Double Bowen Forest Management Project Environmental Assessment

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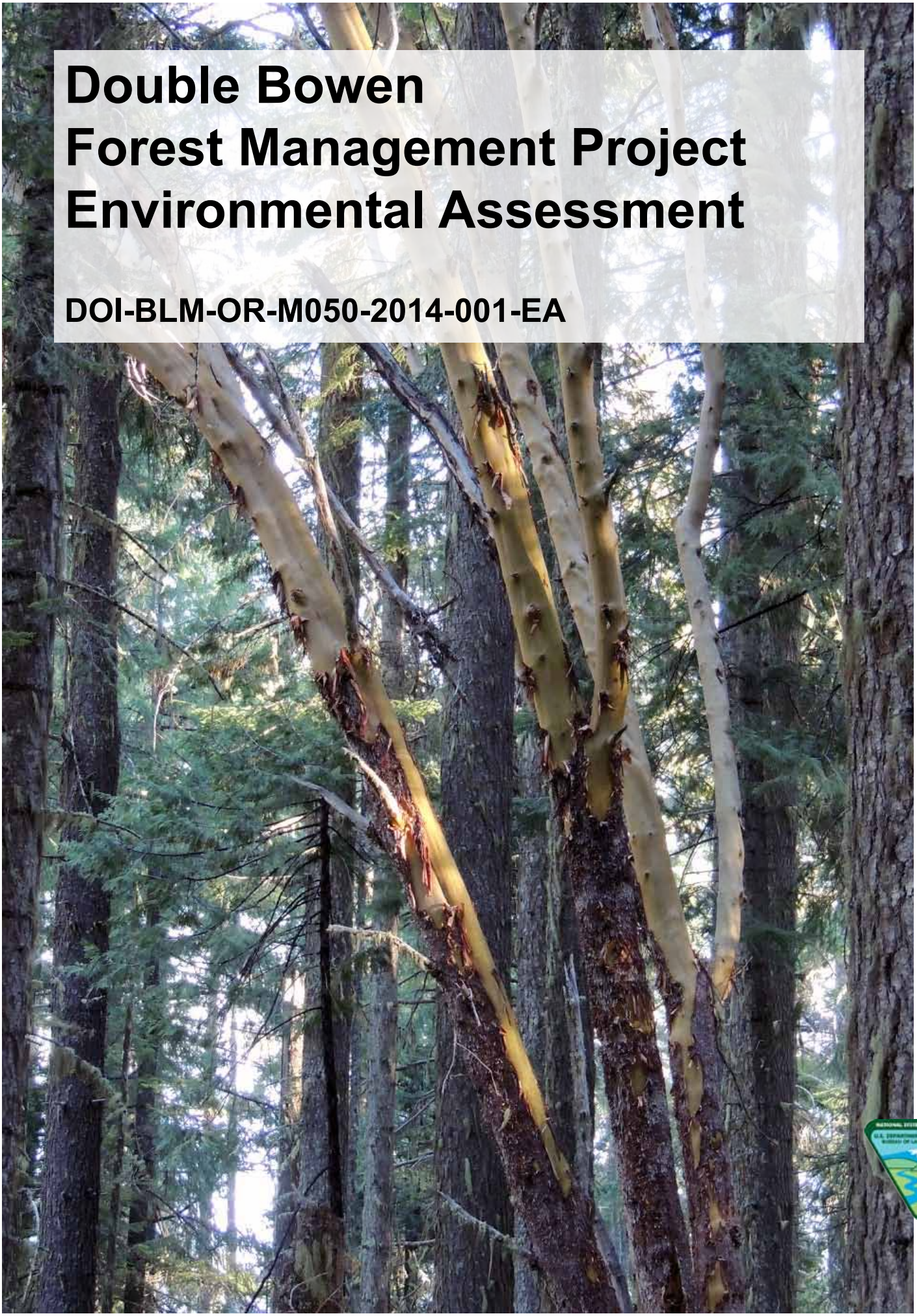

BLM

Butte Falls Resource Area

August 2014

Medford District Vision

Working together to sustain and enhance resilient landscapes and quality of life in southwest Oregon.

Medford District Mission

We are dedicated to professional management of the public lands by sustaining a wide variety of uses to serve the American people, now and in the future. We do this with a land ethic of balanced resource management in an environmentally, socially, and economically sound manner.

We are engaged, knowledgeable, informed, supported, and contributing toward solutions to current and future challenges.

We contribute to and manage toward resilient landscapes and habitats.

We effectively contribute to our communities through a diverse and flexible portfolio of goods, services, and opportunities.

BLM/OR/WA/PL-14/043+1792

Dear Reader:

The Butte Falls Resource Area, Medford District Bureau of Land Management (BLM) has completed the environmental analysis for the proposed Double Bowen Forest Management Project. This document, the Double Bowen Forest Management Project Environmental Assessment (EA), provides a description of the project and Project Area, background information, and the possible effects of implementing the project.

The EA analyzed the following activities proposed on **BLM-administered lands** located south and east of the city of Butte Falls, Oregon in the Big Butte Creek fifth-field watershed:

- Forest Management
  - Timber harvest—782 acres
  - Small diameter thinning—76 acres
  - Riparian thinning—14 acres
- Timber Yarding
  - Ground-based—819 acres
  - Skyline-cable—53 acres
- Road Work
  - Road renovation—31 miles
  - Road decommissioning—3.3 miles of road
  - Temporary route construction and decommissioning—0.4 mile
  - Temporary route reconstruction and decommissioning—0.2 mile
  - Temporary route renovation and decommissioning—0.3 mile
  - Road closure (gate or barricade)—0.2 mile (2 sites)
- Treatment of Forest Management Activity Slash
  - Lop and Scatter
  - Hand pile and hand pile burn
  - Biomass removal
- Water source restoration—2 sites
- Meadow restoration—21 acres

The 30-day comment period for this EA will begin when the legal notice is published in the *Medford Mail Tribune* newspaper. Any comments you may have regarding this project must be received by September 29, 2014 to be considered in final decisions for this proposal.

Please send your comments to Bureau of Land Management, Attention: Robyn Wicks, 3040 Biddle Road, Medford, OR 97504, or e-mail your comments to BLM_OR_MD_Mail@blm.gov (Attention: Robyn Wicks). Questions on the proposed project should be directed to Jean Williams at 541-618-2385 or Nick McDaniel at 541-618-2356.

Remember, all comments will be made available for public review. If you would like your name, street address or both withheld from public review, or from disclosure under the Freedom of Information Act, please state this clearly at the beginning of your written comment. We will honor your request to the extent allowed by law. All comments received from organizations or officials of organizations, businesses, or government agencies will be made available for public inspection in their entirety.

Thank you for your continued interest in the Double Bowen Forest Management Project. Your input plays an important role in our land management decisions.

Jean A. Williams
Acting Field Manager
Butte Falls Resource Area

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1.0 Purpose and Need

This section describes the action proposed by the BLM (Bureau of Land Management), why the BLM is proposing this action, and the location of the proposed action. It also identifies the factors the decision maker will use for choosing the alternative that will best meet the purpose of and need for this project.

The following definitions are for terms used in this section:

allowable sale quantity. The gross amount of timber volume, including salvage that may be sold annually from a specified area over a stated period of time in accordance with the approved land use plan.

Authorized Officer. The Federal employee who has the delegated authority to make a specific decision.

coarse woody debris. Portion of a tree that has fallen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter (Bureau of Land Management 1995, 102).

slash. The branches, bark, tops, cull logs, and broken or uprooted trees left on the ground after logging.

snag. Any standing dead, partially dead, or defective (cull) tree at least 10 inches DBH (diameter at breast height) and at least 6 feet tall (Bureau of Land Management 1995, 114).

1.1 Introduction

This EA (environmental assessment) documents the environmental analysis the BLM conducted to estimate the potential site-specific effects on the human environment that may result from implementation of this project. The EA will provide the BLM's Authorized Officer (Butte Falls Resource Area Field Manager) with current information to aid in the decision-making process. It will also determine if there are significant impacts not already analyzed in the EIS (environmental impact statement) for the Medford District's RMP (Resource Management Plan) and whether a supplement to that EIS is needed or if a Finding of No Significant Impact is appropriate.

1.1.1 Proposed Action

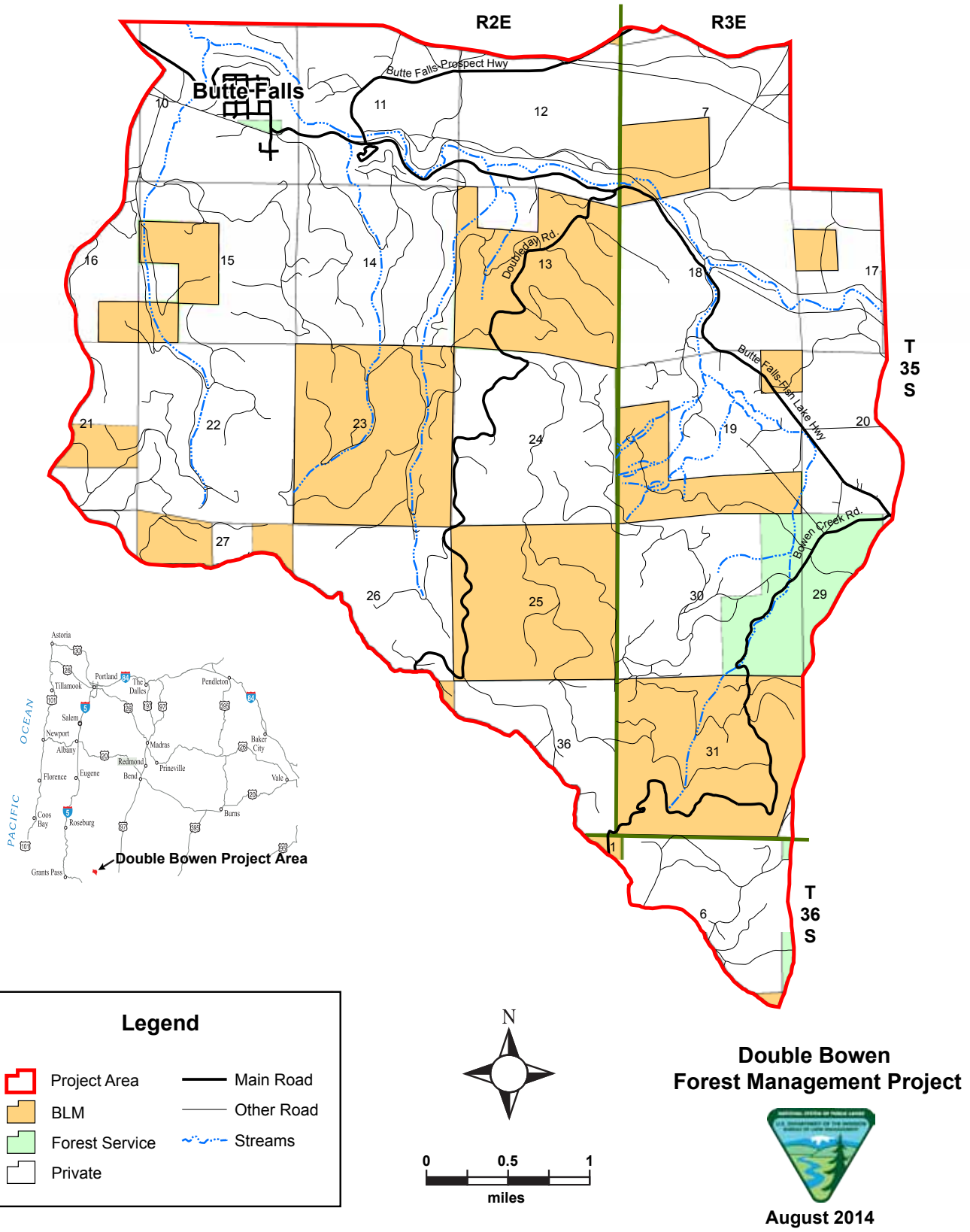
The BLM's Butte Falls Resource Area proposes forest management actions, including timber harvest, on 872 acres of forest land. Silviculture prescriptions may vary by alternative and may include a combination of density management, shelterwood harvest, selection harvest, riparian thinning, restoration thinning, or small diameter thinning. Cut trees would be removed using ground-based or skyline cable yarding systems. Fuel loads resulting from harvest would be reduced by lopping and scattering, piling and burning, underburning, or biomass removal. Shelterwood harvest areas would be replanted. Road projects that would be completed to support the timber harvest activities would include road renovation and temporary route construction, reconstruction, and renovation.

Other proposed projects include road closure, partial and full road decommissioning, water source restoration, and meadow restoration.

1.1.2 Project Area

The 12,774-acre Double Bowen Project Area is located in southwest Oregon northeast of Medford near the city of Butte Falls, Oregon (Map 1). The Project Area is within the 157,000-acre Big Butte Creek fifth-field watershed and is located entirely within the 15,787-acre Lower South Fork Big Butte Creek sixth-field subwatershed.

Map 1. Double Bowen Project Location Map



Lands in the Project Area are a mix of Federal, private, and local government lands. BLM lands compose 28% (3,513 acres) of the Double Bowen Project Area (Figure 1-1).

The Project Area is located on the BLM-administered lands in

- Township 35 South, Range 2 East, sections 13, 15, 23, 25 and
- Township 35 South, Range 3 East, sections 7, 19, 31;
  Willamette Meridian; Jackson County, Oregon.

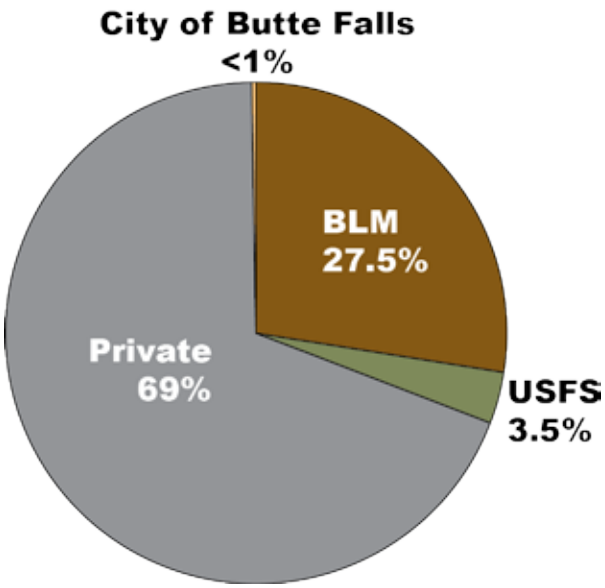


Figure 1-1. Land ownership in the Double Bowen Project Area.

1.2 Purpose

To be given serious consideration as a reasonable alternative, any action alternative must meet the objectives provided in the Medford District ROD/RMP (Record of Decision and Resource Management Plan) for projects to be implemented in the Project Area.

1.2.1 Forest Management and Timber Harvest

Design and implement commercial timber sales on matrix lands in the Lower South Fork Big Butte Creek sixth-field watershed.

The timber harvested from this project would produce revenue for the Federal government and could contribute up to 7 million board feet of timber toward the Medford District's annual Allowable Sale Quantity during fiscal year 2014. The ROD/RMP (p. 81) directs the BLM to design and implement forest management activities to produce a sustained yield of products to support local and regional economic activity.

Timber on matrix lands in the Project Area allocated to the northern GFMA (general forest management area) exceeds the minimum stand age of 100 years set by the ROD/RMP (p. 189). Under the ROD/RMP, stands that meet or exceed the minimum age requirement could be regeneration harvested. In areas with growing season frosts, shelterwood harvest would be used to provide shelter for seedlings in the regenerated stands.

Reduce stand densities in stands greater than 100 years old in order to make site resources available for remaining trees.

Stands that are mature seral stage and older, exhibiting one or more stand layers would be selection harvested. Selection harvest stands are most often northern spotted owl dispersal habitat void of structural complexity found in high quality owl habitat. In selection harvest stands, low vigor trees across *all* diameter sizes would be removed. The goal of selection harvest is to maintain multiple-canopy, multiple-age stands (Bureau of Land Management 1995a, p. 182). For this project, selection harvest would be used to maintain northern spotted owl habitat and increase stand health for the longevity of the northern spotted owl habitat.

Maintain or enhance forest health, stand structure, and function in stands identified as northern spotted owl habitat.

The ROD/RMP (p. 189) allows density management to occur in stands to retain patches of denser habitat where desired to meet criteria for wildlife habitat.

Reduce tree densities to increase landscape resiliency to environmental disturbances.

Forest stands with densities that exceed historic conditions and natural carrying capacities would be harvested using restoration and small diameter thinning techniques. Restoration and small diameter thinning would be implemented to reduce tree mortality and restore stand vigor, resiliency, and stability (Bureau of Land Management 1995a, p. 186).

Aid in reforestation of the areas proposed for regeneration harvest.

