. routes decommissioned. Matrix and Riparian Reserve LUA's.
Elk Valley Roadway Clearing Timber Sale	Present. Awarded in 2011. Ongoing slash disposal operations in 2015, including road maintenance and a culvert replacement	24.1 miles roadway clearing (or 74 ac.). Matrix and Riparian Reserve LUA's.
Anaktuvuk Thin Timber Sale	Past. Awarded in 2009. Finished operations in 2011.	117 ac. commercial thin/riparian thin. Constructed 0.112 miles temp. routes, reconstructed 0.84 miles temp. routes; all temp. routes decommissioned. Matrix and Riparian Reserve LUAs. (43.5 ac. commercial thin/riparian thin, 0.112 miles temp. route construction, 0.55 miles temp. route reconstruction occurred in Cold Elk planning area)
Rogue Cow Salvage Timber Sale	Past. Awarded in 2014. Finished operations in 2015.	339 ac. mortality salvage. Constructed 1.57 miles temp. routes; all temp. routes decommissioned. Matrix LUA. (30 ac. mortality salvage occurred within Cold Elk planning area)
Plum Creek roads	Foreseen	One section of road in Panther Creek could be closed.

Project Name	Past/Present/Foreseen (or year?)	Description of Action (i.e. 500 acres Matrix Thin, 1 mile temp rd)
Cow Creek Highway Improvement Project FHA	Foreseen	In planning process, culvert replacements and shoulder expansion projects. Occurs on Medford and Roseburg BLM districts. Expected implementation in the next five years
West Fork Cow Creek Road Improvement project	Foreseen	On hold
Hazard tree removal along roads	Current and foreseen	Non-discretionary actions to safety roads.
In-stream Log Placement in Panther and Elk Valley Creeks	Current and foreseen	Creation of large wood jams. 19 in Panther Creek and 20 in Elk Valley to improve stream channel conditions for Coho and steelhead Salmon.
Deferred, routine and emergency road maintenance	Current and foreseen	All over. Includes brushing, slide removal, boulder removal, gravel recovery, culvert cleaning. West Fork Cow Creek, Bobby Creek and Walker Prairie mainline are identified for brushing as annual routine maintenance. Emergency road maintenance is prioritized.
Young Stand Management	Current and foreseen	Includes planting, brushing, pre commercial thinning, protection and maintenance treatments. Projected treatment on approximately 4,000 acres up to the next five years. Priorities may be adjusted due to emergencies and budget.
Prescribed fire	Foreseen	Pending fuels reduction budgets. Up to 1,000 acres within a five year period. Location within or adjacent to the planning area on previously analyzed projects.
Adjacent Industrial Timber Harvest and Reforestation	Foreseen	• 100 acres of regen harvest and reforestation in T31, RW9, Sec 29; NW1/4; • 250 acres regen harvest and reforestation in T31 R8, Sec 30; Approx SW1/4 and E1/2 • Tree planting on additional of

Project Name	Past/Present/Foreseen (or year?)	Description of Action (i.e. 500 acres Matrix Thin, 1 mile temp rd)
		T31S R8W, Sec 20 - 50 acres All harvest, reforestation and haul activities would be under guidance of the Oregon Forest Practices Act.
O&C Reciprocal ROW program activities		Tail holds and crossing plats
Road Repairs in Middle Creek (Roseburg BLM District)	Current, foreseeable	Road repairs in Middle Creek. Decision issues Spring of 2015 to replace three culverts on fish bearing streams on the Middle Creek Access road. Two other projects, stream crossing replacement and some stream bank armoring. These activities will occur in Sections 31, 32 and 33 of T. 31 S., R. 7 W. and Section 6 of T. 32 S., R. 7 W.

Appendix D – Review of Elements of the Environment Based on Authorities and Management Direction.

The National Environmental Policy Act (NEPA) is one of many authorities that contain procedural requirements that pertain to treatment of environmental elements when the BLM considers a Federal action. The following table summarizes the results of the interdisciplinary team review of environmental elements.

Elements of the Environment/Authority	Remarks/Effects
Floodplains (E.O. 11988, as amended, Floodplain Management, 5/24/77)	This project complies with this direction because the proposed treatments would not change of affect floodplain functions.
Wetlands (E.O. 11990 Protection of Wetlands 5/24/77) [40 CFR 1508.27(b)(3)]	This project complies with this direction because no wetlands are within the proposed units.
Native American Religious Concerns (American Indian Religious Freedom Act of 1978 (42 USC 1996)	This project complies with this direction because no Native American religious concerns were identified during the scoping period.
Environmental Justice (E.O. 12898 "Environmental Justice" February 11, 1994)	This project complies with this direction because this project would have no effect on low income or minority populations.
Hazardous or Solid Wastes (Resource Conservation and Recovery Act 1976 (43 USC 6901 et seq.)) Comprehensive Environmental Response Compensation, and Liability Act of 1980, as amended (43 USC 9615)	This project would have no effect on this element because no hazardous or solid waste would be stored or disposed of on BLM lands as a result of this project.
Forests and Rangelands (Healthy Forests Restoration act 2003 (P.L. 108-148))	This project complies with this direction because the proposed treatments would reduce fuels, increase fire resiliency and improve health of the forest.
Energy (Executive Order 13212)	This project complies with this direction because this project would have no effect on energy development, production, supply, or distribution.
Prime and Unique Farm Lands	This project complies with this direction because there are no prime or unique farm lands in the Planning Area.

Appendix E – Response to Comments

1. **Comment:** Objectives in the project should include the identification of stands that are highly suitable for regeneration harvest. Consider regeneration harvest in NSO CHU

BLM Response: The purpose and need for proposed treatments in the Cold Elk Project is to produce wood volume at the present time, increase conifer growth rates for wood volume production in the future, and maintain/improve tree vigor of retained conifers and other vegetation while managing northern spotted owl habitat (EA Section 1.4). The PA is densely covered with NSO owl sites, most of which are near or below threshold habitat levels, and RH would negatively affect occupation, reproduction, and survival. The PA is 100% CHU, and RH would negatively impact CHU by removing NRF habitat PCE where NSO are also negatively affected by competition from barred owls. RH in the PA would not be consistent with the NSO Revised Recovery Plan. Regeneration harvest was considered by eliminated from detailed analysis.

2. **Comment:** Despite continued management and conservation on owl habitat on federal lands, long term persistence of NSO may be in question without additional mgmt. intervention. Consider these scientific findings when determining treatments.

BLM Response: Retaining NRF habitat, deferring treatment in complex older stands, and reducing stand densities in younger and middle-aged increases long-term stand health and resiliency for NSOs, and is consistent with the NSO Revised Recovery Plan and marbled murrelet Recovery Plan. Streamlined Consultation with the FWS on the threatened marbled murrelet and NSO, and NSO CHU, would ensure meeting recovery objectives while also providing economic products.

3. **Comment:** Consider the trade-off between effects and beneficial effects to improve riparian conditions Utilize gap cuts to promote early seral and identify treatments to diversify areas. Promote treatments to improve large wood supplies. Implement a variety of thinning intensities and gaps within RR.

BLM Response: Riparian areas exhibit identical stand conditions as upland areas. The average stand conditions exhibit densities beyond the threshold of imminent competition mortality (EA Section 3.1.1). Stands were carefully selected to avoid high quality NSO habitat areas and riparian thinning treatments were delineated based on the quality of the stream and the potential to improve riparian character. The prescription employs a thin from below strategy where the largest dominant trees are retained and subordinate trees are the targeted commodity (EA Appendix G). This treatment would cultivate the retained trees encouraging greater crown and diameter growth. The retention of dominant trees would ensure that large woody structure carries over as legacy stand components. Some gaps are also prescribed that would allow for the development of early seral vegetation. The Variable Density Thinning prescription aims to create gaps, leave clusters of unique structure, utilize larger untreated areas of the stand, and perform spaced thinning to provide overall stand heterogeneity. This diversity in structure we believe would also benefit riparian process and function.

4. **Comment:** Clearly identify the factors contributing to acreage deferrals in the EA.

BLM Response: EA section 1.9 discloses alternative options considered but not analyzed in detail, which includes acreage eliminated from treatment in this project.

5. **Comment:** There are conditions on the ground that are not in step with the dry condition – wet season, wet condition – during dry season EA and contract stipulations. Consider shifting resource protection methods from a firm prescriptive restriction to one that focuses on descriptive end results

BLM Response: Within the scope of the RMP and BMPs, the Project Design Features in EA Section 2.3 attempt to focus on descriptive end results, rather than prescriptive restrictions. For example, operators are allowed to propose logging plans that deviate from spacing 12 feet wide cable corridors and skid trails 150 feet apart as long as it meets the general RMP requirements of limiting soil compaction to 12% and soil productivity loss to 5%. Additionally, seasonal restrictions allow for operating waivers to be granted to allow logging and haul in the fall, winter, and spring months as long as it is dry

6. **Comment:** The ability to yard and haul timber in the winter months will often make the difference between a sale selling and not- and we hope the BLM is working to accommodate this.

BLM Response: The project incorporates operational seasonal restrictions based on protecting various resources. EA Section 2.4 discloses the summary of seasonal restrictions and operational periods. The EA provides flexibility within winter months and dry conditions to provide for the opportunity to continue operations.

7. **Comment:** The measurements of closure and cover are fundamentally two different assessments of canopy condition. Data from the two methods are not interchangeable. Critical habitat rules and studies informing these rules are treating them interchangeably. Current rules may not reflect what the science is telling us

BLM Response: The Cold Elk project methodology is using canopy cover for both the EA, and Biological Assessment consultation with FWS. The silvicultural prescriptions include a combination of canopy cover, basal area, canopy layering, and key structural elements such as snags, down wood, large hardwoods, dominant trees and remnant trees to describe NSO habitat and effects to habitat.

8. **Comment:** Soil erosion is a constant issue, especially after the 2013 fires. The resulting sedimentation disturbs salmon breeding sites and degrades the quality of water. Please prioritize riparian health in all your project activities

BLM Response: The project incorporates the Aquatic Conservation Strategy objectives into the objectives of the project (See EA section 1.4). Best Management Practices and Project Design Features are incorporated to in the proposal to project resources during project implementation (EA section 2.3). Riparian Health and sedimentation are addressed in the effects analysis for Water Resources (EA section 3.6).

9. **Comment:** Large trees are a primary element of NSO habitat function. Retaining large trees in the project would greatly reduce the scientific and social controversy regarding the harvest prescription, and hence could contribute to the production of wood fiber

BLM Response: The BLM recognizes the importance large trees contribute to not only NSO habitat, but also marbled murrelet habitat. Because both habitats occur in the Cold Elk Planning Area, the prescription design employs a thin from below strategy where the largest trees are left for retention while subordinate trees are the primary timber commodity (EA Appendix G). In homogenous stands, some gaps could occur to provide structural variability. Gaps would be positioned away from large dominant overstory trees. A small amount of land (4 acres) is proposed for Disease Management where susceptible tree species would be harvested. This may incidentally include a very small number of larger susceptible trees for the purpose of maintaining resistant tree species.

10. **Comment:** Incorporate and reflect the findings and recommendations contained in the WA indicated that the high road densities in this Key Watershed planning area should be reduced

BLM Response: The RMP does not require the BLM to elevate the recommendations of the watershed analysis above all other RMP objectives. While it serves as the basis for developing project-specific proposals, not all recommendations can be accommodated by each project. No permanent roads are proposed in the project (EA section 2.2) thus no net increase would occur. Temporary routes would be fully decommissioned after use (EA Section 2.2.6). All of the system and non-system roads within the planning area an encumbered by Reciprocal Right-of-Way agreements and cannot be decommissioned without the approval of the Reciprocal partners. Road 31-9-25.3 was considered for decommissioning, but not analyzed in detail (EA Section 1.9.6). This meets the criteria of no net increase in the amount of roads in this Key Watershed (BLM, 1995 p. 23).