A combination of existing regeneration, natural seeding, and tree planting would be used, when applicable, to meet regeneration targets and time frames for the stands. ROD/RMP (p. 72–73) direction is to apply silviculture systems that are planned to produce over time forests that have a desired species composition, structural characteristics, and distribution of seral or age classes.

1.2.2 Road Work

Reduce the potential for sediment production on up to 31 miles of roads that would be used to haul harvested timber.

Before timber is hauled, the timber sale purchaser would implement measures to minimize possible sediment production from timber hauling and sediment delivery to streams. ROD/RMP (p. 163) direction is to restore or improve roads to a desired standard in a manner that minimizes sediment production and water quality degradation.

Decrease the possibility of sediment entering streams by closing or decommissioning up to 3.3 miles of roads surplus to BLM needs at this time.

The 1995 ROD/RMP (p. 28) recommends "closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to Aquatic Conservation Strategy and riparian reserve objectives and considering short-term and long-term transportation needs."

Provide vehicular access to proposed harvest units on BLM-administered lands in the Project Area that are not accessible by existing roads.

A ROD/RMP (p. 86) objective is to "manage roads to meet the needs identified under other resource programs."

1.2.3 Fuels Treatment associated with Timber Harvest

Reduce the potential risk of wildfire that may result from the fuels (e.g. limbs, branches, twigs) produced during harvest activities.

Forest management activities produce fuels that could remain a fire hazard for 10 to 20 years, if left untreated, until natural decomposition occurs. ROD/RMP (p. 91) direction is to reduce activity-based fuel hazards.

1.2.4 Water Source Restoration

Improve water sources available for wildfire suppression and wildlife.

Water sources at 2 sites need sediment and brush removed to make more water available for fire fighting. ROD/RMP direction is to locate and manage water drafting sites to minimize adverse effects on riparian habitat and water quality (p. 90) and to supply water for various resource programs while protecting water quality and riparian vegetation (p. 165).

1.2.5 Meadow Restoration

Restore 21 acres of upland meadows where tree and brush species are encroaching.

In meadow restoration, small conifers and areas of older or decadent brush would be cut, burned, or both in an effort to rejuvenate brush species that would benefit wildlife as browse and remove encroaching vegetation. ROD/RMP direction (p. 49) is to use management practices, including fire, to obtain desired vegetation conditions in special habitats such as meadows.

1.3 Need

The Double Bowen Project interdisciplinary team identified opportunities or underlying problems in the Project Area that have resulted in the list of proposed projects. The needs for the proposed actions are presented below.

BLM employees, through data analysis and field examinations, identified stands that were overstocked and infested with dwarf mistletoe and root rot (laminated, annosus, and *Armillaria*). These stands in the Project Area are in need of immediate forest management activities.

The overstocked stands contain more trees than the sites have water, nutrients, and growing space to sustain, limiting conifer growth potential resulting in a decline in tree vigor.

In many stands, dwarf mistletoe infestation in Douglas-fir is causing a decline in the health and vigor of affected trees. Dwarf mistletoe is a parasitic plant that is dependent on the host tree for nutrients and water. As the mistletoe grows and spreads within the tree crown, it commands a larger and larger share of nutrients and food produced by the tree. Ultimately, the infested tree cannot meet its own needs and tree vigor declines. Heavily infested trees die prematurely, have reduced growth in height and diameter, and are often predisposed to attack by disease and insects.

Trees infected with root rot have reduced growth rates and higher than normal mortality rates. As the fungus spreads and kills more trees, stand openings would occur, with snags and wind thrown trees. Coarse woody debris would accumulate at higher than normal levels. Root to root contact between infected trees and uninfected trees would continue with crown symptoms appearing 5 to 15 years after initial infection. After crown symptoms appear, large trees would live an average of 10 years before tree mortality (Theis and Sturrock 1995).

Clear-cutting, shelterwood harvest, and large, stand-replacing fires have shifted many contiguous stands of late-successional forest to a patchy mosaic of young stands. Older forest stands in the area have declining growth rates or are deteriorating due to insects, disease, or other factors. Declining growth rates have resulted in reduced volume yield from these matrix lands. The proposed forest management activities are needed in the Project Area to reduce the number of trees and reverse these trends to produce sustainable, more resilient stands that contribute to future forest production and other RMP objectives.

Local economies and governments depend on the contributions the BLM-administered lands make to employment and income. In stands identified for harvest, the BLM needs to design economically viable timber sales that contribute to local, regional, and national economies.

The 2011 Northern Spotted Owl Recovery Plan recommends maintaining and restoring "older and more structurally complex multilayered conifer forests on Federal and non-Federal lands across [the northern spotted owl's] range . . . while allowing for other threats, such as fire and insects, to be addressed by

restoration management actions" (U.S. Fish and Wildlife Service 2011, III-67). The BLM needs to retain sufficient nesting, roosting, and foraging habitat within the provincial core use area and provincial home range (1.2-mile radius) of known northern spotted owl sites to support breeding, feeding, and sheltering.

The BLM needs to conserve the older, high quality, and occupied forest habitat as necessary to meet the northern spotted owl recovery goals. Science-based, active vegetation management is needed to restore forest health, especially in drier forests in the eastern and southern portions of the owl's range. Landscape-level planning and vegetation management that allow historical ecological processes, such as characteristic fire regimes and natural forest succession, needs to occur on these landscapes throughout the range of the owl.

Overstocked stands in selected riparian reserves are at risk for stand-replacing wildfires that could increase impacts, such as sedimentation, on aquatic systems and delay achieving desired outcomes, such as increased large woody debris and large trees to provide shade and habitat in riparian reserves. There is a need for reduced stocking levels in riparian stands identified as having high stand relative densities that have caused reduced growth rates in individual trees from competition for available resources including water, light, and nutrients.

Proposed timber harvest units that are currently inaccessible by vehicle need routes that would allow temporary access. These temporary routes need to meet the road standards set forth in BLM 9100 series manuals, the Medford District ROD/RMP, and the BMPs (best management practices) contained in the ROD/RMP.

The use of temporary routes, skid trails, and existing haul roads associated with forest management activities are considered sources for sediment in streams (Bureau of Land Management 1994, p. 4-19 and 4-20). Temporary routes need to be placed on stable locations and temporary routes and skid trails need to use erosion-control techniques to limit sediment movement. Before roads are used for hauling timber, they need to be renovated to reduce the probability of sediment entering streams from these roads. Roads no longer needed for access need to be closed or decommissioned.

Forest management activities result in a temporary increase in wildfire risk through the production of flammable debris such as limbs, branches, and twigs. The BLM needs to address this increased fire risk by reducing activity-generated fuel hazards.

Water sources constructed primarily for fire suppression use also provide a supply of drinking water and habitat for wildlife. Existing water sources are overgrown or contain sediment that limits the amount of water available for fire fighting. These water sources require maintenance to restore them to a functional condition that provides adequate access for fire fighting equipment.

Meadows in the Project Area are gradually disappearing due to the encroachment of brush and conifers resulting from fire exclusion and the periodic burning that once occurred. These meadows need fire or other disturbance agents introduced in order to promote the meadow vegetation normally found in this habitat.

1.4 Issues

1.4.1 Scoping

The BLM began outreach for this project on February 19, 2014 by mailing scoping notices to 66 individuals, businesses, organizations, other government agencies, and tribes. The purpose of the notice was to introduce the Double Bowen project and solicit public participation in its development. The notice requested comments, issues, or concerns regarding this project that might help in its development. The

BLM received a total of six comments in return. Comments were from American Forest Resource Council, Klamath-Siskiyou Wildlands Center, Oregon Wild, and three private citizens.

1.4.2 Issues Considered in Detail

Issues provide a basis for developing project alternatives, comparing the environmental effects of the alternatives, and aiding in the decision-making process. Issues are a point of disagreement, debate, or dispute with a proposed action based on some anticipated effect. Many issues may be identified during scoping but only some are analyzed in the EA. To warrant detailed analysis, an issue must be within the scope of analysis; not already decided by law, regulation, or previous decision; and open to scientific analysis, rather than conjecture.

1.4.2.1 Issues Identified for Analysis

ISSUE: Forest Condition and Forest Health

How can the BLM promote the growth and vigor of overstocked forest stands in the Project Area?

Forest stands in the Project Area are overstocked with more trees than the site's moisture, nutrients, and growing space can support. The supply of essential site resources has decreased while the demand has increased. With current stand densities, tree growth and vigor decline, increasing tree mortality from insects and disease. Stands with high densities, high tree mortality, or both have an increased probability of fire.

How can the BLM reduce the spread of Douglas-fir mistletoe and root rots in forest stands in the Project Area?

Douglas-fir mistletoe is present and common in a portion of the Project Area. Mistletoe is host-specific and may cause tree mortality; growth loss; alteration of crown and canopy structure; increased fire hazard; and increased susceptibility to bark beetles, root rots, and drought stress.

Root rots (annosus, *Armillaria*, and laminated) are present in the Project Area and are affecting white fir, sugar pine, ponderosa pine, and Douglas-fir. The occurrence of root rots is common and has caused tree decline and mortality of white fir, Douglas-fir, sugar pine, and ponderosa pine.

ISSUE: Northern Spotted Owl Habitat

Can the BLM implement forest management projects on matrix lands in northern spotted owl habitat without harm to an individual owl?

Forest stands on matrix lands in the Project Area contain northern spotted owl habitat (nesting, roosting, foraging, or dispersal). For forest stands within known home ranges of northern spotted owls, the BLM must design management actions that would maintain or improve habitat in order to prevent harm to northern spotted owls. Within designated critical habitat, short-term impacts must have long-term benefits for habitat restoration.

ISSUE: Economics

How can the BLM provide an economical timber sale while maintaining healthy, diverse, and productive ecosystems?

Many factors influence the cost of removing timber from Federal lands: harvest prescriptions, yarding systems, timber volume, road needs, activity slash treatment, hauling distances, and seasonal operating restrictions. The BLM must carefully balance these economic factors with the ecosystem needs to design an economically viable timber sale.

1.4.2.2 Issues Considered but Not Analyzed in Detail

A number of issues were raised during scoping that were not analyzed in detail. These issues may be outside the scope of the project, project design features or best management practices eliminate the possibility of significant effects, or no species habitat is present in the Project Area. Appendix A provides a list of these issues raised during scoping that are not analyzed or considered further in this EA.

1.5 Decision Factors

In choosing the alternative that best meets the purpose and need, the BLM will consider the extent to which each alternative would

- reduce competition-related mortality and wildfire risk, and increase tree vigor and growth;
- provide for the establishment and growth of conifer species while retaining structural and habitat components, such as large trees, snags, and coarse woody debris;
- promote the development of healthy, late-successional characteristics;
- generate revenue to the Federal Treasury;
- reduce the short-term and long-term costs of managing the lands in the Project Area;
- provide a long-term benefit for northern spotted owl critical habitat;
- maintain or improve existing highly suitable northern spotted owl habitat within the provincial radius (1.2 miles) of known active northern spotted owl sites and all or substantially all of the older and more structurally complex, multilayered conifer forests; and
- maintain or improve the older growth, high quality, and occupied forest habitat as necessary to meet the northern spotted owl recovery goals.

1.6 Legal Requirements

This proposed forest management project is in conformance with the objectives, land use allocations, and management direction in the 1995 ROD/RMP and any plan amendments in effect at the time this document is published.

This project is consistent with the 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).

The Double Bowen project is also consistent with 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 (Survey and Manage), as incorporated into the ROD/RMP. This project uses the December 2003 species list. This list incorporates species changes and removals made as a result of the 2001, 2002, and 2003 Annual Species Reviews, with the exception of the red tree vole. For the red tree vole, the Ninth Circuit Court of Appeals in *KSWC et al.* v. *Boody et al.*, 468 F3d 549 (9th Circuit 2006) vacated the category change and removal of the red tree vole in the mesic zone and returned the red tree vole to its status as existed in the 2001 Survey and Manage ROD, which makes this species Category C throughout its range.

The analysis in the Double Bowen Forest Management Project EA is site-specific and tiers to the broader analyses found in the PRMP/FEIS (Medford District Proposed Resource Management Plan/Final Environmental Impact Statement). The PRMP/FEIS incorporated the analysis from the Northwest Forest Plan FSEIS (Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl).

The BLM developed this project to be consistent with laws, regulations, and policies including the following: O&C Act (Oregon and California Railroad and Coos Bay Wagon Road Grant Land Act), FLPMA (Federal Land Policy and Management Act), ESA (Endangered Species Act), NEPA (National Environmental Policy Act), ARPA (Archaeological Resources Protection Act), CAA (Clean Air Act), and CWA (Clean Water Act).

1.7 Decisions to be Made

The following decisions will be made through this analysis:

- To determine if an SEIS (Supplemental Environmental Impact Statement) should be prepared based on whether the proposed action would result in significant impacts to the human environment not already analyzed in the EIS prepared for the Medford District ROD/RMP and its amendments.
- If there are any such additional impacts that are significant, we will determine whether the project proposals could be modified to mitigate the impacts so an SEIS would not be necessary. If we determine there is no need to prepare an SEIS, we will document this determination in a Finding of No Significant Impacts.
- To determine at what level, where, and how to harvest trees on BLM-administered lands allocated to the programmed timber harvest base within the Project Area.
- To implement or not implement proposed restoration projects on BLM-administered lands within the Project Area and, if so, which projects, at what level, and where.

2.0 Alternatives

Chapter 2 provides a description of the proposed projects and the alternative ways for meeting the multiple purposes and needs for this project. Project design features that serve as the basis for resource protection during project implementation are included.

The following definitions are for terms used in this section:

area of potential effect. The geographic area or areas within which an undertaking may cause changes in the character or use of historic properties, if any such properties exist (36 CFR 800.2[c]).

fuel type. One of seven classifications used by Scott and Burgan (2005) to group fuel models used to determine expected fire behavior predictions.

timber-understory fuel type. A fuel type where the primary carrier of fire is a mixture of forest litter and herbaceous shrubs beneath a forest canopy. Some timber-understory models are dynamic. Fire behavior is generally moderate to high.

timber litter fuel type. A fuel type where the primary carrier of fire is dead and down woody fuel beneath a forest canopy. Timber litter models are not dynamic. Fire behavior is generally low to moderate.

2.1 Introduction

The BLM used an interdisciplinary approach during the NEPA process to ensure the integrated use of the natural, environmental, and social sciences are applied to the project's development and analysis. The project interdisciplinary team developed the projects and alternatives to meet the purpose and need identified in Chapter 1. They were developed based on existing environmental conditions and also reflect public participation in the planning process.

2.2 Proposed Projects

2.2.1 Forest Management

See Appendix C, Silviculture Prescriptions, for more description of proposed timber harvest.

2.2.1.1 Regeneration Harvest

To maximize volume growth and yield, regeneration harvest should occur in older forest stands with declining growth rates or experiencing deterioration from insects, disease, or other factors. Retained trees would be the most vigorous trees and would be selected based on tree crown ratio and form. Healthy understory ponderosa pine, sugar pine, incense cedar, and Douglas-fir trees free of insects, disease, or damage would be left. Wildlife snags and coarse woody debris would be designated for retention. All other trees would be removed. Slash would be lopped and scattered or piled and burned. Conifer seedlings would be planted following harvest.

Regeneration harvest using **shelterwood** prescription guidelines would retain 12 to 25 green trees per acre greater than 20 inches DBH to provide protection for newly planted and natural seedlings in areas with growing-season frosts. The spatial distribution of trees would be more uniform. After harvest, canopy cover would be 20 to 40%. Overstory trees in excess of 6 to 8 trees per acre may be removed after 15 to 30 years if the understory trees are no longer susceptible to damage caused by late growing-season frost.

2.2.1.2 Density Management

High-density stands would be thinned from below (smallest trees are removed and largest trees are retained) to maintain or enhance forest health, stand structure, and function for northern spotted owl habitat. The residual canopy cover would be a minimum of 40% or 60%, depending on the current owl habitat designation (dispersal or nesting, roosting, and foraging).

2.2.1.3 Selection Harvest

Poor vigor trees from across *all* diameter classes would be removed to reduce stand densities in overstocked stands and make site resources (water, sunlight, nutrients, and growing space) available for remaining trees. The desired basal area and tree crown ratio and form are the primary factors used to determine which trees would be left or removed. A minimum of 40% or 60% canopy cover would remain after harvest, depending on the current owl habitat designation (dispersal or nesting, roosting, and foraging).

2.2.1.4 Restoration Thinning

Stand densities would be reduced to increase landscape resiliency to environmental disturbances such as fire, insects, disease, and climate change. Smaller trees and vegetation that are competing with the dominant and codominant trees for nutrients and water would be removed. Trees 150 years and older and the largest hardwoods would be retained unless identified as an operational safety concern. Structural diversity within stands would be achieved by leaving small, unthinned patches and creating small openings. A minimum of 40% or 60% canopy cover would remain after harvest, depending on the current owl habitat designation (dispersal or nesting, roosting, and foraging).

2.2.1.5 Small Diameter Thinning

High stand densities in younger ponderosa pine and mixed conifer stands would be reduced to promote stand health, create structural diversity, and increase landscape resiliency to environmental disturbances.

Riparian areas located adjacent to upland thinning units would be thinned using a similar prescription with an emphasis on retaining riparian species (e.g., maple, willow). High stand densities in young ponderosa pine and mixed conifer stands have resulted in slow or stagnant growth rates. These stands are overstocked with more trees than the site has water, nutrients, and growing space to sustain. Precommercial thinning and commercial thinning would reduce the number of trees per acre to levels the site has resources to sustain. A minimum of 40% canopy cover would remain after the harvest.

Figure 2-1. Laminated root rot in the Ginger Springs progeny test site.

The Ginger Springs progeny test site, located in T35S, R2E, section 23, is an overstocked stand of Douglas-fir with a prevalence of laminated root rot pockets (Figure 2-1). Stands would be thinned to remove the disease within the stand. After the root rot pockets are removed, openings would be planted with root rot resistant pines or incense cedar. The remainder of the stand would be thinned to a 60% canopy cover.

2.2.1.6 Riparian Thinning

Overstocked, even-aged, second growth riparian stands would be thinned to improve individual tree and stand health, reduce the risk for stand-replacing wildfires, restore ecosystem functions by accelerating the growth of healthier trees, and provide an increase of large wood sooner. Treatment would reduce stand densities by thinning from below, removing smaller trees; trees 20 inches in diameter or larger would not be extracted. A minimum of 50% canopy cover would remain in northern spotted owl dispersal habitat and a minimum of 60% canopy cover would remain in northern spotted owl nesting, roosting, and foraging habitat.

The outer 100 feet of riparian reserves located adjacent to proposed upland thinning units would be thinned. No vegetation would be cut within the inner 90 feet of the riparian reserve. Equipment would not enter the 190-foot riparian reserve (unless on existing roads) but trees could be yarded through the outermost 100 feet.

2.2.1.7 Timber Yarding

Ground-based yarding

In ground-based yarding, a moving vehicle travels to the logs and pulls them to the landing. The machines used for skidding are diverse and can be wheeled or tracked. Trees and logs are removed from the woods and yarded to the landing by lifting the front end of the logs off the ground. Skidders travel on skid trails that are designated and approved by the BLM.

A feller-buncher fells and bunches trees mechanically. The typical feller-buncher is track mounted. Some must move from tree to tree for felling, while others use a boom to fell multiple trees from a single position. The feller-buncher bundles trees for a skidder to pick up and move to a landing.

A forwarder is a rubber-tired machine that typically works with a harvester. Harvesters move through the stand felling, delimbing, bucking, and bunching trees selected for harvest. Forwarders travel into the woods on slash created by the harvester. They load the logs piled by the harvester and carry them to the road where they are off-loaded. The logs carried by a forwarder do not touch the ground during travel. Ground-based

yarding is generally limited to slopes of 35% or less. After harvest is complete, skid trails and landings not needed for future management would be ripped.

Skyline-cable yarding

Skyline-cable yarding is a cable system that pulls the logs to the landing using steel cables. A stationary machine, or yarder, would be located on the road and would pull logs up to the landing with one end of the log suspended. Skyline-cable yarding is typically used where the ground is too steep for ground-based yarding.

Designated skid trails

The BLM would select a specific skid trail route that would be used to facilitate yarding operations. The skid trail can be an existing skid trail or newly located and is intended to be used by the yarding operator.

2.2.1.8 Reforestation

Regeneration harvest units would be replanted after harvest with 300 to 500 trees per acre of Douglas-fir, ponderosa pine, sugar pine, and incense cedar. The amount of each species planted would vary by the unit in order to mimic the species mix before harvest. In stands with root rot, root rot resistant conifer species would be planted. A mix of Douglas-fir, sugar pine and incense cedar would be planted. In regeneration harvest stands adjacent to stands with Douglas-fir mistletoe, no Douglas-fir would be planted within 100-150 feet of the perimeter of the infected stand.

Target stands would have 280 well-spaced trees per acre. At 1, 3, and 5 years, the BLM would conduct surveys to determine seedling survival, stocking levels, and maintenance needs (e.g., tubing, mulching, shading, scalping). Replanting would occur if needed to meet the target number of trees per acre. If necessary, competing vegetation would be removed for a 3-foot radius around planted seedlings.

2.2.2 Road Work

2.2.2.1 Temporary Routes

Temporary routes would allow operators temporary access to harvest units. Temporary routes would be located on stable areas such as ridges. After harvest is complete, routes would be ripped, water barred, mulched, blocked, and seeded with native grass (where needed).

Temporary route construction would occur where no previous routes exist. An access route would be constructed to minimum standards. Construction would include clearing, grubbing, removing, and disposing of vegetation and debris from within established clearing limits. Work also includes the construction of a minimum-width subgrade by excavating, leveling, grading, and outsloping.

Temporary route reconstruction would use previously decommissioned roads. The blocked road is not part of the designated transportation network system. The route was blocked and closed to all forms of motorized vehicles. It has a defined prism and receives no periodic maintenance. Routes would be made suitable for hauling timber by removing encroaching vegetation, repairing narrowed sections, and blading the route surface.

Temporary route renovation would occur on existing, overgrown inaccessible routes that are not currently used by motorized vehicles. The routes contain various stages of overgrowth ranging from sparse low-growing shrubs to a nearly closed forest canopy. Routes would be made suitable for hauling timber by clearing, grubbing, and disposing of vegetation along with excavating and grading to establish a minimum width route.

2.2.2.2 Road Renovation

Before roads are used for forest management activities, they would be surfaced or spot rocked if needed; ditches would be cleaned where needed; catch basins would be cleaned or enlarged; brush growing near culvert inlets or outlets would be removed; culvert inlets and outlets would be cleaned; and brush, limbs, and trees would be removed along roadways to improve sight distance and allow for proper road maintenance.

Road surfacing is placing rock the full width and desired length of the road. Surfacing is done by grading and reshaping the road subgrade, then hauling, placing, and compacting the new surfacing material on the prepared subgrade.

Spot rocking is placing rock on the road in areas as needed to help control erosion and maintain the road surface. This restores the road surface and road condition making it suitable for driving and hauling. Crushed aggregate material would be placed on sections of inadequately surfaced roads that would be used for hauling timber.

2.2.2.3 Road Closure and Full and Partial Decommissioning

Roads that are surplus to BLM's needs at this time and may be needed for future access would be closed to prevent vehicular access. Road closure would be accomplished using methods such as gates, guard rails, or earth or log barricades. The roads behind the closure would be left in a maintenance-free condition.

Road decommissioning would occur where roads are not needed at this time but may be used in the future. Partial decommissioning would water bar roads, remove culverts (armored if necessary), seed with native grasses, and mulch with weed-free mulch. Full decommissioning would include ripping, water barring, removing culverts (armoring if necessary), seeding with native grasses, mulching with weed-free mulch, and planting to reestablish vegetation. In addition, any cross-drain culverts, road fills in stream channels, and potentially unstable fill areas would be removed to restore the natural hydrologic flow.

Decommissioned roads would be closed with a device similar to an earthen barrier or equivalent and would not be maintained in the future. Roads would be closed to vehicles on a long-term basis, but may be used again in the future.

2.2.3 Fuels Treatment Associated with Forest Management

Preliminary fuels treatments were recommended for post forest management acres by alternative. The BLM would conduct a fuels assessment within each unit following harvest activity. This assessment would determine the fuel hazard and fire risk based on surface fuel loading, aspect, slope, access, and location of each unit. Fuels treatments could include lop and scatter, pile and burn, underburn, and biomass removal. Most fuels treatments would begin within 90 days after completion of harvest activities.

2.2.3.1 Lop and Scatter

When the slash (live and dead material 9 inches or less in diameter) remaining in the units after harvest is less than 11 tons per acre, all stems and branches would be cut from the tree trunk and scattered. Trunks 7 inches in diameter and less would be cut to 3-foot lengths and left on the ground. The depth of the slash would not exceed 18 inches.

2.2.3.2 Slash Piling and Pile Burning

Hand piling and hand pile burning would occur when the slash remaining in the units after harvest is greater than 11 tons per acre. If hand piled, material between 1 and 7 inches in diameter and longer than 2 feet would be piled. The piles would be a minimum of 4 feet high and 6 feet in diameter. Piles would be burned in the fall, winter, or spring.

Mechanical piling and pile burning would occur when the slash remaining in the units after harvest is greater than 11 tons per acre and the slope is less than 35%. Mechanical equipment would pick up material and walk it to the pile; material would not be pushed into a pile. Equipment would only travel on previously used skid trails. If machine piled, material between 2 and 12 inches in diameter and 2 feet long would be piled. The piles would be a minimum of 8 feet high and 10 feet in diameter. Piles would be burned in the fall to winter.

2.2.3.3 Underburning

Underburning would remove at least 60% of slash less than 3 inches in diameter and a lesser amount of larger fuel size classes in timbered stands. This treatment would move the stands from a timber understory to a timber litter fuel type. Underburning would be implemented in the spring or fall.

2.2.3.4 Biomass Removal

Whole trees or tree tops would be yarded to log landings, the tree tops and limbs removed and piled at the landings, and the resulting piles of slash hauled away from the landings. Whole tree yarding and tree top yarding would not be required but are options for treating activity slash.

2.2.4 Water Source Restoration

Existing water sources would be maintained to allow use by fire engines, water tenders, and helicopters for fire suppression and by wildlife for drinking water, habitat, and foraging opportunities. Maintenance activities would include clearing brush and trees; removing accumulated sediment from developed sites; installing, repairing, or replacing spring boxes and culverts; repairing or replacing pipelines; installing, repairing, or replacing devices such as bentonite or pond liners that impede water seepage; installing safety devices such as fences and exit ramps; and completing minor road work such as grading and adding rock.

2.2.5 Meadow Restoration

A 21-acre meadow area in T35S, R2E, section 13 would be restored using manual and prescribed fire techniques. Areas of older or decadent brush would be targeted for burning in an effort to rejuvenate brush species that would benefit wildlife as browse. A secondary benefit would be maintaining existing meadows as natural fuel breaks.

In some cases, the brush pockets and small conifers (<7 inches DBH) would be cut with a chainsaw and “cured” before ignition by hand with drip torches. In other areas, the brush may burn in the current condition without the manual cutting as a pretreatment. Prescribed fire would be used to remove encroaching conifers and shrubs and to reduce grass thatch build-up of native or nonnative grasses. Prescribed fire would likely be implemented in the fall and winter. If burning occurs in the spring, only cut and cured brush pockets would be available to burn due to green up.

2.3 Alternatives

2.3.1 Alternative 1 (No Action)

The No Action Alternative describes a baseline against which the effects of the action alternatives can be compared. This alternative describes the existing condition and the continuing trends in the Project Area. Under the No Action alternative, the proposed forest management and restoration activities would not be implemented at this time and current management could continue. Future activities in this area could be proposed and analyzed in subsequent NEPA documentation.

2.3.2 Alternatives 2 and 3 (Maps 2 and 3)

The ID team for the Double Bowen Project developed two action alternatives for meeting the multiple purposes of the project. Alternative 2 applies forest management actions that would provide economic return, benefit stand health, and maintain northern spotted owl habitat in CHU and home ranges (except where disease is affecting stand health and longevity). Alternative 3 applies forest management actions that would provide economic return, increase landscape resiliency to environmental disturbances, and maintain northern spotted owl habitat in CHU and home ranges (except where disease is affecting stand health and longevity). These alternatives vary in response to the issues identified in Chapter 1. The action alternatives explore a range of options for forest management in the Project Area (Table 2-1).

Table 2-1. Double Bowen Projects Proposed in Alternatives 2 and 3

Project	Alternative 2	Alternative 3
Forest Management (acres)		
Shelterwood	42	—
Density Management—40% canopy cover	386	—
Density Management—60% canopy cover	121	—
Selection Harvest—40% canopy cover	202	119
Selection Harvest—60% canopy cover	31	25
Restoration Thinning—40% canopy cover	—	470
Restoration Thinning—60% canopy cover	—	168
Riparian Thinning	14	14
Small Diameter Thinning	76	76
Total	**872**	**872**
Yarding Systems (acres)		
Ground-based	819	819
Skyline-cable	53	53
Roads (miles)		
Temporary Route Construction	0.4	0.4
Temporary Route Reconstruction	0.2	0.2
Temporary Route Renovation	0.3	0.3
Designated Skid Trail	1.2	1.2
Road Renovation	31.0	31.0
Road Closure—Barricade	0.6 (3 sites)	0.6 (3 sites)
Partial Road Decommissioning	2.7	2.7

Table 2-1. Double Bowen Projects Proposed in Alternatives 2 and 3

Project	Alternative 2	Alternative 3
Full Road Decommissioning	0.6	0.6
Other Projects		
Water Source Restoration	2 sites	2 sites
Meadow Restoration	21 acres	21 acres

2.4 Project Design Features

The following project design features are included in the design of the proposed projects. These project design features are a compilation of resource protection measures identified by the Interdisciplinary Team and Best Management Practices identified in the Medford District ROD/RMP. The BLM conducted a review and update of the Best Management Practices in 2011 to provide direction regarding road maintenance practices and road-related actions with the intention to minimize or prevent sediment delivery to waters of the United States in compliance with the Clean Water Act (IM-OR-2011-018). Those Best Management Practices were incorporated into the Medford District RMP in September 2011.

Project design features serve as a basis for resource protection in the implementation of the projects. They will be considered in the analysis of the impacts of the projects in Chapter 3.

2.4.1 Common to All Projects

- Protect raptor species, if any are located. Apply the appropriate buffers and seasonal restrictions based on species, proposed treatment, site-specific environmental conditions, and protection recommendations as determined by the BLM wildlife biologist.
- Store all hazardous materials and petroleum products in durable containers placed outside of riparian reserves. Locate so an accidental spill will be contained and will not drain into the stream system.
- Require the use of chemical toilets at all project sites in the Ginger Springs Municipal Watershed located within "Zone of Influence-2," as identified in the *Ginger Springs Watershed Analysis and Management Plan*.
- Store fuel outside the Ginger Springs Municipal Watershed. No fuel will be stored within the watershed during non-working hours.
- Buffer cultural sites located within the Area of Potential Effect. Buffers will be established sufficient to protect the features of the site from adverse impacts of any proposed management activities. Buffers will be designed by archaeologists or cultural resource specialists. No treatments will occur within this buffer. No fire line construction, prescribed burning, or piling/burning would occur within the flagged boundaries of the recorded cultural resources. Timber that is to be removed next to a buffer will be directionally felled away from buffers for one site potential tree length.
- If, during project implementation, the contractor encounters or becomes aware of any objects or sites of cultural value on Federal lands, such as historical or pre-historical ruins, graves, grave markers, fossils, or artifacts, the contractor shall immediately suspend all operations in the vicinity of the cultural value and notify the Contract Officer Representative so the site can be evaluated by a BLM archaeologist.
- Protect known Special Status and Survey and Manage wildlife, vascular plant, lichen, bryophyte, and fungi sites. Buffers will be determined based on species, proposed treatment, site-specific

environmental conditions, and available management recommendations (Special Status Species Conservation Assessments and Survey and Manage Management Recommendations).

- Ensure hay, straw, and mulch are certified as free of prohibited noxious vegetative parts, seeds, or both, per 75 FR 159:51102. Straw or hay must be obtained from the BLM or purchased from growers certified by Oregon Department of Agriculture's Weed Free Forage and Mulch Program. If hay is used, it must be from native grasses only.
- Require equipment that will travel off system roads or temporary routes to be washed prior to entry onto BLM-administered lands.
- Prepare a spill plan. If a spill does occur, waste diesel, oil, hydraulic fluid, and other hazardous materials will be removed from the site and disposed of at an approved location in accordance with Federal regulations.
- Refuel equipment at least 190 feet from streams, ponds, or other wet areas. Equipment will not be stored in a stream channel. Hydraulic fluid and fuel lines will be in proper working condition in order to minimize leakage into streams.

2.4.2 Common to Timber Harvest and Small Diameter Thinning

- Maintain existing snags except those that need to be felled for safety reasons. Snags felled for safety reasons will be left on site.
- Retain existing large coarse woody debris in the stands.
- Locate skid trails to minimize disturbance to coarse woody debris. Where skid trails encounter large coarse woody debris, a section will be bucked out for equipment access. The remainder will be left in place and not disturbed.
- Restrict harvest activities within 300 feet of meadows that are 10 acres and larger.
- Construct new landings outside of riparian reserves and northern spotted owl cores.
- Limit landings to 0.5 acre or less in size.
- Locate temporary routes and landings on stable locations such as ridge tops, stable benches, or flats with gentle to moderate side slopes, and use existing jeep road and skid trail footprints where possible.
- Minimize temporary route and landing construction on steep slopes, slide areas, and high landslide hazard locations.
- Limit landing and temporary route construction and reconstruction to the dry season (generally May 15 to October 15). Landing or temporary route construction will be located outside of riparian reserves and away from unstable soil conditions and headwalls.
- Use existing skid trails to the extent possible. Where new skid trails are necessary, limit the extent to minimize the impact.
- Limit the width of skyline corridors to be as narrow as operationally feasible; do not exceed a 15-foot width.
- Restrict all ground-based yarding and soil ripping operations from October 15 to May 15, or when soil moisture exceeds 25%.
- Once soil moistures exceed 25%, ground-based operations may only occur when snow depth is at least 18 inches. In the condition where snow is present but soil moistures are below 25%, ground-based operations may occur. Stop ground-based harvest if rutting begins to occur within the unit or when soil moistures exceed 25%.