11. **Comment:** We are concerned that the BLM may propose road and landing construction, yarding and logging activities that will increase the "equivalent roaded area" ERA in the Key Watershed in both the short and long term. Please respond to and implement the findings of the West Fork Cow Creek WA in this regard

BLM Response: An estimate of Roaded Area is part of the analysis for soil and water effects (EA section 3.5 and EA section 3.6). The "equivalent roaded area" ERA is a Forest Service model and has not been adopted by the BLM to address cumulative effects.

12. **Comment:** Plantations are commercially thinned so as to increase vigor and provide wood fiber to meet the intent of the Medford RMP and the O& C Act. Small diameter trees in overly dense stands are thinned

BLM Response: The Variable Density thinning and understory reduction treatments are designed to increase vigor, reduce stand densities and provide wood fiber to meet the intent of the O&C Act, and the Purpose and Need of the project. See EA section 1.4.

13. **Comment:** Retain late-successional forests

BLM Response: Recovery Action 32 aims to retain high-quality NSO habitat stands 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. Stands that were considered high-quality NSO habitat were deferred from treatment to reduce effects to owls because they require well-distributed, older, and more structurally complex multi-layered conifer forests. See EA section 1.9.4.

14. **Comment:** Avoid road construction in this Tier-1 Key Watershed

BLM Response: No permanent road construction is proposed, thus there would be no net increase in the permanent road network. Temporary route construction, reconstruction, and maintenance on existing roads are proposed to facilitate harvest operations (EA section 2.2.6). Temporary routes on BLM lands will be fully decommissioned. Avoiding any road construction would not meet the primary purpose and need of the project (EA section 1.4).

15. **Comment:** What are the effects/impacts of temp routes?

BLM Response: Potential effects of temporary roads on soils and water resources are described in the soil and water effects sections (EA section 3.5 and EA section 3.6).

16. **Comment:** Cumulative impacts of temporary road construction must be disclosed in an Environmental Impact Statement

BLM Response: Effects of temporary route construction are disclosed in Section 3.4. Soil compaction and displacement associated with the proposed action are within those described in the 1995 RMP.

17. **Comment:** Would not non-commercial hand thinning activities better achieve objectives for this land use allocation by avoiding the creation of skid trails and yarding corridors? How will timber be yarded in and through yarding corridors?

BLM Response: The Riparian Reserves proposed for thinning exhibit extreme densities identical to upland densities, both exceeding the threshold for the onset of competition mortality (EA section 3.1.1 and Appendix G). Imminent competition induced mortality is occurring among trees that are larger than 8 inches DBH, therefore a pre-commercial thin would not fully meet the need to treat these stands (EA Section 1.4). Namely, this includes improving the health of the forest and associated habitats, to reduce tree mortality, and to restore the vigor, resiliency and stability of forest stands that are necessary to meet land use allocation objectives (RMP, p. 62) and maintaining or restoring components of the Aquatic Conservation Strategy in Riparian Reserves (RMP, p. 22).

Existing skid trails and landings would be utilized when possible (see PDF section). Yarding corridors and skid trails are a maximum of 12 feet wide, spaced at least 150 feet apart, and are

approved by the Authorized Officer prior to harvest activities. Following use, all landings and skid trails within the Riparian Reserve are ripped and seeded/mulched, etc. see EA Section 2.3.

18. **Comment:** Please focus riparian treatment on small-diameter understory and density reduction of young managed stands

BLM Response: The average relative density for the Cold Elk Project was 0.80 (the onset of competition mortality begins at 0.55, (EA Section 3.1.1). These stands included overpopulated riparian areas largely made up of stems greater than 8 inches DBH. Larger stems require more resources from a site than understory brush and saplings, therefore the competition becomes increasingly heightened in high densities. This is evident in the mortality seen across southern Oregon, where consecutive drought years have not provided the needed resources for trees to survive. The alignment of drought and high densities results in the mortality witnessed across hillsides today. As competition increases, stand resiliency decreases. The ability of forests to withstand environmental changes from wildfire, climate, insects, or diseases depends heavily on the predisposition of the forest, namely its vigor which is directly affected by its density. Vigorous growing conditions for trees and forests hedges against these forces that threaten to impede their resiliency. Focusing on small diameter young stands is not enough to move the relative density of stands to a more resilient condition as designated in the Purpose and Need for Action (EA Section 1.4), namely to improve the health of the forest and associated habitats, to reduce tree mortality, and to restore the vigor, resiliency and stability of forest stands that are necessary to meet land use allocation objectives (RMP, p. 62) and to maintain or restore components of the Aquatic Conservation Strategy in Riparian Reserves (RMP, p. 22).

19. **Comment:** Please provide a thorough cumulative impact analysis of the proposed action in combination with other federal logging and private logging activities.

BLM Response: Appendix C provides for projects considered for the cumulative effects analysis. This includes current and foreseen descriptions of federal and private logging activities. Chapter 3 discloses the cumulative effects for resources.

20. **Comment:** Please ensure the EA addresses the importance of mistletoe to spotted owl

BLM Response: Long-term NSO demographic study data in the Cow Creek watersheds has shown that mistletoe is not an important source of nest structure

21. **Comment:** What are the effects of the proposed action on NSO CHU

BLM Response: Effect to Wildlife, specifically NSO can be found in EA Section 3.3.

22. **Comment:** What are the effects of the project to sedimentation, peak flows, and soil compaction due to ground based disturbance from tractor yarding?

Response: Potential effects of the project to sedimentation, peak flows, and soil compaction from ground based harvesting are described in the soil and water effects sections (EA section 3.5 and EA section 3.6).

23. **Comment:** What are the effects impacts of the project on migratory bird nests? Are there seasonal restrictions proposed to avoid destruction of nests?

Response: Neotropical bird species are addressed here due to widespread concern regarding downward population trends and habitat declines. The BLM has interim guidance for meeting federal responsibilities under the Migratory Bird Treaty Act and Executive Order (EO) 13186. Both the Act and the EO promote the conservation of migratory bird populations. The interim guidance was transmitted through Instruction Memorandum No. 2008-050. The Instruction Memorandum relies on two lists prepared by the USFWS in determining which species are to receive special attention in land management activities. The lists are *Bird Species of Conservation Concern* (BCC) found in various Bird Conservation Regions (PA is in BCR 5) and *Game Birds Below Desired Condition* (GBBDC). At the project level, evaluate the effects of the BLM's actions on migratory birds during the NEPA process if any, and identify where take reasonably attributable to agency actions may have a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. In such situations, BLM will implement approaches lessening negative effects.

Appendix F – Port Orford Cedar Risk Key Assessment

Risk Key is from Alternative 2 of the FSEIS for Management of Port Orford Cedar in Southwest Oregon, and the Record of Decision.

	QUESTION																			
1a.	Are there uninfected POC within, near[1], or downstream of the activity area whose ecological, Tribal, or product use or function measurably contributes to meeting land and resource management plan objectives?	N	N	N	N	N	N	N												
1b.	Are there uninfected POC within, near[1], or downstream of the activity area that, were they to become infected, would likely spread infections to trees whose ecological, Tribal, or product use or function measurably contributes to meeting land and resource management plan objectives?	N	N	N	N	N	N	N												
1c.	Is the activity area within an uninfested 7th field watershed[2] as defined in Alternative 6	N	N	N	N	N	N	N												
2.	Will the proposed project introduce appreciable additional risk[3] of infection to these uninfected POC?																			
		Harvesting in Infested	*Harvesting in Infested*	*Infested on rd to unit with adjacent healthy POC opposite side of rd*	*Harvesting in Infested*	*Infested just outside bottom of harvest unit*	*Paved = no concern*	Rocked = avoid mud puddles/pot holes	*Please implement PDF for washing harvest equipment and vehicles after completion of the sale to mitigate the spread of infested soil to other areas.*											

1 - In questions 1a and 1b, "near" generally means within 25 to 50 feet downslope or 25 feet upslope from management activity areas, access roads, or haul routes; farther for drainage features; 100 to 200 feet in streams.

2 - Uninfested 7th field watersheds are listed on Table A12-2 [*of FSEIS*] as those with at least 100 acres of POC stands, are at least 50% federal ownership, and are free of PL except within the lowermost 2 acres of the drainage.

3 - Appreciable additional risk does not mean "any risk." It means that a reasonable person would recognize risk, additional to existing uncontrollable risk, to believe mitigation is warranted and would make a cost-effective or important difference (see Risk Key Definitions and Examples for further discussion.)

*Activities within these sections should incorporate management activities regardless of POC occurrence within the individual stand due to access routes containing POC

**Management practices: 1) project scheduling, 2) utilize uninfested water, 3) unit scheduling, 4) access, 5) public information, 6) fuels management, 7) incorporate POC objectives into prescribed fire plans, 8) routing recreation us, 9) road management measures, 10) resistant POC planting, 11) washing project equipment, 12) logging systems, 13) spacing objectives for POC thinning, 14) non-POC special forest products, 15) summer rain events, 16) roadside sanitation, and 17) site-specific POC management

Appendix G – Silvicultural Prescription

The following section provides the reader with detailed considerations made by the prescription writer in applying treatments to the units in the proposed action.

Considerations in Prescription Design

Management Deferrals

Wildlife

See wildlife section for details of habitat deferrals. A total of 37 NSO nest patches were mapped within the PA and 430 acres were immediately deferred from treatment consideration. Next, a total of 1,192 acres of RA-32 ground was removed from management intervention as surveys were performed. In addition, the USFWS Recovery Action 32 (RA-32) directs resource personnel to field-identify the best habitat for the NSO (RA-32). Other spotted owl deferrals included those that resulted from the RA-10 process. In total, measures that protected existing spotted owl habitat included 6,127 acres of nesting, roosting, and foraging habitat as well as 2,503 acres of NSO core areas.

A total of 191 acres were identified as RTV zones in 11 separate locations and are likewise deferred from management activities. The red tree vole is a Survey-and-Manage species requiring measures of protection following established protocols. A total of 735 acres of RTV buffers were totaled from sites at 10+ acres in size each.

For the marbled murrelet, a total of 120 separate acres of habitat was deferred. This species is a coastal bird that utilizes large woody structural, nesting primarily on dominant crown class trees with large limbs. The management recommendation for this federally listed species is to provide for its habitat – namely single nest trees along with adjacent trees of interlocking crowns. The units deferred from treatment contained a vast number of these trees making the opportunity for entry unfeasible.

TPCC

Fragile nonsuitable woodland areas were withdrawn from treatment. These totaled 1,491 acres which could include some of the above acreages. FGNW land in the Bobby Creek RNA comprised 59 acres of this total.

Botany

Another Survey and Manage criterion is to survey for fungi for 2 consecutive years in stands 180 years of age and older. Due to the time constraints in the Cold Elk Project deadline, these lands were deferred from treatment totaling 755 acres. Some of these acres are included in the aforementioned deferrals, primarily for wildlife.