- To minimize soil disturbance, mechanized felling equipment must have an arm capable of reaching at least 20 feet.
- In order to restrict the amount of compacted soil to less than 12% in a timber harvest unit,
  - allow mechanized equipment capable of creating and walking on slash (such as a cut-to-length system) to work off designated skid trails for one or two passes on at least 8 inches of slash and under dry soil conditions (less than 25% soil moisture content),
  - allow mechanized equipment (feller buncher systems) to work off designated skid trails during the dry season (soil moisture content less than 15%) for 1 or 2 passes only (one round-trip),
  - space the 1- to 2-pass harvest trails a minimum of 50 feet apart off of designated skid trails,
  - use low, ground-pressure equipment (8 psi or less), and
  - restrict all other use of ground-based equipment to designated skid trails.
- Place woody debris or other appropriate barriers (e.g., rocks, logs, and slash) on the first 100 feet of skid trails leading off system roads in all ground-based yarding units upon completion of yarding.
- Restrict all timber hauling and landing operations on native surface or rocked roads whenever soil moisture conditions or rain events could result in road damage or the transport of sediment to nearby stream channels, generally October 15 to May 15. If the Authorized Officer determines that hauling would not result in road damage or the transport of sediment to nearby stream channels based on soil moisture conditions or rain events, Contracting Officer may approve a conditional waiver for hauling. The conditional waiver may be suspended or revoked if conditions become unacceptable as determined by the Authorized Officer.
- Rip, mulch, water bar, block, and seed (where needed as determined by the BLM) new temporary routes and associated landings in the same season of use. If hauling on a temporary route is not completed in the same year the route is constructed, the route will be storm-proofed and blocked by October 15 or when soil moisture exceeds 25%.
- For units adjacent to the Butte Falls-Fish Lake Highway (to protect scenic values along the highway):
  - Retain trees over 24 inches DBH within 100 feet of the Butte Falls–Fish Lake Highway.
  - Use existing roads for vehicle and equipment access from the highway, if possible. If new roads must be created, screen from road and rehabilitate as soon as possible after use.
  - Retain roadside vegetative screening, where possible, to screen thinning and timber projects.
  - Fall trees away from the highway and cut stumps to ground level, with cut angled away from the road.
  - Create natural, irregular openings, where necessary, to mimic naturally occurring openings in size and spatial patterns.
  - Directionally fall timber away from unit boundaries and interior reserves (skips).
- Restrict yarding through interior reserves (skips) where feasible; however, no yarding is allowed through buffered plant or wildlife sites. If an existing skid trail is within the skip, it may be used if it is determined that it will not cause damage to the resources in the skip.
- Seasonally restrict harvest activities from March 1 to September 30 within 0.25 mile of known northern spotted owl sites (within 0.5 mile for helicopter operations and blasting). The seasonal restriction will be waived if nonnesting is determined. If any new owls are discovered in harvest units following the sale date, activities will be halted until mitigation options are determined.

- Restrict tractor and mechanical operations to slopes generally less than 35%. In areas where it is necessary to exceed these gradients to access adjacent tractor area, use ridge tops where possible.
- Use erosion-control techniques (e.g., water bar, apply native grass seed and weed-free mulch, scatter chipped material, or scatter limbs and other fine material) on skid trails, forwarder trails, and landings to minimize sediment movement off site.

2.4.3 Timber Harvest

- No treatments within two site-potential trees (380 feet) of fish-bearing streams and within one site potential tree (190 feet) of non-fish-bearing, perennial, and intermittent streams.
- In tractor units, trees 21 inches DBH (Over Bark) and smaller designated for cutting will be felled and yarded to approved landing locations as either whole tree or log segments. If excessive stand damage occurs from whole tree yarding, as determined by the Authorized Officer, bucking, limbing, or both will be required.
- In tractor units, trees over 21 inch DBH (Over Bark) designated for cutting will be felled and cut into log lengths not to exceed 44 feet and will be completely limbed prior to yarding.
- Designate skid trails with an average of 150-foot spacing. In order to minimize ground disturbance, use existing trails and avoid creating new skid trails where feasible.
- Rip skid trails in all tractor-yarded regeneration harvest units.
- Apply native seed and certified weed-free straw mulch to the top 20 feet of the skyline-cable yarding corridor where yarding logs to the road results in extended soil exposure.
- Approximately 3 acres of timber harvest unit 25-6 contains slopes greater than 35%. Slopes range from approximately 45% to 50% gradient. Machinery in this portion of the unit will stay on a designated skid trail that exists from previous harvest and will only be allowed to travel downhill. Operations will be stopped if soil rutting or excessive erosion occurs. The skid trail will be covered with slash and down woody debris the same season of use, water barred, and blocked with an earthen barrier, boulders, or large woody debris. Water bars should be spaced no more than 50 feet apart.

2.4.4 Small Diameter Thinning

- Restrict ground-based equipment to slopes 20% or less within 100 feet of a stream. Equipment within the 100 feet will generally be limited to one skid trail parallel to the stream. These trails may be ripped if it will not affect the remaining vegetation. On slopes greater than 20%, no equipment is allowed within 100 feet of the stream; however, trees may be bull-lined to outside of the 100 feet.
- No treatments within 60 feet of fish-bearing, perennial streams and within 35 feet of non-fish-bearing, intermittent streams.
- Use existing skid trails in harvest units, where feasible. All other skid trails must be designated prior to falling timber at an average spacing of 100 feet.

2.4.5 Riparian Thinning

- Maintain a 90-foot, no-treatment buffer on intermittent and perennial streams within timber harvest units.
- Retain a minimum of 50% (60% in northern spotted owl nesting, roosting, and foraging habitat) overstory canopy cover outside the no-treatment area.
- Do not remove riparian hardwood species such as willow, ash, yew, maple, and California black oak.

- Restrict ground-based equipment within riparian reserve boundaries in timber harvest units. Trees felled within riparian reserves will be bull-lined into upland timber harvest units or existing roads before skidding. Do not remove trees greater than 20 inches DBH. If operationally necessary to fell trees of this size, fell toward the stream and leave on the ground.
- Directionally fell trees away from the no-treatment area.
- Maintain a maximum clearing width of 12 feet for cable corridors across no-treatment areas. Space corridors a minimum of 150 feet apart. Require full suspension for any logs yarded through the no-treatment areas.
- When operationally feasible, yard all units in such a way that the coarse woody material remaining after logging will be maintained at or greater than current levels in order to protect the soil surface.
- Wherever trees are cut to be removed, directionally fell trees away from irrigation ditches and the Medford Aqueduct. Fell trees toward skid trails. Protect irrigation ditches and the Medford Aqueduct in the Project Area from damage and keep free of activity slash.
- Restrict all tractor yarding across the Medford Aqueduct from October 15 to May 15, or when soil moisture exceeds 25% and restrict ripping operations across the Aqueduct line.
- Shut down all harvest and yarding operations if there is potential for sediment movement to waterways due to weather or soil moisture conditions.
- Do not pile activity slash within the no-treatment area. Stack slash piles more than 60 feet from fish-bearing, perennial streams and more than 35 feet from non-fish-bearing, intermittent streams. Piles will not be placed in channel bottoms.
- Prohibit the use of foam agents within two site-potential trees of fish-bearing, perennial streams and within one site-potential tree of non-fish-bearing, intermittent streams during prescribed burning and mop-up activities.

2.4.6 Road and Quarry Work

- Suspend ground-disturbing activity if projected forecasted rain will saturate soils to the extent that there is potential for movement of sediment from the road to wetlands, floodplains, and waters of the state. Cover or temporarily stabilize exposed soils during work suspension. Upon completion of ground-disturbing activities, immediately stabilize fill material over stream crossing structures. Measures could include, but are not limited to, erosion control blankets and mats, soil binders, soil tackifiers, and slash placement.
- Seasonally restrict blasting activities from March 1 to September 30 within 0.5 mile of known northern spotted owl sites. The seasonal restriction will be waived if nonnesting is determined.
- Seasonally restrict mechanical roadside brushing activities and heavy equipment use from March 1 through June 30 within 200 feet of known northern spotted owl and raptor nests. This may be extended up to September 30 if nesting activity is occurring at that time. Seasonal restriction will be waived if nonnesting is determined.
- Restrict culvert removal and placement and road renovation, closure, and decommissioning work from October 15 to May 15, or when soil moisture exceeds 25%.
- Block or barricade identified roads after use and before beginning of rainy season (generally by October 15).
- Rip and water bar all temporary routes and associated landings (new construction or reconstruction) to a depth of 18 inches or bedrock (whichever is shallower), apply mulch, and block upon

completion of use. If hauling is not completed in the same year the route is constructed, the route will be storm proofed and blocked by October 15 or when soil moisture exceeds 25%.

- Rip roads identified for decommissioning to a depth of 18 inches using a subsoiler or winged-toothed ripper, apply native seed and weed-free mulch, and block.
- Apply native seed and mulch to fill slopes and disturbed areas of roads to be fully decommissioned. Seeding and mulching will occur in the same operational season that construction activities occur.
- Apply native seed and mulch to soils that are disturbed or exposed during stream culvert removal, replacement, and installation in the same operational season the work is completed.
- Restrict the application of dust abatement materials, such as lignin, Mag-Chloride, or approved petroleum-based dust abatement products, during or just before wet weather, and at stream crossings or other locations that could result in direct delivery to a water body (typically not within 25 feet of a water body or stream channel).
- Place waste stockpile and borrow sites resulting from route construction or reconstruction in a location where sediment-laden runoff can be confined, at least one site potential tree height from a stream.
- When removing culverts, pull slopes back to the natural slope, or at least 1:1, to minimize sloughing and erosion, and to minimize the potential for the stream to undercut stream banks during periods of high stream flows. Mulch, plant, and seed with native plant species on all side slopes of the stream where the culvert was removed in the same season the culvert was removed.
- Dewater streams during culvert placement and replacement to maintain optimum bedding material moisture content and to minimize the movement of sediment downstream.
- Remove all possible excess sediment from stream channels during culvert removal, replacement, and installation in the same operational season the work is completed.
- Use approved rip rap, aggregate, and borrow material for road renovation and surfacing. BLM material sources will be surveyed prior to use and will be free of noxious weeds. If noxious weeds are found, they will be treated before material extraction and use.
- Restrict all quarry development and rock crushing operations whenever soil moisture conditions or rainstorms could cause the transport of sediment resulting from quarry operations to nearby stream channels (generally October 15 to May 15).
- If explosives are necessary in quarry development, require a detailed blasting plan to minimize the amount of rock material outside the designated quarry perimeter.
- Construct silt fences or other preventative structures (diversion ditches, settling ponds) as needed to prevent the potential for runoff from quarry operations into nearby stream channels.
- Plant grass seed, native vegetation, or both within the same operating season to stabilize exposed soil in overburden areas from quarry operations.

2.4.7 Fuels Treatments Associated with Timber Harvest and Small Diameter Thinning

- Seasonally restrict prescribed burning and site preparation with chain saws from March 1 to July 15 within 0.25 mile of known active northern spotted owl nests. The seasonal restriction will be waived if nonnesting is determined.
- Conduct a post-activity fuels assessment on all areas proposed for treatment. Modifications or additional treatment recommendations will be based on the fuels assessment and the amount of slash

created during harvest and small diameter thinning project activities. Treatments including, but not limited to, hand or machine slash piling, slash pile burning, underburning, and biomass removal may be needed to further reduce the fuels hazard to an appropriate level within all units.

- To reduce the amount of surface fuel loadings and emissions from prescribed burning, remove slash from the site, when feasible, by using whole tree harvesting, chipping limb slash in the harvest unit, or a combination of both methods. Where whole tree harvesting is permitted, landing slash will be chipped, burned, or moved off site.
- Do not hand or machine pile slash or burn slash piles within the channel bottom of intermittent streams or within the bottom of dry draws.
- Do not machine pile slash within riparian areas.
- Stack slash piles more than 60 feet from fish-bearing, perennial streams and more than 35 feet from non-fish-bearing, intermittent streams. Piles will not be placed in channel bottoms and dry draws.
- Do not treat vegetation within 60 feet of fish-bearing, perennial streams and within 35 feet of non-fish-bearing, intermittent streams.
- Prohibit the use of foam agents within two site potential trees of fish-bearing, perennial streams and within one site potential tree of non-fish-bearing, intermittent streams during prescribed burning and mop-up activities.
- Provide an approved prescribed fire plan prior to ignition of all prescribed burn units in compliance with the Interagency Prescribed Fire Planning and Implementation Procedures Guide (PMS 484, 2013). The prescribed burn plan would contain measurable objectives, a predetermined prescription, and an escape fire plan to be implemented in the event of an escape.
- To prevent fire escapes and to minimize damage to residual vegetation and trees, schedule burning to occur when weather and fuel conditions allow for lower fire intensities (typically late fall through spring).
- Conduct prescribed burning in compliance with Oregon Department of Forestry's Smoke Management Plan. Smoke emission control could also include conducting mop-up as soon as possible after ignition is complete, covering hand piles to permit burning during the rainy season, and burning lighter fuels with lower fuel moistures to facilitate rapid and complete combustion, while burning larger fuels with higher moisture levels to minimize consumption.
- Disperse slash piles across the treatment areas. Burn slash piles when soil and duff moisture content is high.
- Do not conduct fuels treatment activities such as hand and machine piling and burning within "skips." Ignite prescribed burns outside of skips and allow low intensity prescribed burns to back into the skips.

2.4.8 Water Source Restoration

- Seasonally restrict chainsaw and heavy equipment use from March 1 through June 30 within 200 feet of known northern spotted owl or raptor nests. This may be extended up to September 30 if nesting activity is occurring at that time. Seasonal restriction will be waived if nonnesting is determined.
- Lop and scatter, hand pile and burn, chip, or remove from the site slash resulting from brushing and clearing activities in order to reduce fire hazard.

- Dispose of end-haul material in stable sites outside of floodplains, as identified by the BLM Authorized Officer. Apply erosion control measures at disposal sites to minimize sediment delivery to water bodies.
- Meet Medford District ROD/RMP and Oregon Department of Fish and Wildlife (ODFW) standards for replacement culvert design and installation.
- Minimize disturbance to existing riparian vegetation in order to maintain slope stability and shade.
- Use sediment-control measures such as straw bales, filter cloth, or sediment fences.
- Limit instream work to the period from June 15 to September 15.
- Maximize maintenance activities during late summer and early fall to best avoid wet conditions.
- Temporarily suspend work if monitoring indicates rain storms have saturated soils to the extent there is potential for causing excessive stream sedimentation.
- Apply native plant seed and weed-free mulch as soon as possible after excavation or ripping to reduce erosion.
- Install, operate, and maintain fish screens on water withdrawal equipment in accordance with NOAA (National Oceanic and Atmospheric Administration) Fisheries.

2.4.9 Meadow Restoration

- Use broadcast burning, underburning, or hand cutting and piling to remove encroaching conifers and shrubs.
- Pretreat noxious weeds or other nonnative species, conduct post-burning monitoring, and re-treat as needed.
- Seed or plant appropriate, site-specific native plants after burning to restore native plant composition.
- Retain down wood, snags, and other unique legacy features.
- Seed burn pile scars with native grass or forb seed.

3.0 Affected Environment and Environmental Consequences

Chapter 3 provides the environmental analyses of the biological, physical, social, and economic elements relative to the issues identified in Chapter 1 for the Double Bowen project. This section is organized around the issues identified for detailed analysis where the analysis of the issue will help the decision maker make a reasoned choice among alternatives. For each issue, the setting (Affected Environment) is presented, followed by the effects analysis (Environmental Consequences).

The affected environment describes the existing conditions and trends for the issue-related elements that may be affected by implementing the Double Bowen project. It provides the baseline for measuring the potential effects of implementing an action. The environmental consequence of implementing an action predicts the degree to which the elements relative to the issues would be affected by the action. The effects may be beneficial or detrimental; short term or long term; and direct, indirect, or cumulative. he following definitions are for terms used in this section:

allotment. An area of land designated and managed for livestock grazing. Allotments are composed of pastures delineated by a combination of fences and ridgelines or other natural features.

animal unit months. The amount of forage necessary to sustain the growth of one cow, either carrying a calf or with one at her side, or its equivalent for a period of one month.