Other Insects & Diseases (I&D)

Figure 21 is a snapshot of the annual cooperative aerial surveys conducted by Forest Health Protection staffs of the Oregon Department of Forestry, Washington Department of Natural

Resources, and the USDA Forest Service Pacific Northwest Region. The Region 6 Data Dictionary (USFS 2015) explains:

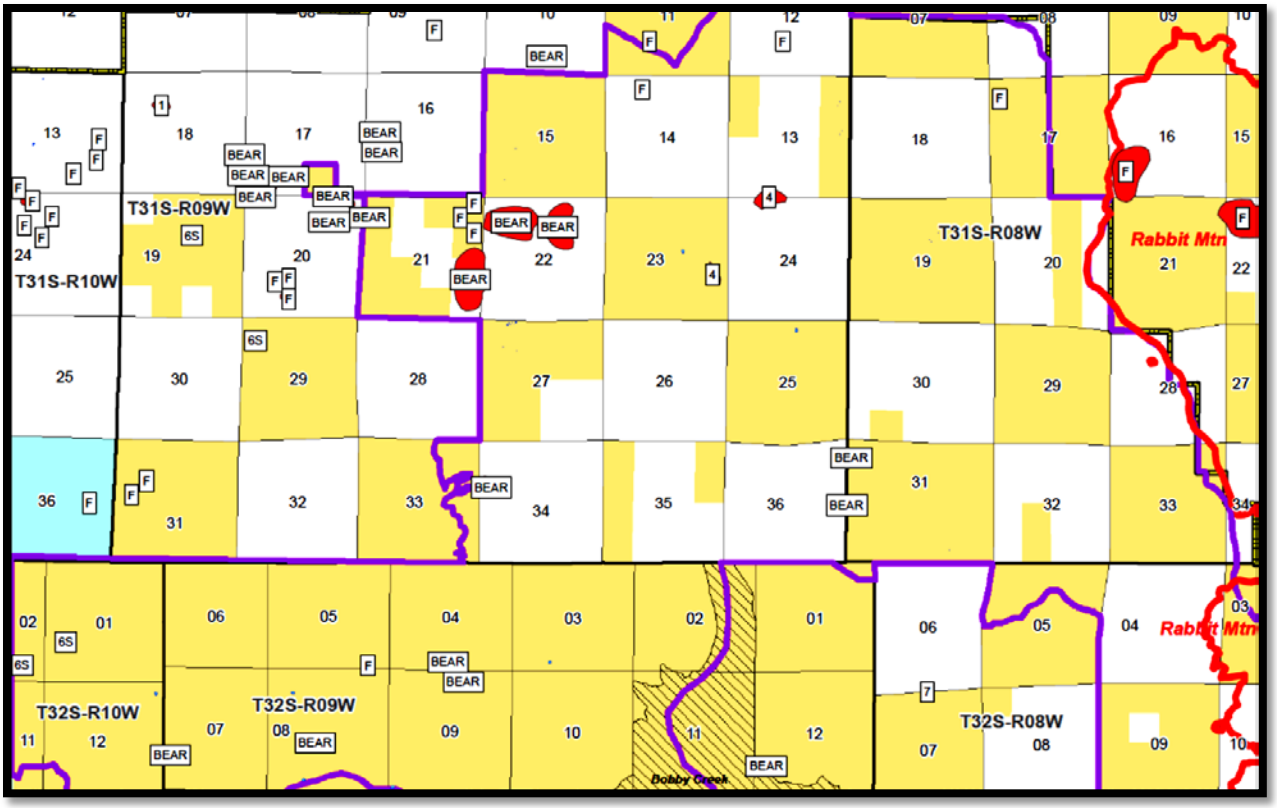
> Each year, all forested federal, state and private land in Oregon and Washington are aerially surveyed for insect and disease activity. This survey is flown cooperatively by Region 6 USDA Forest Service, Forest Health Protection (FHP); Oregon Department of Forestry (ODF), Insect and Disease Section; and Washington Department of Natural Resources (WDNR). These data are collected to determine regional insect and disease trends and to serve as an indicator to land owners/managers on insect and disease activity in their area.
>
> Data are collected during annual surveys that are generally flown from early July through September. Historically, the surveys were flown in fixed-wing aircraft on various grid patterns. The accuracy of polygon placement and polygon attributes may be limited by several factors, including: surveyor experience, weather, time of day, time of year and visibility.

The I&D survey shows flatheaded fir borer *Phaenops (Melanophila) drummondi* detections. This insect breeds in and kills Douglas-fir host trees weakened from drought, competition, fire, or other disturbances. By consuming the cambium and then some inner phloem, this species is a primary cause of Douglas-fir mortality in southwestern Oregon. On southwest Oregon sites below 3,500 feet elevation and droughty sites, the flatheaded fir borer behaves much more aggressively causing extensive Douglas-fir mortality (Shaw et al. 2009) and often attacking and killing numerous apparently healthy Douglas-firs (SWOFIDSC 2016). The flatheaded fir borer does not wait for the tree to die, but rather eats the cambium of a live tree which inhibits the tree from producing new phloem, subsequently killing the tree. Fettig et al. (2007) reported that in Douglas-fir forests, factors contributing to beetle infestation levels consistently include poor growth and high stand density.

Bark beetles are not restricted to dying hosts (SWOFIDSC 2014). Even at low levels, Larsson et al. (1983) suggest that comparatively few mountain pine beetles are needed to kill low vigor ponderosa pine trees. When stand densities are high, pine beetles will behave similarly to the flatheaded fir borer in stands on south and east aspects below 3,500 foot elevations (USFS, South Cascades Late-successional Reserve Assessments (LSRA) RO227 1998). The elevation in the PA ranges from 1,000 to 4,000 and averages 2,500 feet above sea level. Of the units proposed for treatment, approximately 95% of the acreage is below 3,500 feet in elevation. Because the majority of units are below 3,500 feet elevation, high stand densities here signify that pine trees in 95% of the proposed treatment area are predisposed to bark beetle infestations.

Figure 21: 2015 Aerial Insect and Disease Survey snapshot within the PA

Where **F** = Flatheaded fir borer, **4** = Fir engraver, **6S** = Mtn. pine beetle/Sugar pine, and **BEAR** = Bear damage



Desired Condition

Future conditions rely on the implementation of the Medford District RMP (BLM 1995) which envisions enhancing, restoring, or maintaining the ecological health of the environment while providing a sustainable production of natural resources. It also specifies that forests be managed toward a variety of structures, stands containing trees of varying age and size, and stands with an assortment of canopy configurations. Over time, stands should be managed for a balance of seral stages.

The desired future condition is to maintain vigorous growth in stands, enhance species diversity, develop structurally complex forests, and to provide a sustainable production of natural resources. This would be accomplished by utilizing disturbance-based forestry that reduces Douglas-fir and enhance the development of minor fire resilient species.

Silvicultural Design

<u>Commercial Harvest Units</u>

Silvicultural actions utilize variable density thinning to accelerate the development of structural and species diversity, large trees, canopy gaps for spatial diversity and understory development, large

snags, and down wood. The Revised Recover Plan for the NSO (USFWS 2011, pp.III-11 to III-12) informs us that:

> We make this recommendation to apply ecological forestry and restoration in many parts of the spotted owl's range because:
>
> • Climate change is rapidly altering forest ecosystems within the range of the spotted owl with some unpredictable or potentially undesirable outcomes (Lenihan *et al.* 2008, Littell *et al.* 2010, Shafer *et al.* 2010, Spies *et al.* 2010a);
>
> • The Service, forest managers, and policy makers must take reasonable but proactive steps to conserve forest ecosystems and spotted owls in the face of past management and future uncertainty (Agee 2002, Carey 2007, Gaines *et al.* 2010); and
>
> • There is a scientific and social consensus emerging that land managers must restore more sustainable (resistant and resilient) ecological processes to forests at various landscape scales (Hessburg *et al.* 2004, Millar *et al.* 2007, Long 2009, Moritz *et al.* 2011). (USFWS 2011 p. III-12)

Desirable hardwoods would be promoted as leave trees (golden chinquapin and oak trees 10 inches DBH and larger, madrone trees 16 inches DBH and larger with full live crown ratios of 30% or greater). Recognizing the important contribution large trees provide to NSO and MAMU habitat, the prescription employs a thin from below approach in Variable Density Thinning treatments. Some gaps could occur in units to provide structural variability. In Disease Management areas, laminated root disease openings would be confined to dispersal habitat areas only and not exceed 2 acres in size. Prescriptions would be modified where needed to retain additional canopy cover for the NSO. Gaps proposed in foraging habitat would be limited to no more than ¼ acre in size and remove less than 20% of the stand acreage. In addition, portions of the stand where gaps were created could be underplanted to ensure that understory development of desired species occurs. These areas would be assessed post-harvest.

Standards and Guidelines on CWD, green tree, and snag retention require retaining both living and dead structural elements in harvest units (USFS/BLM 1994). Snags and CWD would be retained in units within operational safety guidelines. The Medford District RMP (1995) describes management actions/direction in Matrix (General Forest Management Areas) that leave a minimum of 120 linear feet of logs per acre ≥ to 16 inches in diameter and 16 feet long counting decay class 1 and 2 logs towards the total and reflecting the species mix of the original stand (USFS/BLM 1994). Trees with stem decay, namely red ring rot *(Phellinus pini)* would be retained thereby contributing to imminent snag recruits. The fungus can cause extensive basal decay where wood softened by decay and the cavities created by decay are utilized by many wildlife species. Unlike laminated root disease, the trees infected by red ring rot remain standing much longer as their wood maintains some strength against failure. *Phellinus pini* infected trees are easily identifiable and are specifically prescribed for retention. Because the prescription utilizes a thin from below approach, all harvest units would leave the largest diameter trees. The prescription would, thereby meet these minimum retention requirements which includes the post-harvest standing green residual structure required to make up the deficit of CWD and snag retention requirements (BLM 1995, pp. 38, 42, 46, 72). The Recovery Plan (USFWS, Revised Recovery Plan fo rthe Northern Spotted Owl (Strix occidentalis caurina) 2011) describes the importance of down wood as a component of NSO habitat. Harvest prescriptions would utilize unthinned patches to provide variability. These areas constitute a variety of

management deferrals including ecological protection zones in riparian reserves, RTV buffers, botany special status plant buffers, marbled murrelet tree pockets, RA-32 acreage, NSO nest patches, 180 year old stand deferrals, nonsuitable woodland, and inoperable areas. In these untreated areas, suppression mortality will also contribute to snags and down wood recruitment (USFS/BLM 1994, p. C-40).

All units would receive post-harvest activity fuels treatments to reduce potential increases in fuel hazard due to the buildup of harvest generated slash and residual small high density trees. These fuels treatments could include lop and scatter, slashing, hand piling, hand pile burning and/or biomass removal.

Basic Prescription and Guidelines

- Reduce stand density to increase long-term tree growth, quality, and vigor of the remaining trees and increase resistance of landscape to fire, drought, and insects by reducing basal areas in overstocked stands.

- Provide and protect patches of ecological significance (seeps, rock outcrops, hardwood groves) and wildlife values (hiding cover, habitat, visual barriers).

Create diversified stand structure (height, age, and diameter classes) to enhance structural complexity and composition which is the result of variability by utilizing skips, gaps, and clumps.