3.1 Introduction

3.1.1 Physical Setting

The 12,774-acre Double Bowen Project Area includes lands managed by the BLM, Forest Service, City of Butte Falls, and private landowners. The Butte Falls Resource Area of the Medford District BLM manages the public lands and resources administered by the BLM within the Project Area. BLM lands total 3,513 acres (27.5%) in the Project Area (Figure 1-1).

The Project Area is located in the 157,000-acre Big Butte Creek fifth-field watershed within the larger Upper Rogue River fourth-field subbasin. Hukill Creek, Ginger Creek, Doubleday Creek, and Bowen Creek are perennial streams that flow south to north and are tributaries to South Fork Big Butte Creek.

The Butte Falls-Fish Lake Highway is a main transportation route that runs east and west through the northern part of the Project Area. The city of Butte Falls (population 435) lies in the northwest corner of the Project Area near the same name waterfall on South Fork Big Butte Creek.

The Project Area is within the Cascades West physiographic province. The climate of the Project Area is generally warm and dry with typically cool, wet winters and hot, dry summers. Summer temperatures range from the high 70s to the low 90s. Occasional daytime temperatures in the summer may reach 100°F. Winter lows drop regularly to 10° to 20°F. Annual precipitation averages 35 inches. Most of the precipitation occurs between mid-October to mid-April as rain or snow. Elevation ranges from 2,520 to 4,280 feet.

3.1.2 Land-Use Allocations and Other Considerations

3.1.2.1 Matrix

The Northwest Forest Plan (C-39) described matrix lands as those areas where most scheduled timber harvest would occur. The 1995 ROD/RMP objectives for matrix lands are to "produce a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability; provide connectivity (along with other allocations such as riparian reserves) between late-successional reserves; provide habitat for a variety of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees; and provide early successional habitat" (Bureau of Land Management 1995a, 39). Matrix lands are divided into northern and southern GFMA and connectivity/diversity blocks. The 2,653 acres of matrix lands within the Project Area are northern GFMA and connectivity/diversity block.

Connectivity/diversity blocks are spaced throughout the northern GFMA matrix land use allocation. Each block is to be maintained in at least 25 to 30% late-successional forest condition. Riparian reserves and other allocations with late-successional forest count toward this percentage. The Project Area contains one, 551-acre connectivity/diversity block in T35S, R2E, section 25. Currently, 67% of the forested land in the connectivity/diversity block is in late-successional condition.

3.1.2.2 Riparian Reserve

Riparian reserves are "areas along all streams, wetlands, ponds, lakes, and unstable or potentially unstable areas where the conservation of aquatic and riparian-dependent terrestrial resources receives primary emphasis" (Forest Service and Bureau of Land Management 1994, 7). Riparian reserves are managed to provide benefits to riparian-associated species, enhance habitat conservation for organisms dependent on the transition zone between upslope and riparian areas, improve travel and dispersal for many terrestrial animals and plants, and provide habitat connectivity within the watershed. Riparian reserve widths are set during watershed analysis and the boundaries may vary based on site-specific elements and characteristics including the size of a site-potential tree. The riparian reserve width is 190 feet for the Big Butte Creek fifth-field watershed.

3.1.2.3 100-acre Northern Spotted Owl Activity Centers

Known northern spotted owl activity centers are one of the five components of the Northwest Forest Plan's late-successional reserve system. Known spotted owl activity centers are defined as "one hundred acres of the best northern spotted owl habitat as close as possible to a nest site or owl activity center for all known (as of January 1, 1994) northern spotted owl activity centers" (Bureau of Land Management 1995a, 32). Two 100-acre northern spotted owl activity centers are located within the Double Bowen Project Area.

3.1.2.4 Visual Resource Management (VRM) Class II, III, and IV

The lands in the Double Bowen Project Area were classified in the 1995 ROD/RMP) to be managed as VRM Class II, III, and IV (Bureau of Land Management 1995a, 70 and Map 10). VRM Class II lands (221 acres) in the Project Area are BLM lands within the foreground/middleground of the county road from Butte Falls to Prospect (Butte Falls/Prospect Highway). VRM Class III lands (200 acres) in the Project Area are BLM lands allocated to meet rural interface area objectives. VRM Class IV lands (3,091 acres) are BLM lands classified as northern GFMA matrix.

3.1.2.5 Ginger Springs Municipal Watershed

The 3,990-acre Ginger Springs Municipal Watershed supplies water for the city of Butte Falls' municipal water system. The Double Bowen Project Area includes 2,467 acres within the municipal watershed; 813 of those acres are managed by the BLM. The ROD/RMP recognized that the BLM administers a significant portion of the land within the watershed that supplies the community water system for the city of Butte Falls (Bureau of Land Management 1995a, 42). The ROD/RMP directed the BLM to prepare a watershed plan for the municipal watershed. The BLM prepared a watershed analysis and management plan in 1998 that provides guidance for the management of BLM lands within the Ginger Springs Municipal Watershed.

3.1.3 Project Area Background

3.1.3.1 Brief History of the Project Area

The history of the Big Butte Creek watershed provides the foundation for understanding the conditions that exist in the Project Area today. Natural processes and human activities influence and shape the vegetation and landscape found within the watersheds. They may cause slow and subtle changes only visible through the passage of time, or sudden, devastating changes that occur in an instant.

Natural forces such as wildfires, floods, and windstorms have altered vegetation and stream conditions. Wildfires and windstorms influence vegetation patterns, stand ages, and species composition. Floods cause streams to change channels, wash away soils and streamside vegetation, deposit gravels and sediments, and form pools.

Human influences on the land have a continual and wide-ranging effect on the natural environment. Native Americans, however, appear to have used this area lightly and probably visited seasonally to hunt game or gather edible plants. Native hunters and gatherers lived in low-elevation villages and moved into the higher elevations during the summer and early fall as edible plants and game animals became more abundant.

The earliest records of Euro-American settlement date to the 1860s when small-scale farms began appearing, principally in the large, open meadows in the watersheds. Families grazed small herds of stock and used fire to improve grazing forage. Small communities formed with post offices and schools. Early settlers made a living by raising cattle and making shakes or shingles to sell in the Rogue River Valley. In 1905, the Butte Falls Sugar Pine Lumber Company cleared trees from a townsite above Butte Creek to build the town of Butte Falls. The completion of the Pacific and Eastern Railroad in 1910 from Butte Falls to Medford provided the means to haul people, supplies, and lumber products between the two towns (Figure 3-1). Later, after the lumber mills in Butte Falls closed, the railroad was primarily used to haul logs to mills in Medford.

Figure 3-1. Butte Falls and railroad trestle bridge used for hauling logs.

The city of Butte Falls was incorporated in 1911 and received a water right to Ginger Springs in 1914 from the Oregon State Watermaster.

By the mid-1940s, much of the mature timber on timber company lands had been harvested and the demand for timber from Federal lands

increased. In addition, the high demand for lumber during World War II also served to increase timber harvest on Federal lands. Roads were built or extended to provide access to timber stands, improve fire protection capabilities, and provide access for recreation and administration. By the 1960s, the railroad was no longer used to haul timber to Medford and improved roads provided better access to and from the Rogue Valley.

Passage of the O&C Act in 1937 provided direction for Federal lands managed by the BLM in this area. The O&C Act is intended to contribute to the local economy by providing for Federal timberlands to be managed for permanent timber production on a sustained yield basis. One of the purposes of the O&C Act was to increase timber harvest on these lands to their timber-producing capacity. Timber harvest revenues were to provide a consistent level of income to the counties that contain O&C lands.

Land ownership patterns, past timber harvest, windstorms, wildfires, and fire exclusion have helped to create the existing conditions in the Double Bowen Project Area. Fire exclusion and harvest methods have contributed to the current high density and multiple-layered stand conditions in many of the proposed harvest units. Past harvest methods also influenced the locations and conditions of the roads within this watershed. These past practices have contributed to the affected environments described in detail later in this section.

3.1.3.2 Past Actions in the Project Area

The following is a general description of past harvest activities and trends on BLM-administered land within the Double Bowen Project Area. Over the past 76 years, harvest has occurred on approximately 90% of the BLM forested land within the Project Area; harvest practices ranged from mortality salvage and selective cutting of individual trees, to regeneration harvest and clear-cutting (Figure 3-2).

The Medford District ROD/RMP, completed in June 1995, incorporated the standards and guidelines of the 1994 Northwest Forest Plan. Under the ROD/RMP and Northwest Forest Plan, land use allocations were established for all BLM lands. The ROD/ RMP provided the objectives and management direction for each category of land use allocation. Tools for achieving the objectives for timber management include regeneration harvest, commercial thinning, density management, and selection harvest. Since

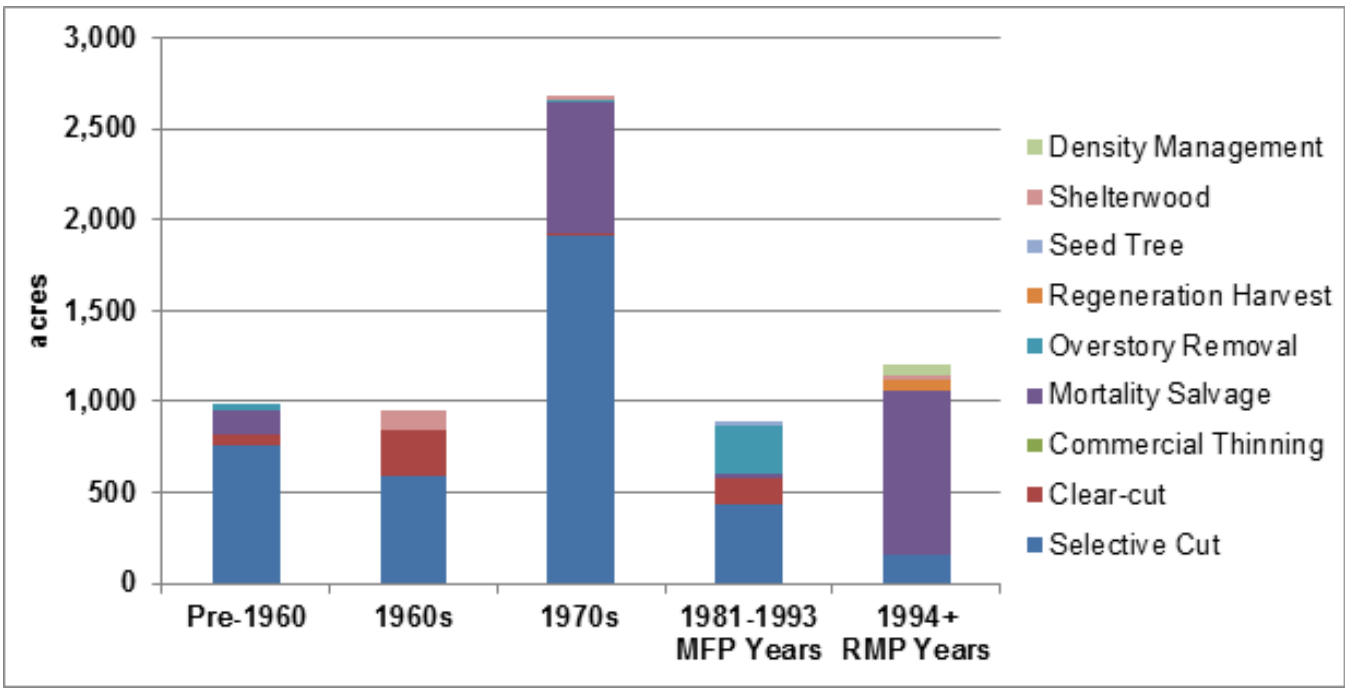


Figure 3-2. Past timber harvest on BLM lands within the Double Bowen Project Area.

implementation of the ROD/RMP, timber harvest in the Project Area has included 1,201 acres of harvest: 60 acres of regeneration harvest, 157 acres of selection harvest, 56 acres of density management, and 904 acres of mortality salvage. These harvest activities occurred on matrix lands and implemented riparian reserve buffers, green tree retention (larger remnant trees) in regeneration harvest units, and coarse woody debris and snag retention, as directed by the ROD/RMP. The Ranch Stew project has thinned approximately 176 acres of pine plantations and natural mixed conifer stands within the Project Area.

In January 2008, a windstorm brought strong winds and heavy rain and snow to southern Oregon. Wind gusts up to 90 miles per hour downed power lines and uprooted trees through the eastern portion of the BLM Medford District's Butte Falls Resource Area. Blown down trees occurred throughout the Big Butte Creek, Little Butte Creek, South Fork Rogue River, and Rogue River/Lost Creek fifth-field watersheds. The blowdown severity varied from scattered individual trees to severely damaged stands showing catastrophic impacts. Blowdown was scattered across 6,300 acres of BLM lands and 3,460 acres in Big Butte Creek fifth-field watershed. Through a series of roadside salvage and area salvage timber sales, the BLM salvage harvested approximately 5,000 acres throughout the 4, fifth-field watersheds. The BLM salvaged blowdown in 513 acres located within the Double Bowen Project Area.

In September 2008, the summer after the windstorm, lightning rolled over the Salt Creek drainage south of the Project Area and started the Doubleday Fire, which burned over the ridge and into the Project Area. The conditions were extreme with dry fuels and high winds. The fire burned a total of 1,271 acres with 955 acres in the Project Area; 352 acres burned on BLM lands within the Project Area. Of the 352 acres on BLM, 167 acres were salvaged in 2009 under the Doubleday Fire Salvage project. The BLM planted native conifers in the areas that sustained mortality of more than 90% of the conifer. Most of the private merchantable timber was salvaged and private lands were replanted soon after the fire.

From 1900 to 2013, the Project Area has experienced 89 small fires (less than 100 acres) on BLM and private lands. Also since 1900, 5 large fires ranging from 200 to 1,300 acres have occurred in the Project Area: 2 in 1914, 2 in 1936, and 1 in 2008 (Doubleday Fire). About 74% of the fires were human-caused.

Since 2000, the BLM has decommissioned 1.9 miles of road in the Project Area. In 2010, the BLM realigned a steep, through-cut BLM road by fully decommissioning 600 feet and constructing 900 feet of road in a more stable location.

The landscape pattern in the Double Bowen Project Area is largely determined by the checkerboard ownership. Blocks of BLM-administered lands intermingle with privately owned lands. Field observation and review of aerial photographs indicates most timber company lands within the watershed have been harvested. The majority of merchantable overstory trees were removed, leaving a younger stand of Douglas-fir with lesser amounts of ponderosa pine, incense cedar, and scattered hardwoods. Some of these harvested acres have been planted and are now plantations of ponderosa pine or Douglas-fir of varied sizes and ages.

"The nonfederal forests within the range of the northern spotted owl are predominantly forests that have grown back since harvest and are generally even-aged stands. They are typically managed as commercial forests. . . . harvest generally occurs in a stand's fifth or sixth decade" (Forest Service and Bureau of Land Management 1994, 3&4-6). The Northwest Forest Plan states "these forests generally are now in early and mid-successional stages, with many at or approaching ages and sizes that will predictably result in harvest."

The Project Area contains portions of the Summit Prairie and Big Butte grazing allotments. The Summit Prairie grazing allotment contains the following pastures within the Project Area: Fredenburg, Ginger Creek, and Perry School. Cattle are moved to these pastures in June and April and remain there until the end of

May (Perry School) or September (Fredenburg, Ginger Creek). A total of 792 animal unit months (AUMs) are authorized on the 19,973 acres of BLM-administered lands in the three pastures. The Big Butte grazing allotment contains a portion of the Wasson Canyon pasture within the Project Area. The Wasson Canyon pasture is part of three combined pastures (Esmond/Wasson/Salt). The combined pastures authorize 447 AUMs on 2,631 acres of BLM-administered lands from April 16 to June 30.

3.2 Forest Condition/Forest Health

ISSUE: *How can the BLM promote the growth and vigor of overstocked forest stands in the Project Area?*

ISSUE: *How can the BLM reduce the spread of Douglas-fir mistletoe and root rots in forest stands in the Project Area?*

This section analyzes the potential impacts of the proposed forest management and restoration activities on forest health and forest condition. The following definitions are for terms used in this section:

canopy cover. The proportion of ground or water covered by a vertical projection of the outermost perimeter of the natural spread of foliage or plants, including small openings within the canopy.

crown. The part of a tree or woody plant bearing live branches and foliage.

crown ratio. The ratio of crown length to total tree height.

full site occupancy. When stands have maximum stocking levels of established trees that ideally have adequate site resources (e.g., moisture, nutrients, and growing space).

plant series. A major stratification of habitat named after the dominant plant species in the final stage of ecological succession.

relative density. A measure of crowding in a stand of trees. It compares the number of trees present to the number of trees the site has resources (water, nutrients, and sunlight) to support.