Variable Density Thinning

Units: 8-36, 1-5, 1-11, 2-2, 3-1, 3-2, 3-3, 3-4, 3-5, 3-8, 3-12, 3-14, 3-18, 4-12, 4-29, 5-1, 5-6, 5-15, 5-19, 6-16, 7-2, 7-3, 7-5, 7-7, 7-9, 7-27, 7-28, 8-1, 8-4, 8-7, 8-8, 8-10, 8-14, 9-1, 9-3, 9-5, 9-8, 9-13, 10-2, 10-4, 10-5, 10-20, 11-8, 11-13, 2-1B, 13-2, 13-3, 13-9, 13-10, 15-1, 15-4, 15-11A, 15-11B, 15-18, 15-19, 16-2, 18-7, 19-6, 19-8, 19-9, 20-4, 20-5, 21-4, 21-6, 21-9, 23-3, 23-4, 23-7, 23-11, 23-12, 23-13, 23-25, 23-33, 23-34, 23-38, 23-43, 25-4, 25-11, 25-21, 27-1, 27-2, 27-4, 27-8, 27-34, 29-3, 29-4, 29-5, 29-7, 29-31, 31-2, 31-4, 31-5, 31-11, 31-22, 33-1, 33-7, 33-8, 33-18, 33-28, 35-4, and 35-8

Forests are managed to trend so that over time landscapes would trend toward a forest composed of stands containing a variety of structures, stands containing trees of varying age and size, and stands with an assortment of canopy configurations (BLM 1995, pp. 190-191). As stands age, within stand conditions should trend toward those characteristic of older forest types. A lower stand density reduces competition, accelerating the growth of leave trees, thereby shortening the period of time needed to attain large woody structure associated with older forests. Canopy gaps could occur where laminated root disease susceptible tree species are removed and for helicopter yarding areas where yarding corridors are undesirable for maintaining NSO habitat. Tree planting would likely occur separately in laminated root rot areas to regenerate the sites with resistant trees and on sites with openings of 1 acre. Generally, gaps would not exceed one acre in size in NSO dispersal habitat and gaps would not exceed ¼ acre in size in NSO foraging, or NSO nesting, roosting, foraging habitat. Treatments in NSO dispersal habitat would retain live tree basal area to maintain a minimum of 40% canopy cover. To maintain 60% canopy cover in NSO foraging, the basal area retention increases; while treatments in NSO nesting, roosting, and foraging habitat further increases the basal area retention to maintain 60% canopy cover and the large woody structure associated with this higher quality NSO habitat.

Variable Density Thinning/Understory Reduction

Units: 2-2, 5-6, 9-1, 11-19, 13-2, 19-3, 19-8, 31-4, 31-11, 31-22, 32-3, 33-7, and 33-8

Disease Management

Unit 25-1

Laminated root disease pocket would be treated that removes all susceptible tree species, namely Douglas-fir and white fir. Resistant species would be retained to sustain conifer productivity and provide legacy structure from the previous stand. Resistant species in the Cold Elk Project include cedars, hardwoods, and pines. Tree planting would occur to establish a new structural layer or cohort for habitat development consisting of resistant conifer seedlings to sustain forest productivity.

Riparian Thinning

Units: 8-36, 1-5, 1-11, 2-2, 2-15, 3-1, 3-2, 3-3, 3-4, 3-5, 3-8, 3-12, 3-14, 3-18, 4-7, 4-12, 4-29, 5-1, 5-6, 5-15, 5-19, 7-2, 7-3, 7-5, 7-7, 7-9, 7-27, 7-28, 8-1, 8-4, 8-7, 8-10, 8-14, 8-22, 9-1, 9-3, 9-5, 9-8, 9-13, 10-2, 10-4, 10-5, 10-7, 10-20, 11-3, 11-8, 11-13, 11-19, 2-1A, 2-1B, 5-6B, 9-1B, 11-19B, 13-2, 13-3, 13-9, 13-10, 15-4, 15-11A, 15-11B, 15-18, 15-19, 16-2, 18-7, 19-3, 19-6, 19-8, 19-9, 20-4, 20-5, 21-4, 21-6, 21-9, 23-3, 23-4, 23-7, 23-11, 23-12, 23-13, 23-25, 23-38, 23-43, 23-47, 25-4, 25-1, 25-11, 25-21, 27-1, 27-2, 27-4, 27-8, 27-34, 29-3, 29-4, 29-5, 29-7, 29-31, 31-2, 31-4, 31-4B, 31-5, 31-11, 31-22, 32-3, 33-1, 33-3, 33-7, 33-8, 33-18, 33-28, 35-4, and 35-8

These areas exhibit stand densities similar to their upland counterparts. Ecological Protection Zones (EPZ) are modified riparian buffers. Areas between riparian zone boundary and EPZ boundary function more as upland forest ecology than by a riparian function.

EPZ recommendations apply treatments in modified riparian zones because these upland areas currently demonstrate a need for improving conifer growth and developing habitat. By applying EPZ boundaries, Variable Density Thinning treatments would be accomplished that would meet ACS objectives and benefit the ecological functions and processes of the stand. Stream surveys were conducted to determine extent and site specific operational EPZ widths.

Non-commercial Treatments

Units proposed for Understory Reduction exhibit densities that forestall conifer growth and development of the stand. Densities can be as high as 10,000 understory trees per acre, often higher in clumps. Hand piling and burning in strategic areas on the landscape may be applied to reduce fire hazard.

Basic Prescription and Guidelines

- Reduce understory densities to break up the fuel continuity and decrease fuel loading.
- Enhance understory vigor and productivity by removing competing vegetation from desirable species.

- Plant desirable species where species diversity and/or regeneration is lacking (e.g. ponderosa pine, incense cedar, etc.).

Understory Reduction

Units: 2-15, 4-7, 8-22, 10-7, 10-17, 11-3, 2-1A, 5-6B, 9-1B, 11-19B, 23-47, 31-4B, 33-3

This treatment consists of reducing the understory (vegetation less than 8 inches diameter) with chainsaws and disposing of the material by hand-piling and burning or use of a lop and scatter method in lighter fuels. Understory reduction would break up stand-level fuel continuity, increase residual tree growth and vigor, and improve stand resiliency to external factors such as drought and fire.

- In dry forest stands, fire resilient species would be favored as residuals:

Conifers	**Hardwoods**
1. Ponderosa pine	1. White oak
2. Incense cedar	2. Black oak
3. Sugar pine	3. Canyon live oak
4. Port-Orford Cedar	4. Pacific dogwood
5. Western hemlock	5. Golden chinquapin
6. Douglas-fir	6. Pacific madrone

- In moist forest stands, the following species preference would be applied:

Conifers	**Hardwoods**
1. Western hemlock	1. Pacific dogwood
2. Port Orford cedar	2. Black oak
3. Sugar pine	3. Golden chinquapin
4. Incense cedar	4. Pacific madrone
5. Ponderosa pine	5. Canyon live oak
6. Douglas-fir	6. White oak

Environmental Effects to Alternatives 1 and 2

Alternative 1 – No Action

Effects to the No-Action Alternative are categorized by stand condition variable and each variable is assessed by short (0-20 years) and long term (20+ years) effects of the action.

Table 41: Short Term Vegetation Effects (0-20 years) of Alternative 1

Stand Condition	**Alternative 1**
	No Action
Vigor of Residual Trees	Current RD of 0.80 indicates high probability of competition mortality. Decline in all photosynthate allocation areas beginning with shedding defense mechanisms to insects and diseases followed by seed production. Continued competition will reduce vigor until killed by competition mortality or wildfire.
Growth Rate	Continued decline in all growth factors until disturbance mechanism makes new available

Stand Condition	Alternative 1 No Action
	growing space (unlikely given aggressive fire suppression) .
Habitat Development	Poor and prolonged development given no stand differentiation, no new cohort development, and little to no layering for high quality habitat conditions.
Live Crown Ratio	Continued decrease below 30% where mortality is likely.
Species Diversity	Further decline as minor species require more sunlight than the dominating species of DF that continues to suppress any competition.
Shrubs/Brush/ Forbs	Continued decline in natural shrub component. Private industry continues to herbicide spray for shrubs on their lands in the area making this component nearly obsolete.
Snags	Increase in numbers, decrease in size and quality.
Coarse Woody Debris	Increase in numbers, decrease in size and quality.
Branching	Decrease as the residual trees self-prune by shedding their limbs to prioritize height growth as competition for sunlight is accentuated.
Windthrow Hazard	Increase as H/D ratios favor the disproportionate amount of height to diameter girth to support the ever increasing heights of trees during competitive exclusion phase of forest development
Ability to Respond to Environmental Changes	Dramatic decrease. Imminent competition mortality (RD 0.80) already observed and recorded in stand exam data. Weakened stands remain predisposed to insect and diseases, stand replacing fire, and climate extremes.
Rate of Development of Older Forest Characteristics	Continued prolongation of habitat development. The lack of disturbance mechanisms impedes cohort development and stand differentiation as fires continue to be suppressed and competition remains heightened. As trees die, very small space becomes available so that others will occupy the growing space. Where fire is excluded this rate of stand differentiation is insignificant.

Table 42: Long Term Vegetation Effects (21+ years) of Alternative 1

Stand Condition	Alternative 1 No Action
Vigor of Residual Trees	Continued and prolonged decline with ongoing competition mortality.
Growth Rate	Continued and prolonged decline with ongoing competition mortality.
Live Crown Ratio	Continued and prolonged decline with ongoing competition mortality.
Habitat Development	Anticipate widespread stand senescence in all size classes impeding the ability to develop quality habitat. Denies rapid habitat development. Development is prolonged and of low quality. Uninterrupted excess stem densities impede residual trees to attain large size for providing large woody structure.
Species Diversity	Prolonged decrease as the proportion of DF vastly outcompetes all other species. Continued encroachment of DF onto oak woodlands.
Shrubs/Brush/ Forbs	Continued and prolonged decline in size and number of sites with DF encroachment.
Snags	Increase as stand densities exceed the carrying capacity of the site. Increase in numbers decrease in size. The few remaining large pine, oak, and cedar species will continue to die and appear as snags as they succumb to competition mortality.
Coarse Woody Debris	Low quality increases as stand densities exceed the carrying capacity of the site. Increase in numbers decrease in size. The few remaining large pine, oak, and cedar species will continue to die and appear in small amounts as advanced stages of decay cause structural failure.
Branching	Drastic decrease as inter-tree competition forces trees to self-prune and clamor for height advantage.
Windthrow Hazard	Increase as poor H/D ratios persist.
Ability to Respond to Environmental Changes	Decrease as stand densities exceed the carrying capacity of the site. Weakened stand conditions predispose trees to insects and diseases, stand replacing wildfire, ongoing competition mortality, and the detrimental effects of climate extremes.
Rate of Development of Older Forest Characteristics	Prolonged decreases in large woody structure as trees within the stagnant stand prioritize all its remaining resources on survival/respiration and very little on growth. Continued and unbroken prolongation of habitat development. The lack of disturbance mechanisms impedes cohort development and stand differentiation as fires continue to be suppressed and competition remains heightened. As trees die, very small space becomes available so that others will occupy the growing space. Where fire is excluded this rate of stand differentiation is insignificant.

Alternative 2 – Variable Density Thinning, Understory Reduction

Effects to each treatment proposed in Alternative 2 are categorized by stand condition variable and each variable is assessed by short (0-20 years) and long term (20+ years) effects of the action.