3.2.1 Methodology

Forest condition and forest health information for the Project Area was compiled using the following sources:

- 1994 Medford District PRMP/EIS (Proposed Resource Management Plan/Environmental Impact Statement).
- The 1995 Central Big Butte Watershed Analysis provided baseline information specific to forest vegetation and the impacts of managing forest stands.
- GIS (geographic information system) data described the kind, amount, and distribution of forest vegetation on BLM-administered lands across the watersheds and subwatersheds in which the projects are located.
- Field visits (stand exams) in 2005, 2006, and 2013 within the Project Area provided stand-specific data related to tree density, structure, composition, and general stand health.
- The analysis area for Forest Condition/Forest Health is the same as the Double Bowen Project Area.

3.2.2 Assumptions

- Timber management activities will occur on BLM-administered lands allocated to planned, sustainable harvest. The type, quantity, and impacts of timber management activities were analyzed in the Medford PRMP/EIS for both the short- (10 years) and long-term (decades).

- Designated CHU (critical habitat unit) will not have northern spotted owl habitat downgraded unless there is an ecological benefit in doing so that has been identified. Stands within the Project Area that warrant potential downgrade of owl habitat include stands with multiple conifer disease types, high disease infestation levels, and high stand densities. Ecological benefits and treatment goals include increased health of individual residual trees, stand health, and stand longevity.
- The Northern Spotted Owl Recovery Plan will influence stand treatment using owl analysis circles in conjunction with owl habitat types as directed by management.
- Stands designated as RA32 by the BLM will not be considered for forest management activities at this time.
- Most private forestlands will be intensively managed with final harvest on commercial economic rotations averaging 60 years (Bureau of Land Management 1994, 4-5).
- Impacts to forest vegetation by predicted regional climate change is uncertain. The regional climate has become warmer and wetter with reduced snowpack and continued change is likely (Bureau of Land Management 2008, 488).

3.2.3 Affected Environment

3.2.3.1 Introduction

Forest health and forest condition in the Double Bowen Forest Management Project Area include all components of forest ecosystems that influence stand and forest resiliency to environmental disturbances. Forest and individual stand resiliency to environmental stresses (natural or human-caused) is a direct reflection of stand health and stand condition. Environmental factors that can affect resiliency in this analysis include, but are not limited to, high stand densities, insect and disease, frequent frosts, high growing-season temperatures, moisture and nutrient availability, vegetative competition, soil type, fire, and fire suppression. All of these factors can influence stand stability, production, mortality rates, and vigor.

Three types of forest stands are proposed for treatment in the Project Area:

- Ponderosa pine plantations established in 1965 contain even-aged ponderosa pine with an average tree diameter of 14 inches. Varying amounts of natural regeneration of Douglas-fir, white fir, and incense cedar are present in the understory. Douglas-fir plantations established in 1980 contain even-aged Douglas-fir with an average diameter of 11 inches. Minor amounts of natural regeneration of Douglas-fir, white fir, incense cedar, sugar pine, and ponderosa pine are present.
- Residual young mixed-conifer stands harvested in the mid-1960s had nearly all merchantable trees removed leaving individual and small pockets of trees ranging in size from seedlings to commercial (8 inches DBH and above). Following the harvest, ponderosa pine seedlings were interplanted. Currently, the stands are a mosaic of species, diameters, and density levels.
- Mixed-conifer, mostly closed-canopy type stands of Douglas-fir, white fir, incense cedar, sugar pine, and ponderosa pine ranging from 50 to 300 years old. Stand structure varies from single-layered, even-aged to multilayered, uneven-aged stands.

Within these forest stands, conifer vigor and growth is determined by environmental factors and tree age. Environmental factors that affect tree vigor and growth are high growing-season temperatures, moisture and nutrient availability, vegetative competition, soil type, frequent frosts, and insects and disease (mistletoe and root rot). Conifer growth rates vary with tree age; young trees grow rapidly, but as they age, the rate of growth slows (Figure 3-3). For most sites in southwest Oregon, 100 years is the age at which the average

yearly growth in height and diameter of individual trees of a forest stand has peaked (culmination of mean annual increment) (Bureau of Land Management 1995a, 103).

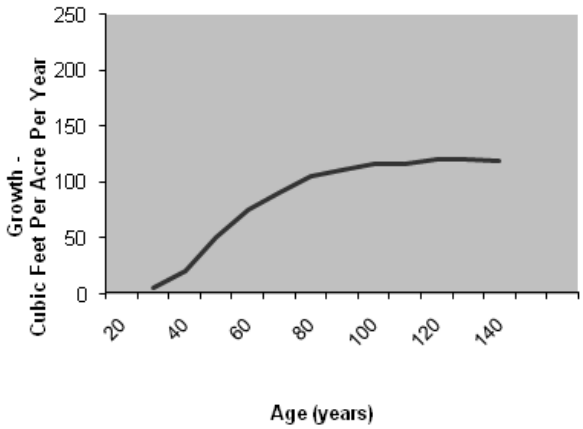


Figure 3-3. Culmination of mean annual increment.

Periodic disturbance events (mostly insect and disease), elevation, slope, aspect, precipitation, and soil type are the primary environmental factors that determine the presence, abundance, and structural characteristics of forest plant communities. Within the Project Area, the plant communities have been altered by management activities such as timber harvest and fire suppression strategies that have permitted the development and growth of dense forest stands. These factors have changed the size, diversity, and arrangement of forest vegetation and have created a mosaic of stands of varying densities and developmental stages across the landscape.

Other environmental factors that influence forest plant communities within the Project Area include high growing-season temperatures, frequent frosts, and high evaporative demands that effect the establishment, growth, and productivity of forests. The forest plant communities are at the warm/dry end of the environmental gradient, with moisture limitations late in the growing season. Frost potential is a problem that affects the establishment and growth of Douglas-fir and white fir. Cold air often accumulates (puddles) in low lying areas with slopes less than 15%. Late frosts caused by excessive loss of heat through nighttime reradiation are a common occurrence in some areas. The degree of vegetative frost damage is influenced by terrain, soil moisture content, and the amount and kind of ground cover present.

3.2.3.2 Plant Series

The white fir plant series is the most common forest plant classification in the Project Area (Atzet, et al. 1996). Douglas-fir is the dominant overstory tree, with lesser amounts of white fir, incense-cedar, ponderosa pine, and sugar pine. Understory species include white fir, Douglas-fir, incense cedar, ponderosa pine, and sugar pine. Hardwoods present include minor amounts of California black oak, madrone (in areas of relatively recent fires), and golden chinquapin on shallow rocky soils.

Shrub species present in varying amounts are deer brush ceanothus, oceanspray, vine maple, hazel, serviceberry, red stem ceanothus, thimbleberry, and Oregon grape. Common herbaceous vegetation includes pathfinder, western starflower, western twinflower, and white inside-out flower. Shrub competition is moderate following site disturbance once the overstory is opened up (less than 60% crown cover). Vegetative management would be required to ensure successful establishment and growth of conifer regeneration.

The white fir plants series also makes itself evident in the 40-year-old pine plantations. Through years of natural seeding by adjacent forest stands, the understory of the pine stands have become stocked with Douglas-fir and white fir, and incidental amounts of incense cedar and sugar pine. Hardwood and shrub species are likewise similar in presence.

3.2.3.3 Stand Density, Tree Vigor, and Growth

Forest stands with relative densities above 60% have reduced tree vigor; higher mortality of suppressed trees; and a higher susceptibility to insects, disease, and severe fire behavior (Perry 1994; Hann and Wang 1990; Curtis 1982). These conditions reduce stand resiliency and resistance to environmental stresses.

The forest stands proposed for treatment have high relative densities (average 70%) and decreased stand resiliency; these stands are susceptible to environmental disturbances. Direct competition among individual trees for limited site resources (e.g., nutrients, water, and sunlight) is likely to result in increased mortality rates, especially by conifers with crown ratios less than 35%. Conifers with a crown ratio 35% or greater have sufficient leaf area for photosynthesis, tree health, and survivability if competition for site resources is low or nonexistent. Growth and vigor of healthy trees within these stands is likely to decline in high density stands. With the loss of the natural thinning effects of wildfire, overstocked, stagnant forest stands have developed. The supply of essential site resources has decreased while the demand has increased.

The quantity of on-site nutrients in forests varies from stand to stand and is influenced by site quality and the amount, type, and size of vegetation present. The current amount of vegetation defines the existing levels of nutrients and is considered the baseline amount that would be affected by management actions.

Overstocked stands have more trees than the site has moisture, nutrients, and growing space to sustain. Without adequate resources, tree growth and vigor declines, increasing the probability of tree mortality from insects or disease. Overstocked forest stands and increased fuel accumulations create conditions that raise the potential for stand-replacement wildfires. In the event of wildfires, forest stands with a canopy cover of 70% or greater have an increased fire spread rate, a higher probability of crown fires, and fires that are more difficult to control. The existing forest canopy cover in the stands proposed for treatment is 60 to 100%.

Tree species diversity is affected by high stand densities. Competition for limited site resources (nutrients, water, and sunlight) between dense understories and large overstory ponderosa and sugar pines has increased. This competition has affected pine species by reducing tree vigor, increasing tree susceptibility to bark beetle attack, and increasing pine mortality rates throughout the Big Butte Creek fifth-field watershed.

Forest Disease

Douglas-fir Mistletoe

Douglas-fir mistletoe is present and affecting tree vigor in forest stands in T35S, R2E, sections 23 and 25 and T35S, R3E, section 31 (Figure 3-4). In many stands, dwarf mistletoe infestation in Douglas-fir is causing a decline in the health and vigor of affected trees. Dwarf mistletoe is a parasitic plant that is dependent on the host tree for nutrients and water. As the mistletoe grows and spreads within the tree crown, it commands a larger and larger share of nutrients and food produced by the tree. Ultimately, the infested tree cannot meet its own needs and tree vigor declines. Heavily infested trees die prematurely; have reduced height and diameter growth; alteration of crown and canopy structure; increased fire hazard; and increased susceptibility to bark beetles, root rots, and drought stress. Throughout the analysis area and outside of the sections mentioned above, mistletoe occurs at lower levels and is a concern with respect to future stand development.

Root Rots

Root rots (annosus, *Armillaria*, and laminated) are present and affect white fir, ponderosa pine, sugar pine, and Douglas-fir. In T35S, R2E, section 25 and T35S, R3E, section 31, the occurrence of root rots is common and has caused tree decline and mortality. Trees infected with root rot have reduced growth rates and higher than normal mortality rates. As the root rot fungus spreads and kills more trees, stand openings occur, with snags and windthrown trees common. Coarse woody debris accumulates at higher than normal levels. Root-to-root contact between infected trees and uninfected trees continues with crown symptoms appearing 5 to 15 years after initial infection. After crown symptoms appear, large trees live an average of 10

Figure 3-4. Stand infected with Douglas-fir mistletoe in T35S, R3E, section 31.

years before tree mortality (Theis and Sturrock 1995). Root rots create tree stress and can predispose trees to bark beetle attack. In the root rot areas described above, bark beetles have attacked and killed affected trees.

3.2.4 Environmental Consequences

3.2.4.1 Effects of Alternative 1 (No-Action) on Forest Condition/Forest Health

Direct and Indirect Effects

Under Alternative 1, forest management actions proposed in this project would not occur. This alternative would not implement the Medford District ROD/RMP management directions for general forest management areas and riparian reserves.

In stands 100 years or older, densities would remain high (currently 66% relative density) and would continue to increase. Competition for limited site resources would result in a decline in tree vigor, limited conifer growth potential, and increased mortality rate.

In northern GFMA forest stands less than 100 years, stand densities would remain high (currently 72% average relative density) and would continue to increase. Intense competition for limited site resources would result in a decline in tree vigor and limited conifer growth potential. Minimum growth per tree would occur with the maximum volume growth per acre offset by mortality (Ernst and Knapp 1985). Growth rates would remain stagnant or decline with tree mortality expected to increase. In stands with a relative density greater than 60%, the annual tree mortality rate is about double (Hann and Wang 1990) compared to forest stands with relative densities less than 60%. In the absence of disturbance events, such as wildfire or commercial thinning, the number of trees per acre would remain at levels above the carrying capacity of the site (Oliver, Ferrell and Tappeiner 1996). Stands would remain overstocked and mortality would most likely occur from competition among trees for site resources.

Douglas-fir mistletoe would pursue healthy conifer hosts of all sizes (regeneration and overstory trees). Mistletoe causes tree mortality; growth loss; alteration of crown and canopy structure; increased fire hazard; and increased susceptibility to bark beetles, root rots, and drought stress. Douglas-fir mistletoe would continue to cause a decline of infected trees. Horizontal and vertical spread of the parasitic plant would continue with the mistletoe rating (see Appendix C, section C.7.3) expected to increase one class every 10–15 years. Depending on canopy structure, moisture availability, and current mistletoe levels, the rate of tree decline and mortality would vary. Trees with a current mistletoe rating of 6 would be expected to die within the next 5 years. Trees with a current mistletoe rating of 5 would be expected to die within the next 10 years. Infection of understory Douglas-fir trees would continue with most of the infected trees less than 8 inches in diameter not expected to reach merchantable size prior to mortality.

Root rots would continue to spread, infecting susceptible conifer species causing mortality. There would be an increase in coarse woody debris as root rot develops, weakens the roots of the trees, and causes them to fall. The overstory canopy would be reduced in patches. Adjacent large green trees would be impacted and continue to die.

Cumulative Effects

Past Actions

Since the implementation of the ROD/RMP in 1995, approximately 9,178 acres of BLM-administered lands have been harvested within the 158,000-acre Big Butte Creek fifth-field watershed. Density reduction treatments (e.g., restoration thinning, commercial thinning, density management, and individual tree selection) occurred on approximately 63% (5,782 acres) of the treatment acres, regeneration harvest on about 4% (367 acres), mortality salvage on about 32% (2,937 acres), and overstory removal and clear-cut on the remaining 1% (92 acres).

Density reduction has redistributed growth from many small trees to fewer large healthy trees. The remaining trees have adequate site resources to maintain good growth rates with tree vigor at levels necessary to minimize mortality due to competition or insects and disease. Regeneration harvest has replaced stands that have passed the point of optimum wood production with young, fast-growing conifer stands that maximize the volume growth capability of the site. Mortality salvage in 2009 removed scattered individual to large concentrations of windthrown or wind-damaged trees. Approximately 43% (1,106 acres) of the mortality salvage area had severe wind damage resulting in stand conditions similar to a regeneration harvest. Within these stands, trees were uprooted, tops snapped off, and crowns defoliated by the loss of branches and needles. In some cases, canopy cover declined from approximately 80–100% to less than 30%. A mix of conifer seedlings was planted to ensure full site occupancy.

On BLM-administered lands, the greatest impact to on-site nutrients occurred in forest stands that were regeneration harvested and in stands that had large amounts of windthrown or fire-killed trees salvaged. The removal of the majority of the trees followed by slash burning reduced the amount of on-site nutrients. Lower intensity silviculture treatments such as density reduction (e.g., commercial thinning, density management, restoration thinning, riparian thinning, small diameter thinning, selection harvest, and scattered mortality salvage) remove a smaller amount of vegetation and subsequently have a lower impact to on-site nutrients. Lower intensity treatments retain stand densities and structural characteristics (live trees, snags, ground level vegetation and coarse woody debris). The partial loss of nutrients from the stand is not expected to affect long-term site productivity.

Since the implementation of the Northwest Forest Plan in 1994, Forest Service-administered lands have had management activities within the Big Butte Creek fifth-field watershed. Silviculture harvest methods were primarily density reduction thinning and some sanitation (mortality salvage) harvesting. Because of the silviculture harvest methods used, the impact to the forest nutrient pool is negligible.

On timber company lands, harvest activities have ranged from partial harvests to clear-cuts. Most of the 55,106 acres of timber company lands have been logged over the past 60 years. Within these stands, management objectives are designed to maximize volume growth per acre. Generally, these lands are managed using even-aged silviculture systems that remove the majority of the trees on short rotations (<60 years). It is expected that a loss of on-site nutrients would occur and could affect long-term site productivity.

Of the 13,985 acres of privately owned lands within the Big Butte Creek fifth-field watershed, varying levels of harvest have occurred over the past 60 to 80 years.

Present Actions

In the Big Butte Creek fifth-field watershed, BLM- and Forest Service-administered lands have active timber sale contracts for harvest. Currently, the BLM's active timber sales are Friese Camp, with 261 of 576 acres of restoration thinning completed to date, and Middle Friese, with 487 acres of restoration thinning. Harvest on all of Middle Friese timber sale acres and the remaining 315 acres of the Friese Camp timber sale are expected to be completed in 2014. Active Forest Service timber sales within the Big Butte Creek fifth-field watershed are Big Butte Springs and Rustler. Approximately 6,200 acres of density reduction in the Big Butte Springs timber sale is expected to be completed in the next 1–2 years. The Rustler timber sales have approximately 6,500 acres of commercial density management treatments that are expected to be completed within the next 5 years.