Table 43: Short Term Vegetation Effects (0-20 years) of Alternative 2

Stand Condition	Alternative 2	
	Variable Density Thinning	**Understory Reduction**
Vigor of Residual Trees	Slight increase (in 60%+ canopy retention units)/Increase (in 40%+ canopy retention units)	Increase
Growth Rate	Increase to foliage & fine root production (60% canopy retention)/Increase to foliage & fine root production, height growth, & slight increase in diameter growth (40% canopy retention)	Increase in all growth areas in response to new growing space
Habitat Development	Immediate increase in QMD from a thin from below strategy, immediate improvement in diverse species composition, T&M units retain the current habitat, Downgrade units retain min. 40% canopy	Immediate increase in QMD, diverse species composition. First 2 yrs w/increased fire hazard from red slash then 2+ years net decrease in fire hazard as fine fuels break down
Live Crown Ratio	Slight increase (60% canopy retention)/Increase (40% canopy retention)	Slight change to increase
Species Diversity	Immediate increase where minor species exist (60% canopy retention)/Immediate and sustained increase where minor species exist & radial thinning occurs (40% canopy retention)	Immediate and sustained increase on stand and Project level scale
Shrubs/Brush/ Forbs	No change to slight increase (60% canopy retention)/Increase then leveling off as crowns close (40% canopy retention)	Increase then levels off as conifers continue expanding onto available growing space
Snags	Slight increase as retained stem decay trees die off (60% canopy retention); No change to slight increase as retained stem decay trees die off (40% canopy retention)	No change
Coarse Woody Debris	Slight increase from logging debris – not beyond acceptable fuel loadings following activity fuels treatments	Immediate increase in fine fuels in the first 2 yrs. & slash <8" dia., decrease in fine fuels after 2 yrs.
Branching	Increase then level off (60% canopy retention)/Increase (40% canopy retention)	Retention of lower limbs and lateral expansion
Windthrow Hazard	Slight increase on ridgelines (60% canopy retention)/slight increase, increase on ridgelines, & increase in larger gaps (40% canopy retention)	No change to slight decrease as HD ratios develop; Stands of suppressed saplings – slight increase
Ability to Respond to Environmental Changes	Slight increase (60% canopy retention)/Increase (40% canopy retention)	Decrease in first 2 yrs of treatment to increase as fine fuels break down then increase after 2 years
Rate of Development of Older Forest Characteristics	Slight increase (60% canopy retention)/Increase (40% canopy retention)	Increase

Table 44: Long Term Vegetation Effects (21+ years) of Alternative 2

Stand Condition	Alternative 2	
	Variable Density Thinning	**Understory Reduction**
Vigor of Residual Trees	Slight increase then level off (60% canopy retention)/Sustained increase (40% canopy retention)	Sustained increase until crown closure
Growth Rate	Increase in height, slight increase in dia, to leveling	Sustained increase until crown closure

Stand Condition	Alternative 2	
	Variable Density Thinning	Understory Reduction
	off w/crown closure then growth declines in all areas (60% canopy retention)/Increase in ht & dia growth, increase in seed production, increase in defense mechanisms until crown closure (40% canopy retention)	
Live Crown Ratio	No change (60% canopy retention)/Increase (40% canopy retention)	Sustained increase until crown closure
Habitat Development	Sustained increase in canopy growth, new increases in dia. & ht. growth; Sustained development of diverse species; T&M units that retain 60% canopy: growth levels off earlier followed by growth decline than units retaining 40% canopy	Sustained increase until crown closure
Species Diversity	No change (60% canopy retention)/Increase as radial thinning on stand and landscape scale (40% canopy retention)	Sustained increase until crown closure
Shrubs/Brush/ Forbs	Decrease (60% canopy retention)/Gradual decrease with crown closure (40% canopy retention)	Decrease with crown closure
Snags	Increase in numbers of stem decay trees, then increase in numbers, decrease in size w/crown closure (60%)/Increase in numbers of stem decay trees then decrease in numbers, increase in size (40%)	Decrease in numbers, increase in size
Coarse Woody Debris	Increase in numbers, decrease in size (60% canopy retention)/Decrease in numbers, increase in size (40% canopy retention)	Decrease in numbers, increase in size
Branching	Diminishing (60% canopy retention) / Retention of limbs present, new epicormic branching in DF, development of large branches currently present (40% canopy retention)	Retention of lower limbs until canopy closes, some development /retention of large branches
Windthrow Hazard	Decreases as root growth strengthens tree stability	Decrease with improved H/D ratio
Ability to Respond to Environmental Changes	Decreases (60% canopy retention)/Sustained increase until crown closure (40% canopy retention)	Sustained increase until crown closure
Rate of Development of Older Forest Characteristics	Increase to leveling off (60% canopy retention)/Sustained increase (40% canopy retention)	Increase

Stand Exam Data Collection

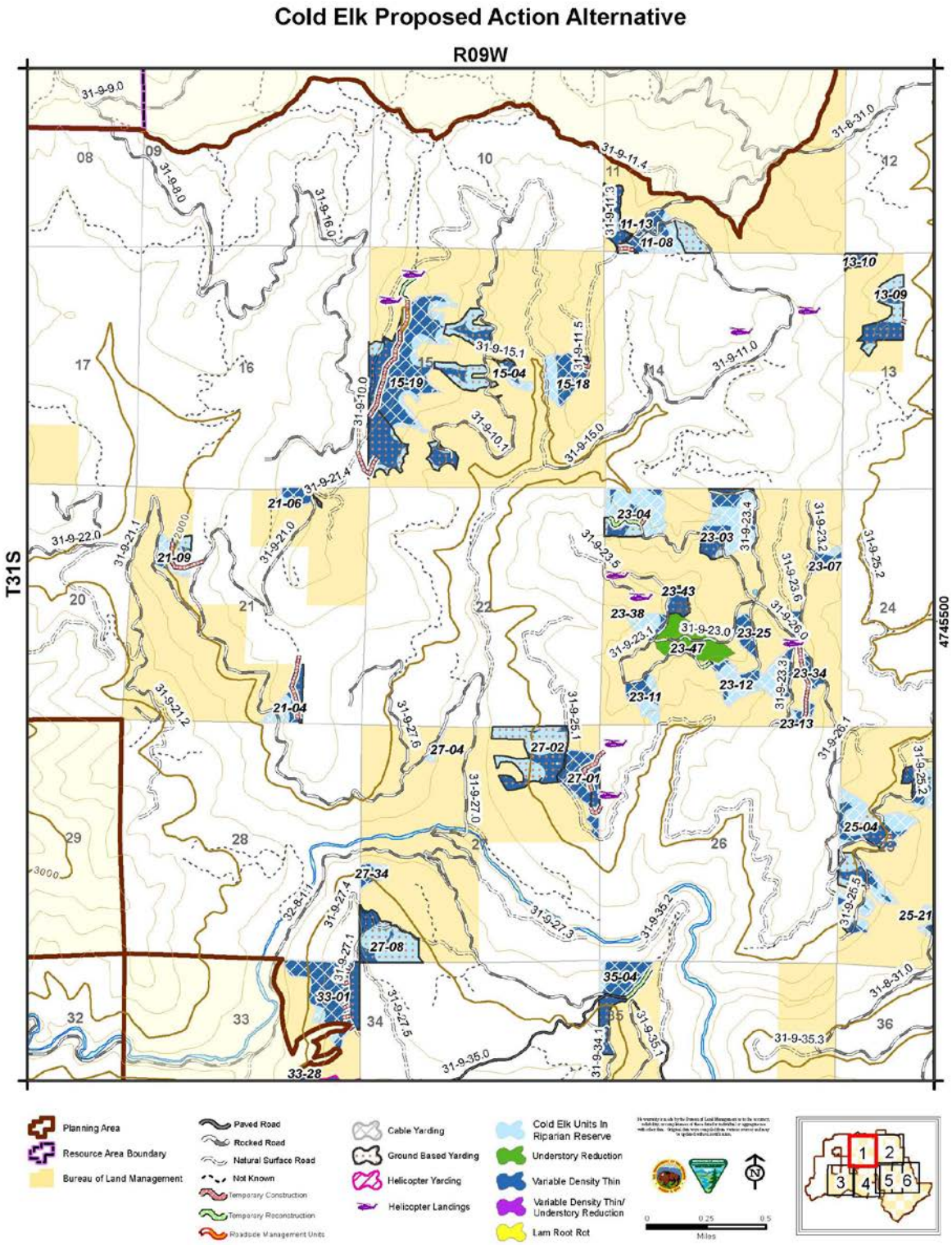
Survey data followed Medford Distract Stand Exam Contract provisions which include in part the following sample design:

> Plot Sample Types – Extensive Stand Exams shall be accomplished by using two types of sample plots at each plot location. A variable plot will be used to collect individual tree data. A fixed plot with an 11.8-foot radius will be used to collect seedling, vegetation and sapling data.
>
> Down Woody Material plots are included in the task order, a line transect plot will be used to collect Down Woody Material (DWM) data (See 5.6).
>
> Variable Plot – The variable-radius plot will be taken using an American Scale Spiegel Relaskop or electronic dendrometer with a BAF of **10, 20, 27.78, 33.61, 40, 46.95, 54.45, 62.5, or 80.28**. A BAF will be selected (20, 27.8, 33.6, 40, 46.9, 54.4, 62.5, and 71.1) that will result six to ten (6-10) tally trees (including hardwoods) per plot within each survey unit. Only one BAF can be used for each individual exam.

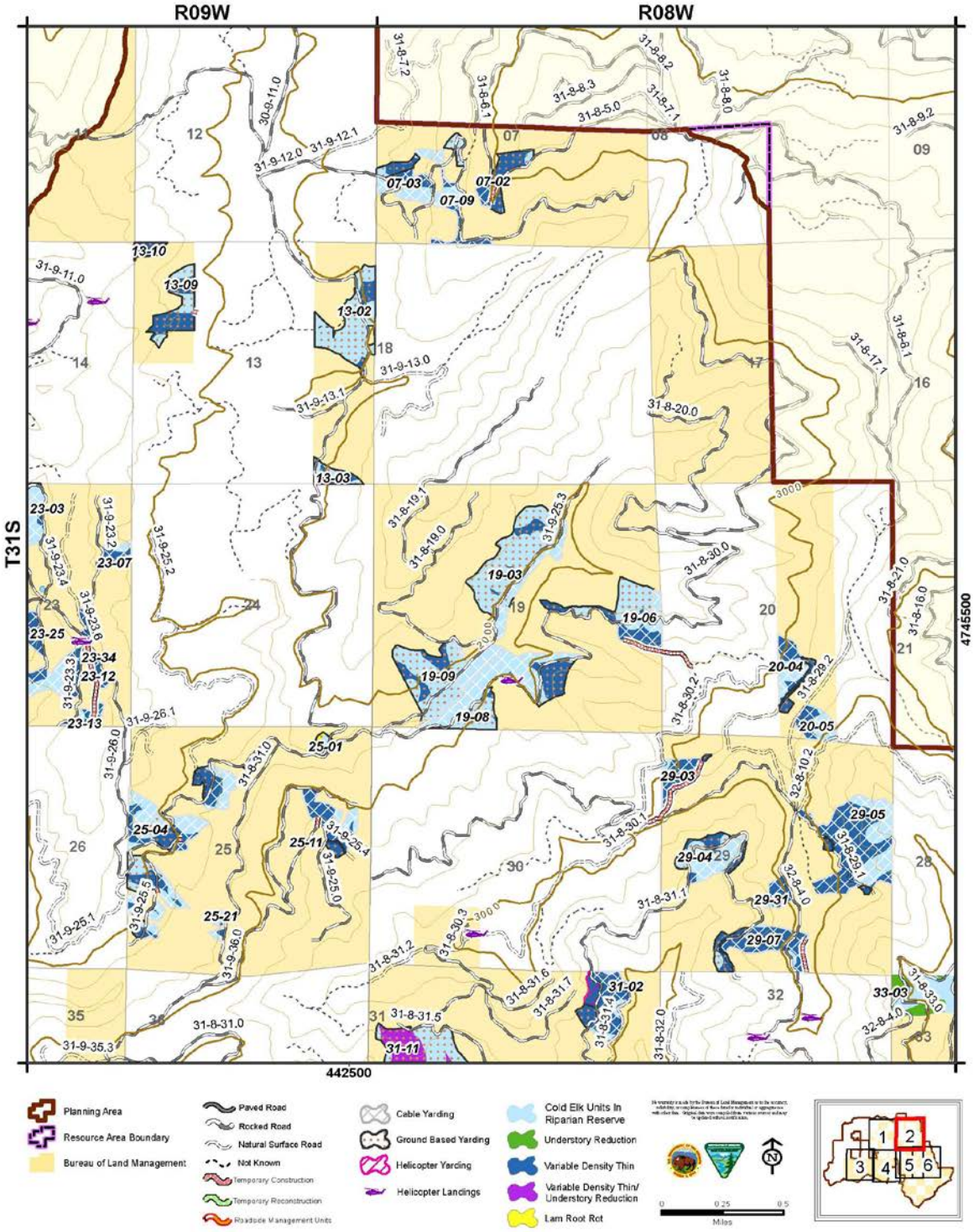
Before selecting a BAF the contractor shall preview the Survey Unit to determine the appropriate factor to use.