Within the Big Butte Creek fifth-field watershed, the BLM's Ranch Stew/Ranch Stew II stewardship contract is currently active. The Ranch Stew project has implemented density reduction on 1,739 acres of young stands (averaging 50–60 years old), and has an additional 100 acres of 40- to 50-year-old stands scheduled for thinning. All work is expected to be completed in 2014, but is dependent on funding. This contract, in the fifth year of a 5-year contract, averages 350–400 acres of thinning annually.

On timber company lands, some logging is occurring at this time, although the amount and duration of logging activity is unknown. On lands owned by private individuals, the amount of logging is unknown, but harvesting is generally limited to small areas and individual trees are used for lumber or firewood.

Future Actions

Three timber sales are planned within the Big Butte Creek watershed in 2015 and 2016: Clark's Dog, Eighty Acre Creek, and Flounce Back. Clark's Dog and Eighty Acre Creek, planned for 2015, would harvest approximately 2,000 acres. Flounce Back, planned for 2016, would harvest approximately 60 acres within the Big Butte Creek watershed.

In addition to timber sales, noncommercial treatments such as protection, maintenance, precommercial thinning, and release may occur. These treatments would enhance seedling survival, reduce vegetative competition, and allow for increased conifer growth. These treatments would undoubtedly occur through the reforestation and plantation maintenance that occurs across the Butte Falls Resource Area.

On timber company lands, harvest plans are unknown. However, in stands with an average 8 inches DBH and greater, we can reasonably expect commercial logging within the next 5 to 10 years. Timber companies

would most likely use silviculture methods (e.g., clear-cutting and overstory removal) that create early seral stands. Post-harvest activities, such as conifer planting, applying herbicides to control brush and hardwoods, and precommercial thinning, would be scheduled to ensure the survival, establishment, and maximum growth per acre of conifers. In stands less than 8 inches DBH, little commercial logging is expected in the next 15 to 20 years. Within such stands, brush and hardwood control and precommercial thinning are the two primary management activities most likely to occur, both of which would reduce stand densities and increase conifer growth.

On privately owned lands, limited harvest activities are expected. Occasional logging of large individual trees would occur and would most likely be limited to small areas.

3.2.4.2 Effects of Alternative 2 on Forest Condition/Forest Health

Alternative 2 proposes density management, shelterwood regeneration, selection harvest, riparian thinning, and small diameter thinning silviculture treatments (Table 3-1). Alternative 2 would apply silviculture treatments that benefit stand health while maintaining owl habitat within the home range of the northern spotted owl and northern spotted owl CHU. Within northern spotted owl CHU and 1.2-mile home range, spotted owl habitat currently defined as structurally complex; dispersal; or nesting, roosting, and foraging would not be altered to the extent that the current habitat designation would be downgraded, unless the BLM has identified an ecological benefit. These objectives apply to all proposed treatment area stands except timber harvest units 31-5 and 31-6 where potential downgrading of owl habitat is likely to occur to mitigate the spread of root rots (annosus, *Armillaria*, laminated) and Douglas-fir mistletoe.

Table 3-1. Silviculture Treatments Proposed in Alternative 2

Silviculture Treatment	Acres
Density Management—40% canopy cover	386
Density Management—60% canopy cover	121
Shelterwood Regeneration	42
Selection Harvest—40% canopy cover	202
Selection Harvest—60% canopy cover	31
Riparian Thinning	14
Small Diameter Thinning	76
Total	**872**

Direct and Indirect Effects

Shelterwood harvest would convert 42 acres of slow-growing late seral stands into fast-growing early seral stands. Stands proposed for regeneration harvest are above the age of culmination of mean annual increment and have passed the point of optimum wood production. To maximize the volume growth capability of the site, slow-growing trees would be harvested and young, fast-growing conifers would be established. Stands identified for regeneration harvest would not remove all trees of marketable size, but would retain 12 to 25 healthy, large green trees per acre greater than 20 inches DBH. Canopy cover would be reduced to 20–40%, depending on the level of green tree retention. In 15 to 30 years after harvest, overstory trees greater than 20 inches DBH in excess of 6 to 8 trees per acre may be removed in shelterwood harvest areas if the planted understory conifer trees are no longer susceptible to damage caused by late, growing-season frosts.

In stands infected with Douglas-fir mistletoe, the infected Doulas-fir would be targeted first for removal. If other conifer species cannot provide enough trees to meet the 12 to 25 green trees per acre greater than 20

inches DBH, mistletoe-infected Douglas-fir trees would be retained as long as they are clumped near the perimeter and in the lowest topographic areas in the stand.

Retained overstory trees and down logs would provide for structural and biological legacies (Franklin 1992; Hunter 1995; Hansen, et al. 1991). These structural components are necessary to maintain ecosystem processes throughout the management cycle (Bureau of Land Management 1995a, 188).

Following shelterwood harvest, logging slash would be treated to reduce wildfire risk, conifer trees would be planted, and associated silviculture treatments (e.g., using vexar tubing, mulching, shading, or scalping) would be applied to insure seedling survival and establishment. The growth and vigor of planted trees would be maximized due to low vegetative competition and trees with crown ratios greater than 35%. Conifers with 35% crown ratio or greater have sufficient leaf area for photosynthesis to maintain individual tree health and survivability.

Density management, riparian thinning, and small diameter thinning would harvest the smaller, less vigorous trees on a total of 597 acres.

In density management stands, suppressed trees would be removed followed by thinning the main canopy to reduce density and remove insect- or disease-infected or otherwise declining trees. In selection harvest stands, low vigor trees across all diameter sizes would be removed. These silviculture treatments would reduce the number of trees per acre toward levels the site has water and nutrients to sustain. Depending on the average diameter of the remaining trees, 40 to 100 trees per acre greater than 8 inches in diameter would remain with relative densities below 60%. Stands with larger diameter trees would have fewer trees per acre reserved; stands with smaller diameter leave trees would have more trees per acre retained.

Riparian thinning would target stands generally 100 years old or less that have little or no structural diversity (second growth, even-aged type stands). Stand densities would be reduced from a relative density of 84% to a relative density of 35% by removing smaller diameter trees and leaving a minimum canopy cover of 50% in northern spotted owl dispersal habitat, and a minimum canopy cover of 60% in nesting, roosting, and foraging habitat. By reducing stand density to below 60% relative density, the annual mortality rate would decline by about 50%. An increase in tree growth would occur once the root systems of the residual trees expand (approximately 5 to 10 years) and are able to use moisture, nutrients, and additional growing space. Tree crowns would increase in size and photosynthetic area, with stand crown cover increasing approximately 10% every 5 years (based on ORGANON growth and yield projections) until 100% canopy cover is reached (Hann 2003). These silviculture treatments would generally result in stands with fewer but larger trees and trees with increased growth rates.

Small diameter thinning would occur in overstocked ponderosa pine plantations, Douglas-fir progeny test sites, and mixed conifer stands that are generally less than 50 years old. Stands would be thinned from below first to remove the suppressed component of the stand, followed by thinning the main canopy to reduce densities and remove trees that are insect-infected or otherwise declining. Variable thinning from below would improve individual tree health, increase species diversity, reduce stand densities, and create structural diversity. Thinning would create stands more resilient to stand-replacing wildfires and other environmental disturbances.

In selection harvest stands, high risk trees across all diameter size classes would be removed on 233 acres. Tree vigor, as defined by crown form and crown condition, would be the primary factor used in determining high risk trees. Disease would be reduced by removing trees that are infected or susceptible to root rots and Douglas-fir mistletoe. In areas of annosus root rot, healthy codominant and dominant Douglas-fir, ponderosa pine, sugar pine, incense cedar, and hardwood species would be favored over white fir. In areas

of *Armillaria* root rot, all conifer species, with the exception of incense cedar, are susceptible to infection. White fir is the most severely infected conifer with Douglas-fir, ponderosa pine, and sugar pine moderately affected. In areas of laminated root rot (*Phellinus*), healthy codominant and dominant ponderosa pine, sugar pine, incense cedar, and hardwood species would be favored over white fir and Douglas-fir. By reducing the continuity of susceptible root systems, the spread and impact of laminated root rot would be reduced. In stands infected with Douglas-fir mistletoe, the most severely infected Douglas-fir would be targeted first for removal. Mistletoe-infected trees with a rating of 4 to 6 would be selected for removal first, followed by Douglas-fir trees with a mistletoe rating of 3.

In addition to burning the post-harvest activity slash piles, 86 acres of underburning is proposed for meadow restoration and to reduce fuel loads in adjacent timber sale units. Proposed underburning for meadow restoration includes 21 acres of meadow and adjacent forested land. In the 10 acres of forested land adjacent to the meadow, stand canopy cover may be reduced from 60% to no less than 40%, with treatment likely to occur within the next 5 years. Proposed underburning on 65 acres in timber sale units would reduce the shrub component and small tree densities, providing additional site resources (moisture and nutrients) for the growth of residual trees. Canopy cover in timber sale units after treatment would be no less than 40%. Treatment is most likely to occur 2–3 years after timber harvest or within the next 5–10 years.

Depending on the intensity of the fire, underburning may either have a positive or negative effect on conifer growth. The positive effects include the reduction of competing understory vegetation, release of nutrients into the soil for tree growth, reduction of fire hazard, and retention of sufficient duff material to maintain the nutrients necessary to sustain long-term forest productivity. If the burn is too hot, the litter and duff layer may be lost with a subsequent loss of nitrogen and a reduction in long-term soil productivity and tree growth. The following project design feature would be used to protect vegetation during prescribed burning: "To prevent fire escapes and to minimize damage to residual vegetation and trees, schedule burning to occur when weather and fuel conditions allow for lower fire intensities (typically late fall through spring)" (see section 2.8.7, Fuels Treatments Associated with Timber Harvest and Small Diameter Thinning, in this document).

No permanent road construction is proposed in this project. Proposed temporary route construction of approximately 0.4 mile would remove all vegetation on less than 1 acre of forested land. Following harvest activities, temporary routes would have the road bed tilled, seeded, and mulched. Removal of the compacted surface would restore site productivity and provide suitable growing conditions for conifer regeneration.

Cumulative Effects

See section 3.4.4.1, Effects of Alternative 1 (No-Action) on Forest Condition/Forest Health, Cumulative Effects.

Proposed regeneration harvest in Alternative 2 would reduce structural complexity, lower biological diversity, and increase habitat fragmentation on 42 acres, or less than 1% (0.03%) of the Big Butte Creek fifth-field watershed. Silviculture treatments such as density management and selection harvest would occur in place of regeneration harvest methods on 391 acres of the 433 acres of stands 100 years old and older that are proposed for treatment. By not using regeneration harvest treatment methods in stands 100 years old and greater, forest stands would not stay on desired developmental trajectories. The development of desired habitat components would be slowed and stand vigor would not be maintained or improved. In forest stands 100 years old or greater, optimum net wood production has been reached. In the absence of regeneration harvests, these stands would continue to grow but at rates less than their full potential.

In northern GFMA forest stands that are generally less than 100 years old, stand densities on BLM-administered lands would be reduced. Tree growth and vigor would be maximized by reducing the competition for limited site resources. An increase in usable timber yield would occur by concentrating and increasing growth rates in fewer trees, resulting in larger and more valuable logs. Trees that would otherwise die prior to the final regeneration harvest would also be harvested.

In stands 50 to 100 years old, 439 acres (5%) of the BLM matrix forested lands in the Big Butte Creek fifth-field watershed estimated as needing density reduction would receive density management, selection harvest, or small diameter thinning. An additional 391 acres (3%) of the available BLM matrix forested lands within the Big Butte Creek fifth-field watersheds 100 years old and greater would also be treated with density reduction methods (density management and selection harvest).

On timber company lands, harvesting would continue and older stands would be converted to early seral stands, with conifers planted to maximize growth and timber yield. Most timber company lands would be managed with final harvest on commercial economic rotations averaging 60 years (Bureau of Land Management 1994, 4-5).

3.2.4.3 Effects of Alternative 3 on Forest Condition/Forest Health

In Alternative 3, restoration thinning, selection harvest, riparian thinning, and small diameter thinning are proposed on 872 acres (Table 3-2). Alternative 3 would increase landscape resiliency to environmental disturbances (e.g., fire, insects, disease, and climate change) by reducing stand densities, favoring drought-tolerant species, and increasing structural complexity while maintaining northern spotted owl habitat and CHU. Within CHU and owl habitat that is currently defined as structurally complex; dispersal; or nesting, roosting, and foraging, habitat would not be altered to the extent that the current habitat designation is downgraded, unless the BLM has identified an ecological benefit for doing so. This would apply to all stands proposed for treatment except timber harvest units 31-5 and 31-6, where potential downgrading of owl habitat is likely to occur to reduce the spread of root rots (annosus, *Armillaria*, laminated) and Douglas-fir mistletoe. No regeneration harvest is proposed.

Stands identified for restoration thinning, riparian thinning, and small diameter thinning would have the smaller, less vigorous trees harvested. In stands selectively harvested, low vigor trees across all diameter sizes would be removed. These silviculture treatments would reduce the number of trees per acre toward levels the site has water and nutrients to sustain.

Table 3-2. Silviculture Treatments Proposed in Alternative 3

Silviculture Treatment	Treatment Acres
Selection Harvest—40% canopy cover	119
Selection Harvest—60% canopy cover	25
Restoration Thinning—40% canopy cover	470
Restoration Thinning—60% canopy cover	168
Riparian Thinning	14
Small Diameter Thinning	76
Total	**872**

Direct and Indirect Effects

Restoration thinning on 638 acres would reduce stand density, strive to retain old trees (>150 years), favor drought-tolerant species, provide structural complexity (unthinned patches and small openings), increase

Figure 3-5. Overstocked stand proposed for forest management.

average stand diameter, and maintain at least 40% canopy cover. These characteristics would increase stand resiliency to environmental disturbances (e.g., fire, insects, disease, and climate change) by removing smaller trees and vegetation that compete for limited site resources and provide surface and ladder fuels that increase fire intensity. Thinning would reduce the number of trees per acre toward levels the site has water and nutrients to sustain. Approximately 80 to 100 trees per acre greater than 8 inches in diameter would remain with a relative density below 60%. With a reduction of tree density to below 60% relative density, the annual mortality rate would be expected to decline by about 50%. An increase in tree growth would occur once the root systems of the residual trees expand (approximately 5 to 10 years) and are able to use moisture, nutrients, and additional growing space.

Canopy cover in restoration thinning, selection harvest, and small diameter thinning stands would decrease from 60–100% to a minimum of 40–60%. Within northern spotted owl CHU and home ranges, stands would retain a minimum of 40% canopy cover in dispersal habitat, and a minimum of 60% canopy cover in nesting/roosting/foraging habitat unless there is an ecological benefit identified to downgrade habitat. Selection harvest in two stands in northern spotted owl nesting/roosting/foraging habitat would reduce canopy cover to a minimum of 40% to mitigate the spread of root rots (laminated, annosus, *Armillaria*) and Douglas-fir mistletoe. Outside of northern spotted owl CHU and home range, a minimum of 40% canopy cover would be reserved.

Selection harvest, riparian thinning, and small diameter thinning would occur on a total of 234 acres. Stands identified for riparian and small diameter thinning would have the smaller, less vigorous trees harvested. In stands selectively harvested, low vigor trees across all diameter sizes would be removed. These silviculture treatments would reduce the number of trees per acre toward levels the site has water and nutrients to sustain. Depending on the average diameter of the remaining trees, 40 to 100 trees per acre greater than 8 inches in diameter would remain with relative densities below 60%. Stands with larger diameter trees would have fewer trees per acre reserved; stands with smaller diameter leave trees would have more trees per acre retained.

Riparian thinning would target stands generally 100 years old or less that have little or no structural diversity (second growth, even-aged type stands). Stand densities would be reduced from 84% to 35% relative density by removing smaller diameter trees and leaving a minimum canopy cover of 50% in dispersal habitat, and a minimum canopy cover of 60% in nesting, roosting, and foraging habitat. By reducing stand density to below 60% relative density, the annual mortality rate would decline by about 50%. An increase in tree growth would occur once the root systems of the residual trees expand (approximately 5 to 10 years) and are able to use moisture, nutrients, and additional growing space. Tree crowns would increase in size and photosynthetic area, with stand crown cover increasing approximately 10% every 5 years (based on ORGANON growth and yield projections) until 100% canopy cover is reached (Hann 2003). These silviculture treatments would generally result in stands with fewer but larger trees and trees with increased growth rates.

Small diameter thinning would occur in overstocked ponderosa pine plantations, Douglas-fir progeny test sites, and mixed conifer stands that are generally less than 50 years old. Stands would be thinned from below first to remove the suppressed component of the stand, followed by thinning the main canopy to reduce densities and remove trees that are insect-infected or otherwise declining. Variable thinning from below would improve individual tree health, increase species diversity, reduce stand densities, and create structural diversity. Thinning would create stands more resilient to stand-replacing wildfires and other environmental disturbances.