Fixed-radius plot – A fixed-radius plot with an 11.8 foot radius measured horizontally from the variable-radius plot center shall be used for recording seedlings, saplings and vegetation. All saplings that have 50% or more of their bole (measured at ground level) within the fixed-radius plot are considered in the plot.

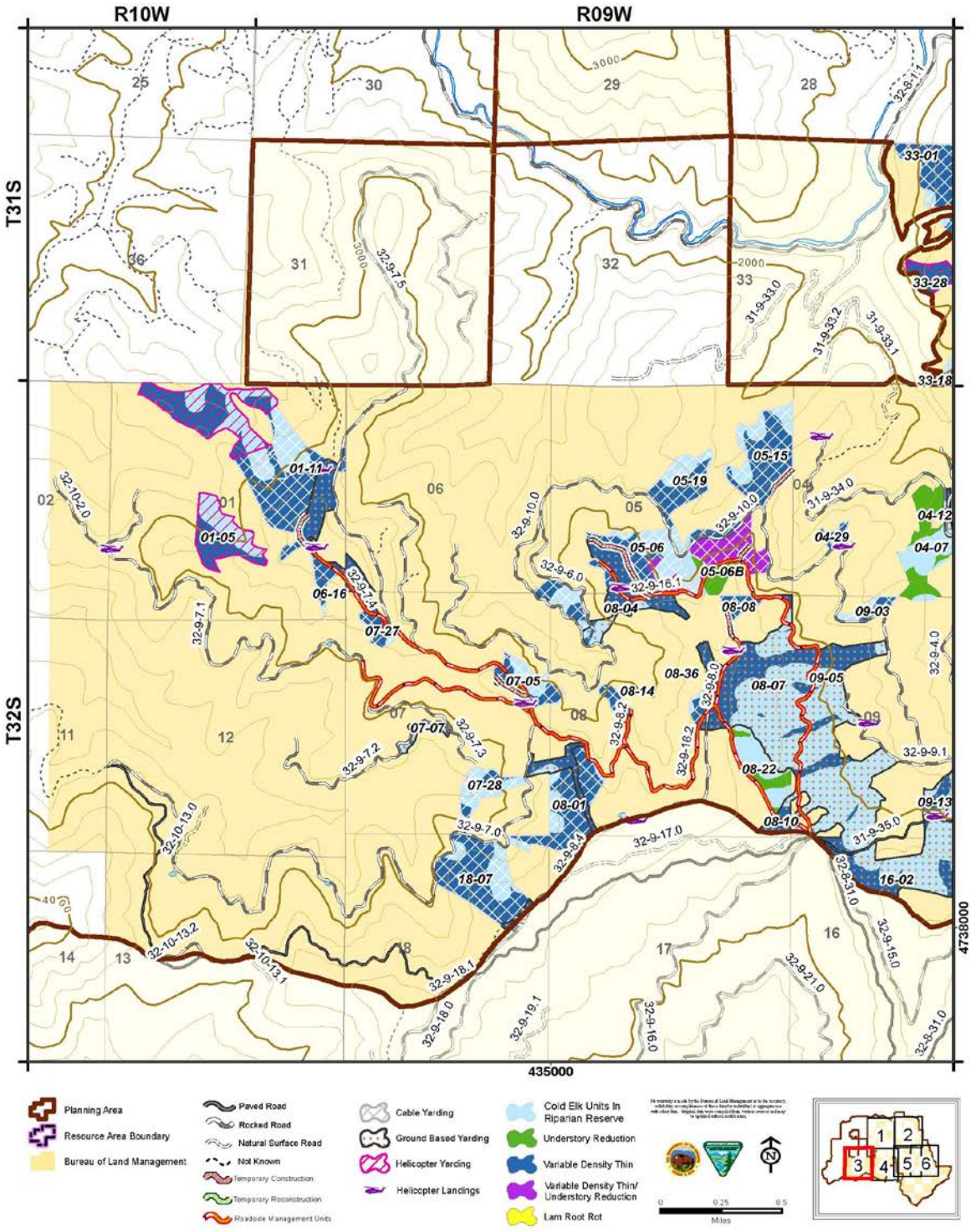
Appendix H – Cold Elk Proposed Unit Maps



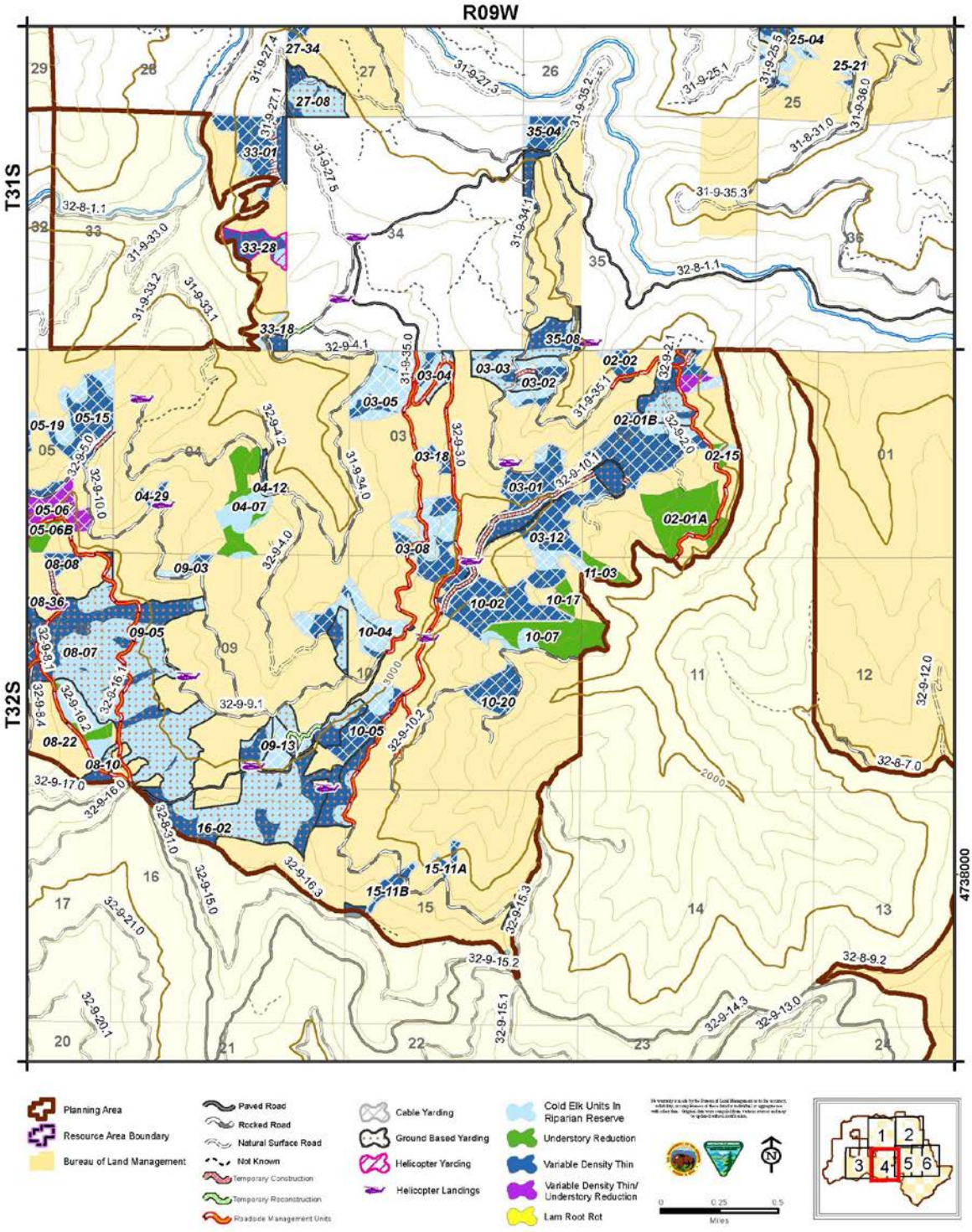
Cold Elk Proposed Action Alternative



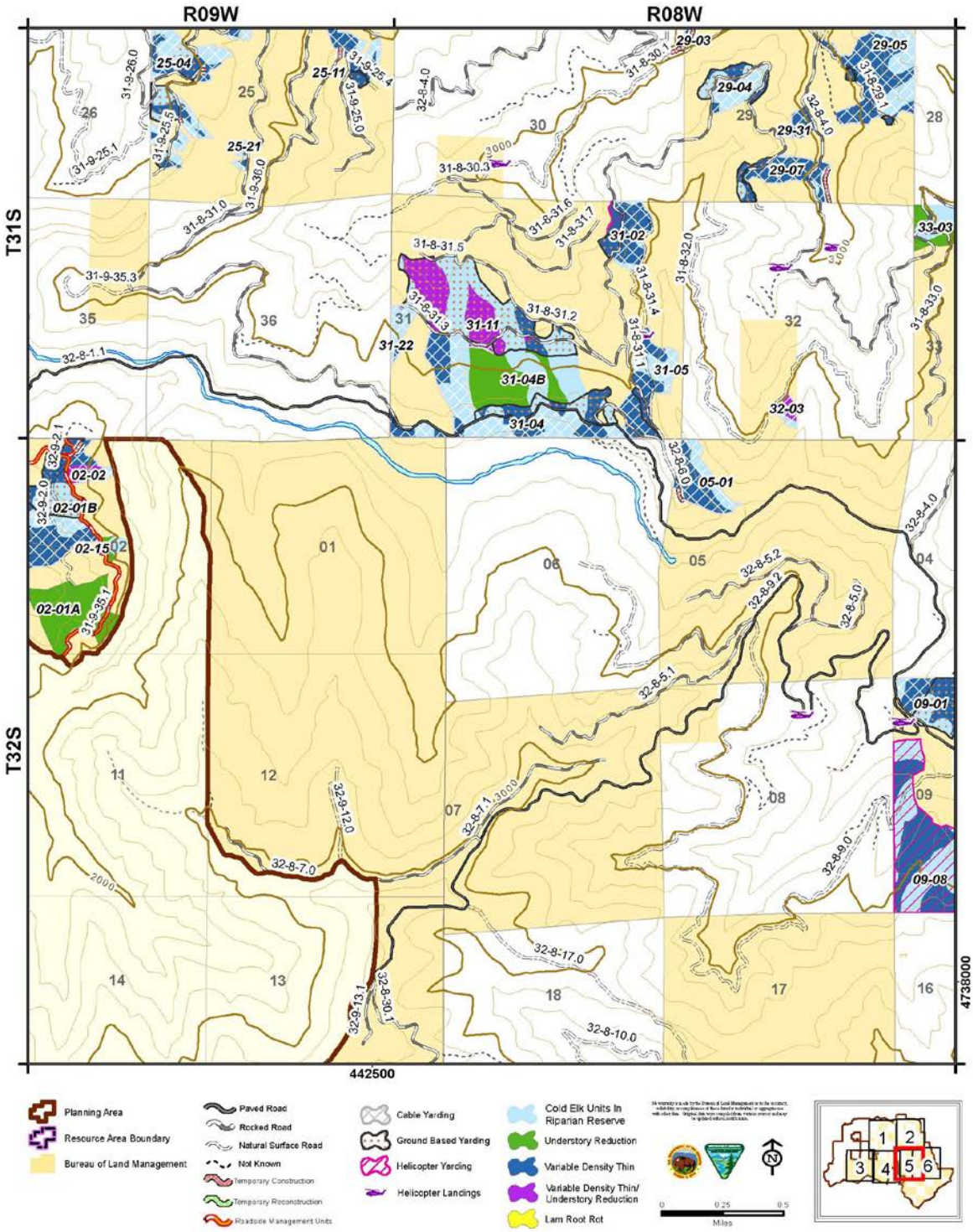
Cold Elk Proposed Action Alternative



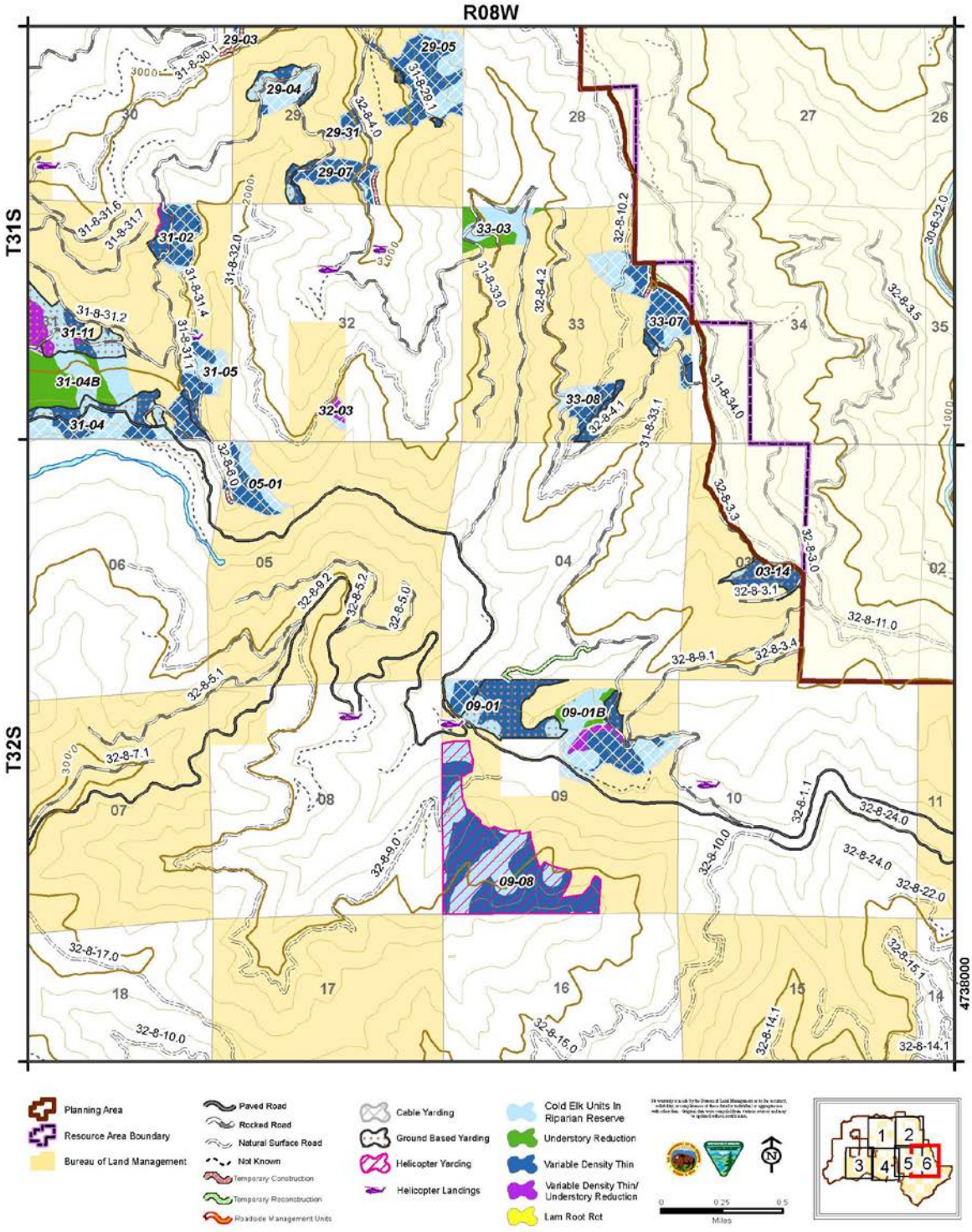
Cold Elk Proposed Action Alternative



Cold Elk Proposed Action Alternative



Cold Elk Proposed Action Alternative



Appendix I – Proposed Action Alternative Detailed Unit Table

Proposed Action Alternative								
EA unit reference		Logging System			Temporary Route Construction			
					BLM Lands		Private Lands	
EA Unit	Unit Acres	Ground Based	Cable/ Skyline	Helicopter	Temporary Route Construction (miles)	Temporary Route Reconstruction (miles)	Temporary Route Construction (miles)	Temporary Route Reconstruction (miles)
01-05	31.0	0.0	0.0	31.0	0.00	0.00	0.00	0.00
01-11	144.0	18.0	76.0	50.0	0.17	0.00	0.00	0.00
02-01A	46.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
02-01B	80.0	25.0	55.0	0.0	0.03	0.00	0.00	0.00
02-02	25.0	4.0	21.0	0.0	0.05	0.00	0.00	0.00
02-15	6.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
03-01	48.0	18.0	30.0	0.0	0.57	0.00	0.00	0.00
03-02	26.0	5.0	21.0	0.0	0.09	0.00	0.00	0.00
03-03	18.0	18.0	0.0	0.0	0.00	0.00	0.00	0.00
03-04	19.0	7.0	12.0	0.0	0.03	0.00	0.00	0.00
03-05	40.0	0.0	40.0	0.0	0.00	0.00	0.00	0.00
03-08	49.0	0.0	49.0	0.0	0.00	0.00	0.00	0.00
03-12	57.0	9.0	48.0	0.0	0.06	0.00	0.00	0.00
03-14	19.0	19.0	0.0	0.0	0.00	0.00	0.00	0.00
03-18	6.0	0.0	6.0	0.0	0.00	0.00	0.00	0.00
04-07	39.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
04-12	5.0	5.0	0.0	0.0	0.00	0.00	0.00	0.00
04-29	5.0	0.0	5.0	0.0	0.00	0.00	0.00	0.00
05-01	27.0	0.0	27.0	0.0	0.06	0.00	0.00	0.00
05-06	83.0	15.0	68.0	0.0	0.45	0.00	0.00	0.00
05-06B	13.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
05-15	48.0	0.0	48.0	0.0	0.13	0.00	0.00	0.00
05-19	37.0	0.0	37.0	0.0	0.00	0.00	0.00	0.00
06-16	11.0	11.0	0.0	0.0	0.00	0.00	0.00	0.00
07-02	15.0	11.0	4.0	0.0	0.07	0.00	0.00	0.00
07-03	23.0	5.0	18.0	0.0	0.00	0.00	0.00	0.00
07-05	21.0	2.0	19.0	0.0	0.16	0.00	0.00	0.00
07-07	5.0	5.0	0.0	0.0	0.00	0.00	0.00	0.00
07-09	16.0	4.0	12.0	0.0	0.00	0.00	0.00	0.00
07-27	8.0	1.0	7.0	0.0	0.00	0.00	0.00	0.00
07-28	19.0	0.0	19.0	0.0	0.00	0.00	0.00	0.00
08-01	58.0	12.0	46.0	0.0	0.00	0.00	0.00	0.00
08-04	37.0	20.0	17.0	0.0	0.00	0.00	0.00	0.00
08-07	107.0	107.0	0.0	0.0	0.00	0.00	0.00	0.00
08-08	8.0	0.0	8.0	0.0	0.16	0.00	0.00	0.00
08-10	7.0	7.0	0.0	0.0	0.00	0.00	0.00	0.00
08-14	7.0	2.0	5.0	0.0	0.00	0.00	0.00	0.00
08-22	27.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
08-36	14.0	8.0	6.0	0.0	0.00	0.00	0.00	0.00
09-01	105.0	47.0	58.0	0.0	0.00	0.00	0.00	0.45
09-01B	18.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
09-03	7.0	0.0	7.0	0.0	0.03	0.00	0.00	0.00
09-05	120.0	120.0	0.0	0.0	0.00	0.00	0.00	0.00
09-08	135.0	0.0	0.0	135.0	0.00	0.00	0.00	0.00
09-13	35.0	23.0	12.0	0.0	0.00	0.23	0.00	0.00
10-02	56.0	3.0	53.0	0.0	0.26	0.00	0.00	0.00
10-04	46.0	10.0	36.0	0.0	0.00	0.00	0.00	0.00
10-05	60.0	33.0	27.0	0.0	0.00	0.00	0.00	0.00
10-07	42.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
10-17	7.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
10-20	20.0	0.0	20.0	0.0	0.00	0.00	0.00	0.00
11-03	9.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
11-08	28.0	9.0	19.0	0.0	0.07	0.00	0.00	0.00
11-13	12.0	12.0	0.0	0.0	0.00	0.00	0.00	0.00
11-19	9.0	0.0	9.0	0.0	0.00	0.00	0.00	0.00
11-19B	5.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
13-02	35.0	35.0	0.0	0.0	0.00	0.00	0.00	0.00
13-03	8.0	8.0	0.0	0.0	0.00	0.00	0.00	0.00
13-09	20.0	20.0	0.0	0.0	0.00	0.00	0.04	0.00
13-10	4.0	4.0	0.0	0.0	0.00	0.00	0.00	0.00
15-01	3.0	3.0	0.0	0.0	0.00	0.00	0.00	0.00
15-04	5.0	2.0	3.0	0.0	0.00	0.00	0.00	0.00
15-11A	6.0	0.0	6.0	0.0	0.00	0.00	0.00	0.00
15-11B	12.0	3.0	9.0	0.0	0.00	0.00	0.00	0.00
15-18	20.0	1.0	19.0	0.0	0.06	0.00	0.00	0.00
15-19	121.0	65.0	56.0	0.0	0.61	0.17	0.11	0.00
16-02	105.0	105.0	0.0	0.0	0.00	0.00	0.00	0.00
18-07	59.0	4.0	55.0	0.0	0.07	0.00	0.00	0.00
19-03	60.0	49.0	11.0	0.0	0.00	0.00	0.00	0.00

Proposed Action Alternative								
EA unit reference		Logging System			Temporary Route Construction			
					BLM Lands		Private Lands	
EA Unit	Unit Acres	Ground Based	Cable/ Skyline	Helicopter	Temporary Route Construction (miles)	Temporary Route Reconstruction (miles)	Temporary Route Construction (miles)	Temporary Route Reconstruction (miles)
01-05	31.0	0.0	0.0	31.0	0.00	0.00	0.00	0.00
01-11	144.0	18.0	76.0	50.0	0.17	0.00	0.00	0.00
02-01A	46.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
02-01B	80.0	25.0	55.0	0.0	0.03	0.00	0.00	0.00
02-02	25.0	4.0	21.0	0.0	0.05	0.00	0.00	0.00
02-15	6.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
03-01	48.0	18.0	30.0	0.0	0.57	0.00	0.00	0.00
03-02	26.0	5.0	21.0	0.0	0.09	0.00	0.00	0.00
03-03	18.0	18.0	0.0	0.0	0.00	0.00	0.00	0.00
03-04	19.0	7.0	12.0	0.0	0.03	0.00	0.00	0.00
03-05	40.0	0.0	40.0	0.0	0.00	0.00	0.00	0.00
03-08	49.0	0.0	49.0	0.0	0.00	0.00	0.00	0.00
03-12	57.0	9.0	48.0	0.0	0.06	0.00	0.00	0.00
03-14	19.0	19.0	0.0	0.0	0.00	0.00	0.00	0.00
03-18	6.0	0.0	6.0	0.0	0.00	0.00	0.00	0.00
04-07	39.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
04-12	5.0	5.0	0.0	0.0	0.00	0.00	0.00	0.00
04-29	5.0	0.0	5.0	0.0	0.00	0.00	0.00	0.00
05-01	27.0	0.0	27.0	0.0	0.06	0.00	0.00	0.00
05-06	83.0	15.0	68.0	0.0	0.45	0.00	0.00	0.00
05-06B	13.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
05-15	48.0	0.0	48.0	0.0	0.13	0.00	0.00	0.00
05-19	37.0	0.0	37.0	0.0	0.00	0.00	0.00	0.00
06-16	11.0	11.0	0.0	0.0	0.00	0.00	0.00	0.00
07-02	15.0	11.0	4.0	0.0	0.07	0.00	0.00	0.00
07-03	23.0	5.0	18.0	0.0	0.00	0.00	0.00	0.00
07-05	21.0	2.0	19.0	0.0	0.16	0.00	0.00	0.00
07-07	5.0	5.0	0.0	0.0	0.00	0.00	0.00	0.00
07-09	16.0	4.0	12.0	0.0	0.00	0.00	0.00	0.00
07-27	8.0	1.0	7.0	0.0	0.00	0.00	0.00	0.00
07-28	19.0	0.0	19.0	0.0	0.00	0.00	0.00	0.00
08-01	58.0	12.0	46.0	0.0	0.00	0.00	0.00	0.00
08-04	37.0	20.0	17.0	0.0	0.00	0.00	0.00	0.00
08-07	107.0	107.0	0.0	0.0	0.00	0.00	0.00	0.00
08-08	8.0	0.0	8.0	0.0	0.16	0.00	0.00	0.00
08-10	7.0	7.0	0.0	0.0	0.00	0.00	0.00	0.00
08-14	7.0	2.0	5.0	0.0	0.00	0.00	0.00	0.00
08-22	27.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
08-36	14.0	8.0	6.0	0.0	0.00	0.00	0.00	0.00
09-01	105.0	47.0	58.0	0.0	0.00	0.00	0.00	0.45
09-01B	18.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
09-03	7.0	0.0	7.0	0.0	0.03	0.00	0.00	0.00
09-05	120.0	120.0	0.0	0.0	0.00	0.00	0.00	0.00
09-08	135.0	0.0	0.0	135.0	0.00	0.00	0.00	0.00
09-13	35.0	23.0	12.0	0.0	0.00	0.23	0.00	0.00
10-02	56.0	3.0	53.0	0.0	0.26	0.00	0.00	0.00
10-04	46.0	10.0	36.0	0.0	0.00	0.00	0.00	0.00
10-05	60.0	33.0	27.0	0.0	0.00	0.00	0.00	0.00
10-07	42.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
10-17	7.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
10-20	20.0	0.0	20.0	0.0	0.00	0.00	0.00	0.00
11-03	9.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
11-08	28.0	9.0	19.0	0.0	0.07	0.00	0.00	0.00
11-13	12.0	12.0	0.0	0.0	0.00	0.00	0.00	0.00
11-19	9.0	0.0	9.0	0.0	0.00	0.00	0.00	0.00
11-19B	5.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00
13-02	35.0	35.0	0.0	0.0	0.00	0.00	0.00	0.00
13-03	8.0	8.0	0.0	0.0	0.00	0.00	0.00	0.00
13-09	20.0	20.0	0.0	0.0	0.00	0.00	0.04	0.00
13-10	4.0	4.0	0.0	0.0	0.00	0.00	0.00	0.00
15-01	3.0	3.0	0.0	0.0	0.00	0.00	0.00	0.00
15-04	5.0	2.0	3.0	0.0	0.00	0.00	0.00	0.00
15-11A	6.0	0.0	6.0	0.0	0.00	0.00	0.00	0.00
15-11B	12.0	3.0	9.0	0.0	0.00	0.00	0.00	0.00
15-18	20.0	1.0	19.0	0.0	0.06	0.00	0.00	0.00
15-19	121.0	65.0	56.0	0.0	0.61	0.17	0.11	0.00
16-02	105.0	105.0	0.0	0.0	0.00	0.00	0.00	0.00
18-07	59.0	4.0	55.0	0.0	0.07	0.00	0.00	0.00
19-03	60.0	49.0	11.0	0.0	0.00	0.00	0.00	0.00

Appendix J - Soil Properties from the National Cooperative Soil Survey for West Fork Cow Creek (Natural Resources Conservation Service (NRCS-USDA) n.d.)

MU Code	MU Name	Slopes %	Soil Rutting Hazard	Fire Damage Susceptibility	Road Suitability	GIS Acres
6F	Acker-Norling complex	30 to 60	Moderate	Highly susceptible	Poorly suited	8,801
13G	Atring-Vermisa complex	60 to 90	Slight	Highly susceptible	Poorly suited	7,371
120G	Kanid-Atring complex	60 to 90	Slight	Highly susceptible	Poorly suited	4,290
182F	Orford-McDuff complex	30 to 60	Severe	Highly susceptible	Poorly suited	4,130
117F	Josephine-Speaker complex	30 to 60	Slight	Highly susceptible	Poorly suited	3,861
19G	Beekman-Vermisa complex	60 to 90	Moderate	Highly susceptible	Poorly suited	3,280
5F	Acker-Norling complex	30 to 60	Moderate	Highly susceptible	Poorly suited	3,173
15F	Digger-Umpcoos-Rock outcrop association	50 to 90	Severe	Highly susceptible	Poorly suited	2,979
50E	Remote-Digger-Preacher complex	30 to 50	Severe	Highly susceptible	Poorly suited	2,621
204G	Remote-Digger complex	60 to 90	Slight	Highly susceptible	Poorly suited	1,736
69E	Dumont gravelly loam	12 to 30	Moderate	Moderately susceptible	Moderately suited	1,603
14F	Digger-Preacher-Umpcoos association	50 to 80	Severe	Highly susceptible	Poorly suited	1,300
179E	Orford gravelly silt loam	3 to 30	Severe	Moderately susceptible	Moderately suited	1,098
90E	Gustin-Orford complex	3 to 30	Severe	Slightly susceptible	Moderately suited	892
192E	Pollard gravelly loam	3 to 30	Moderate	Moderately susceptible	Moderately suited	713
50D	Remote-Digger-Preacher complex	12 to 30	Severe	Moderately susceptible	Moderately suited	687
266F	Windygap-Bellpine complex	30 to 60	Severe	Slightly susceptible	Poorly suited	546
53E	Serpentano very stony loam	35 to 70	Slight	Highly susceptible	Poorly suited	543
9G	Atring very gravelly loam	high elevation	Severe	Highly susceptible	Poorly suited	490
7F	Acker-Norling complex	high elevation	Moderate	Highly susceptible	Poorly suited	448
256G	Vermisa-Rock outcrop complex	60 to 100	Slight	Highly susceptible	Poorly suited	433
58G	Digger-Bohannon-Umpcoos complex	60 to 90	Slight	Highly susceptible	Poorly suited	409
49F	Remote loam	50 to 75	Severe	Highly susceptible	Poorly suited	407
58F	Umpcoos-Rock outcrop association	70 to 99	Slight	Highly susceptible	Poorly suited	404
263E	Windygap clay loam	12 to 30	Severe	Slightly susceptible	Moderately suited	393
276E	Zalea-Pyrady complex	15 to 30	Moderate	Moderately susceptible	Moderately suited	352
197F	Preacher-Bohannon complex	30 to 60	Severe	Highly susceptible	Poorly suited	320
46D	Preacher-Bohannon loams	3 to 30	Severe	Moderately susceptible	Moderately suited	314
78F	Stackyards-Rilea-Euchrand complex	60 to 90	Slight	Highly susceptible	Poorly suited	307
152E	McNab-Windygap complex	3 to 30	Severe	Moderately susceptible	Moderately suited	284
196E	Preacher-Blachly complex	12 to 30	Severe	Moderately susceptible	Moderately suited	232
44D	Preacher-Blachly association	12 to 30	Severe	Moderately susceptible	Moderately suited	212
197E	Preacher-Bohannon complex	3 to 30	Severe	Moderately susceptible	Moderately suited	208
46E	Preacher-Bohannon loams	30 to 60	Severe	Highly susceptible	Poorly suited	143

86F	Gravecreek gravelly loam	30 to 60	Moderate	Highly susceptible	Poorly suited	104
79F	Stackyards-Rilea-Euchrand complex	60 to 90	Slight	Highly susceptible	Poorly suited	91
10B	Chismore silt loam	3 to 7	Severe	Slightly susceptible	Moderately suited	87
186F	Pearsoll-Dubakella complex	30 to 70	Slight	Highly susceptible	Poorly suited	75
49E	Remote loam	30 to 50	Severe	Highly susceptible	Poorly suited	71
74E	Cedarcamp-Snowcamp-Rock outcrop complex	30 to 60	Slight	Highly susceptible	Poorly suited	65
85F	Gravecreek gravelly loam	30 to 60	Moderate	Highly susceptible	Poorly suited	50
25C	Bigdutch gravelly loam	3 to 12	Moderate	Moderately susceptible	Moderately suited	45
25E	Bigdutch gravelly loam	12 to 30	Moderate	Moderately susceptible	Moderately suited	31
211	Rock outcrop		Not rated	Not rated	Not rated	29
70D	Bobsgarden-Rilea-Yorel complex	0 to 30	Slight	Moderately susceptible	Moderately suited	28
73E	Cedarcamp-Snowcamp-Rock outcrop complex	30 to 60	Slight	Highly susceptible	Poorly suited	27
231G	Stackyards extremely gravelly loam	60 to 90	Slight	Highly susceptible	Poorly suited	26
181F	Orford-Gustin complex	30 to 60	Moderate	Highly susceptible	Poorly suited	25
97E	Honeygrove gravelly clay loam	3 to 30	Moderate	Moderately susceptible	Moderately suited	22
68F	Bobsgarden-Rilea-Euchrand complex	60 to 90	Slight	Highly susceptible	Poorly suited	22
68E	Bobsgarden-Rilea-Euchrand complex	30 to 60	Slight	Highly susceptible	Poorly suited	21
244G	Stackyards-Rilea-Euchrand complex	60 to 90	Slight	Highly susceptible	Poorly suited	20
191	Pits		Not rated	Not rated	Not rated	8
97F	Honeygrove gravelly clay loam	30 to 60	Moderate	Highly susceptible	Poorly suited	6
32E	Bobsgarden-Rilea-Yorel complex	0 to 30	Moderate	Moderately susceptible	Moderately suited	5
278E	Zalea-Pyrady-Yorel complex	15 to 30	Slight	Moderately susceptible	Moderately suited	3
94G	Kanid-Atring complex	60 to 90	Slight	Highly susceptible	Poorly suited	3
89F	Acker-Norling complex	30 to 60	Moderate	Highly susceptible	Poorly suited	3
245G	Stackyards-Rilea-Euchrand complex	60 to 90	Slight	Highly susceptible	Poorly suited	3
28G	Bobsgarden-Rilea-Euchrand complex	60 to 90	Moderate	Highly susceptible	Poorly suited	3