In Alternative 3, no stands are proposed for regeneration harvest. In older (more than 100 years) dense stands, restoration thinning or selection harvest would be used in place of ROD/RMP planned regeneration harvests. Restoration thinning and selection harvest would not meet the sustained yield objectives of the RMP/ROD (p. 38), but would increase tree survivability and tree longevity. Not harvesting stands planned for regeneration harvest would result in the loss of the growth capability of stands where stand health is declining because stand densities are high, or where mortality is apparent due to root rots and Douglas-fir mistletoe. Maximizing the growth capability of the site requires unhealthy, slow-growing trees to be harvested and young, healthy, fast-growing conifers to be planted. In the absence of regeneration harvest in stands that have reached culmination of mean annual increment, this alternative would meet some (restoration thinning and selection harvest) but not all of the timber management assumptions and conifer growth and timber yield projections provided for in the Medford District PRMP/EIS.

In addition to burning the post-harvest activity slash piles, 86 acres of underburning is proposed for meadow restoration and to reduce fuel loads in timber harvest units. Proposed underburning for meadow restoration includes approximately 21 acres of meadow and adjacent forested land. In the forested land (approximately 10 acres) adjacent to the meadow, stand canopy cover may be reduced from 60% to no less than 40%, with treatment likely to occur within the next 5 years. Proposed underburning on 65 acres of timber harvest units would reduce the shrub component and small tree densities, providing additional site resources (moisture and nutrients) for the growth of residual trees. Canopy cover in timber harvest units after treatment would be no less than 40%. Treatment is most likely to occur 2–3 years after timber harvest or within the next 5–10 years.

Depending on the intensity of the fire, underburning may either have a positive or negative effect on conifer growth. The positive effects include the reduction of competing understory vegetation, release of nutrients into the soil for tree growth, reduction of fire hazard, and retention of sufficient duff material to maintain the nutrients necessary to sustain long-term forest productivity. If the burn is too hot, the litter and duff layer may be lost with a subsequent loss of nitrogen and a reduction in long-term soil productivity and tree growth. The following project design feature would be used to protect vegetation during prescribed burning: “To

prevent fire escapes and to minimize damage to residual vegetation and trees, schedule burning to occur when weather and fuel conditions allow for lower fire intensities (typically late fall through spring)" (see section 2.8.7, Fuels Treatments Associated with Timber Harvest and Small Diameter Thinning, in this document).

No permanent road construction is proposed in this project. Proposed temporary route construction of 0.4 mile would remove all vegetation on less than 1 acre of forested land. Following harvest activities, temporary routes would be tilled, seeded, and mulched. Removal of the compacted surface would restore site productivity and provide suitable growing conditions for conifers.

In the absence of regeneration harvest in stands that have reached culmination of mean annual increment, this alternative would meet some (restoration thinning and selection harvest), but not all, of the timber management assumptions and conifer growth and timber yield projections provided for in the Medford District PRMP/EIS.

Cumulative Effects

See section 3.2.4.1, Effects of Alternative 1 (No-Action) on Forest Condition/Forest Health, Cumulative Effects.

In forest stands 100 years old or greater, optimum net wood production has been reached. This alternative replaces regeneration harvests with restoration thinning and selection harvest. Restoration thinning and selection harvest would not convert these slow-growing stands into fast-growing early seral stands; although, the gaps created during restoration thinning would provide pockets of early seral stands. Restoration thinning and selection harvest in this alternative would treat 433 acres, or 3% of the BLM matrix forested land 100 years old or greater within the Big Butte Creek fifth-field watershed. Restoration thinning and selection harvest retains late-successional stand densities and characteristics (live trees, snags, ground level vegetation, and coarse woody debris).

In northern GFMA forest stands less than 100 years, stand densities on BLM-administered lands would be reduced. Tree growth and vigor would be maximized by reducing the competition for limited site resources. An increase in usable timber yield would occur by concentrating and increasing growth rates in fewer trees, resulting in larger and more valuable logs. Trees that would otherwise die prior to the final regeneration harvest would also be harvested. This alternative would treat 439 acres or approximately 5% of the BLM matrix land 50 to 100 years old estimated as needing density reduction treatment within the Big Butte Creek fifth-field watershed.

On private forest lands, harvesting would continue and older stands would be converted to early seral stands, with conifers planted to maximize growth and timber yield. Most private forestlands would be intensively managed with final harvest on commercial economic rotations averaging 60 years (Bureau of Land Management 1994, 4-5).

3.3 Northern Spotted Owl Habitat

ISSUE: *Can the BLM provide silviculture treatments on matrix lands in northern spotted owl habitat without harm to an individual owl?*

This section analyzes the potential impacts from the proposed forest management activities on northern spotted owl habitat. Terms used in this section are defined as follows:

Bureau sensitive species. A special status species category established by the BLM that includes those plant and animal species eligible for status as federally listed, Federal candidate, state listed, or state candidate (plant) species; or approved for this category by the BLM State Director; or included under agency species conservation policies.

core area. A 0.5-mile radius circle (approximately 500 acres) from the nest or center of activity to delineate the area most heavily used by spotted owls during the nesting season; it is included in the provincial home range circle. Core areas represent the areas that are defended by territorial owls and generally do not overlap the core areas of other owl pairs (Anthony and Wagner 1998; Dugger, Wagner, et al. 2005; Zabel, et al. 2003; Bingham and Noon 1997).

home range. The area annually traversed by spotted owls that provides important habitat elements.

nest patch. The 300-meter radius (70 acres) around a known or likely nest site. Nest patch is included in the core and home range area (Swindle, et al. 1999; Perkins 2000; Miller 1989; Meyer, Irwin and Boyce 1998).

occupied spotted owl site. A location with evidence of continued use by spotted owls. Evidence includes breeding, repeated location of a pair or single bird during a single season or over several years, presence of young before dispersal, or some other strong indication of continued occupation.

primary constituent elements. Those physical and biological features of a landscape that a species needs to survive and reproduce.

provincial radius. Radius of a circle that represents an approximate home range for an owl in a given geographic location or province. The Double Bowen project is located in the Western Cascades Province. The provincial radius for the Western Cascades Province is 1.2 miles (Thomas, et al. 1990; Courtney, et al. 2004). The provincial home ranges of several owl pairs may overlap.

recovery action. Near-term recommendations to guide the activities needed to accomplish the recovery objectives and achieve the recovery criteria in the 2011 *Revised Recovery Plan for the Northern Spotted Owl* (Strix occidentalis caurina). The Revised Recovery Plan presents 33 actions that address overall recovery of the northern spotted owl.

spotted owl site. Any location where territorial spotted owls are known to be present, were historically present, or may be present in unsurveyed habitat. Spotted owl sites can be identified through surveys where spotted owls were detected. In cases where survey data are unavailable, spotted owl sites can be identified by (1) conducting surveys, or (2) using a modeling approach that uses habitat and landscape characteristics to identify areas with a high probability of being occupied by spotted owls (U.S. Fish and Wildlife Service 2011, G-4).

treat and maintain. An action or activity occurs within spotted owl dispersal or nesting, roosting, and foraging habitat but will not change the conditions that would classify the stand as dispersal or nesting, roosting, and foraging habitat post-treatment.

3.3.1 Methodology

- The process for conducting biological evaluations and assessments includes a review of existing records, field reconnaissance, field surveys, and analysis of potential impacts. The project wildlife biologist conducted a review of potential wildlife habitat using field assessments, maps, aerial photographs, GIS software, wildlife survey data, and stand exam records for the Project Area.
- The BLM wildlife biologist classified spotted owl habitat in the Project Area by habitat type (Table 3-3) using 1997 IVMP (Interagency Vegetation Mapping Project), FOI (Forest Operations Inventory), TPCC (Timber Production Capability Classification), and on-site habitat analysis. IVMP is a joint Forest Service/BLM project that derives a 25-meter pixel-based vegetation map from 1997 satellite imagery. The 1997 IVMP provides a representation of vegetation age classes across all ownerships within the Project Area. The vegetation map has been classified into categories according to the Interagency Vegetation Standards that were adopted by the Interagency Advisory Committee. IVMP data is primarily useful for cumulative effects analysis that includes public and private lands. The FOI gives a more detailed description of age classes on BLM lands because it is based on field data as well as aerial photo inventories. The combined data allows the vegetation to be grouped into the early, mid-, and late seral age classes for comparison purposes, although these data sources have differing degrees of detail and resolution. The TPCC refers to the suitability of the soil to produce timber.
- RA32 Habitat Evaluation Methodology 1.3 was used to determine the presence or absence of highly suitable, structurally complex spotted owl habitat in all project units under consideration in this analysis. This methodology complies with the Recovery Action 32 (RA32) recommendation in the *Revised Recovery Plan for the Northern Spotted Owl* (Strix occidentalis caurina) to maintain all of the older and more structurally complex, multilayered conifer forests.
- Using recommendations from Recovery Action 10 (RA10) in the Northern Spotted Owl Recovery Plan, known spotted owl sites within the Project Area were identified and considered for habitat retention.
- The BLM will conduct strategic surveys for northern spotted owls following the 2011 Protocol for Surveying Proposed Management Activities that May Impact Northern Spotted Owls (2011 NSO Survey Protocol, Revised January 9, 2012).

3.3.2 Assumptions

- Late-successional forest is forested habitat 80 years or older. Late-successional forest generally, but not always, provides suitable habitat for spotted owls. Suitable spotted owl habitat is usually 80 years and older, but it also contains other attributes, such as multiple tree layers, snags, and decaying logs. Spotted owl habitat is specifically rated for its suitability for spotted owls, while late-successional forest (not rated as suitable spotted owl habitat) may provide habitat for other wildlife species.

3.3.3 Affected Environment

3.3.3.1 Northern Spotted Owl Habitat

The northern spotted owl, listed as threatened under the Endangered Species Act, is associated with the existing habitats found within the Project Area. Northern spotted owls prefer coniferous forest with multiple vertical layers of vegetation; a variety of tree species and age classes; and the presence of large logs and large diameter live and dead trees (snags) for nesting, roosting, and foraging habitat. They may also be found in younger stands with multilayered, closed canopies, large diameter trees, and abundance of dead and down woody material. Based on studies of owl habitat selection, including habitat structure and use and

Table 3-3. Northern Spotted Owl Habitat Types

Habitat Type	Description
Type 1: Suitable Nesting, Roosting, Foraging (NRF)	These forests have a high canopy cover (greater than 60%), a multilayered structure, and large overstory trees greater than 21 inches in diameter. Deformed, diseased, and broken-top trees, as well as large snags and down logs, are also present. Nesting, roosting, and foraging habitat meets all spotted owl life requirements.
High-quality habitat (RA32) Subset of Type 1 habitat	Older, multilayered, structurally complex forests characterized as having large trees greater than 17 inches in diameter, high canopy cover (greater than 60%), and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees (Figure 3-6). RA32 habitat may vary due to climatic gradients across the range.
Type 2: Roosting, Foraging (RF)	Canopy cover greater than 60% and canopy structure generally single layered. Overstory trees are generally greater than 16 inches in diameter. Snags and down wood not considered a requirement.
Type 3: Capable	Does not presently meet spotted owl needs but has the potential to grow into habitat Types 1, 2, or 5.
Type 4: Non-habitat	Does not have the potential of developing into late-successional forest or supporting old-growth dependent species.
Type 5: Dispersal	This habitat is not suitable for nesting, but provides requirements believed important for spotted owl dispersal. Canopy cover is generally between 40 and 60%. In stands with greater than 60% canopy cover, overstory tree diameters are generally less than 16 inches. The area has the capability of becoming foraging or nesting habitat. Deformed trees, snags, and down wood are absent or less prevalent than in Type 1 habitat.

prey preference throughout the range of the owl, spotted owl habitat consists of four components: nesting, roosting, foraging, and dispersal (Thomas, et al. 1990) (Table 3-3).

Suitable nesting, roosting, foraging habitat in southwest Oregon is typified by mixed-conifer habitats with recurrent fire history, patchy habitat components, and higher incidences of woodrats. A review of current habitat ratings of 3,960 acres of Federal lands (Forest Service and BLM) within the Project Area indicates that 25% (967 acres) of Federal lands provide nesting, roosting, foraging habitat (including 1% RA32 habitat); 5% (203 acres) provide roosting, foraging habitat; and 43% (1,683 acres) provide dispersal-only habitat (Figure 3-7). Suitable nesting, roosting, foraging and roosting, foraging habitat also functions as dispersal habitat. The remaining 1,107 acres of Federal lands are capable, non-habitat, or

Figure 3-6. Example of the RA32 habitat identified and retained in the Project Area. Photo by David Roelofs

undetermined. Habitat assessments in the field identified approximately 370 acres of the proposed treatment units as generally having only one tree layer. These simplified stands do not currently offer suitable nesting structure for spotted owls.

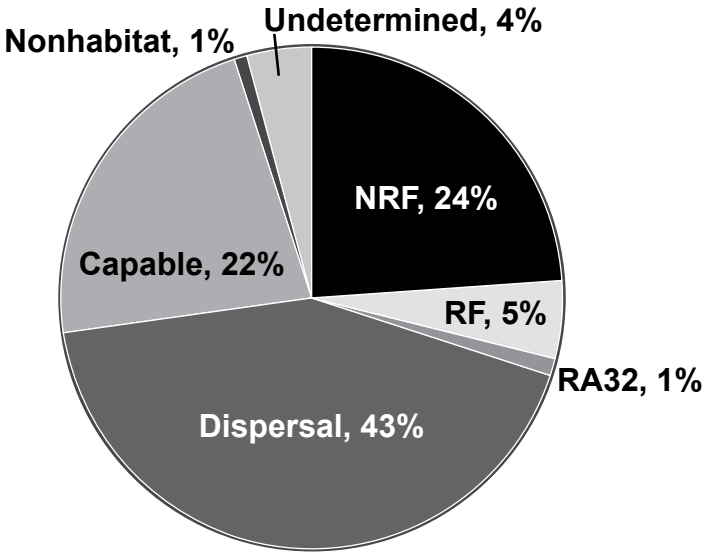


Figure 3-7. Existing northern spotted owl habitat on Federal lands in the Project Area.

Critical Habitat

In December 2012, the US Fish and Wildlife Service released the *Revised Critical Habitat for the Northern Spotted Owl*, which designated northern spotted owl critical habitat on BLM lands. A CHU (critical habitat unit) identifies geographic areas that contain features essential for the conservation of the spotted owl and may require special management considerations. For the northern spotted owl, these features include particular forest types of sufficient area, quality, and configuration distributed across the range of the species that will support the needs of territorial owl pairs throughout the year, including habitat for nesting, roosting, foraging, and dispersal. Approximately 90% (3,510 acres) of Federal land within the Project Area is in designated critical habitat. See Figure 3-8 for a breakdown of northern spotted owl habitat in CHU.

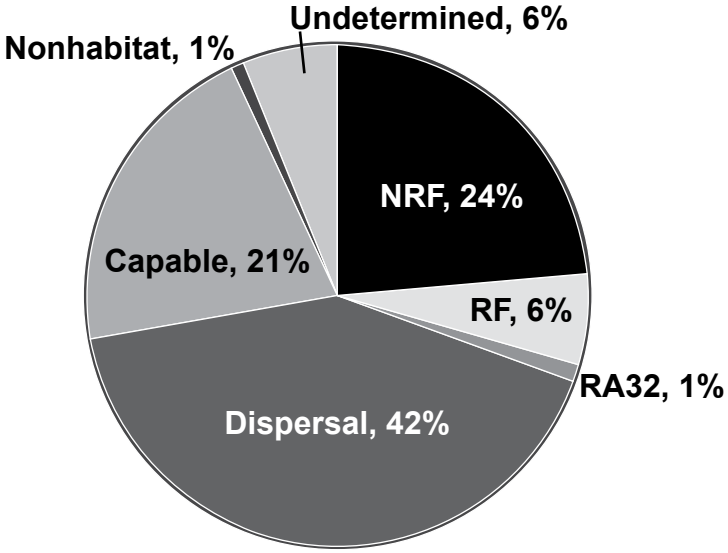


Figure 3-8. Existing northern spotted owl habitat in CHU on Federal lands in the Project Area.

The Double Bowen projects are within CHU 10, subunit KLE-5. The KLE-5 subunit occurs in Jackson County, Oregon and comprises 38,283 acres of lands managed by the BLM and Forest Service. 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 barred owls. This subunit is expected to function primarily for north-south connectivity between subunits and also for demographic support.

Northern Spotted Owl Recovery Plan

The 2011 *Revised Recovery Plan for the Northern Spotted Owl* (Strix occidentalis caurina) recommends retaining all known spotted owl sites as well as high quality habitat, as identified in RA32. The Recovery Plan is not a regulatory document; it provides guidance to bring about recovery through prescribed management actions and supplies criteria to determine when recovery has been achieved. The BLM works with the US Fish and Wildlife Service to incorporate the Recovery Goals and Actions in the Recovery Plan consistent with BLM laws and regulations.

The current foundation of the spotted owl recovery plan is the 1994 Northwest Forest Plan. Management direction and land use allocations in the standards and guidelines of the Northwest Forest Plan are intended to constitute the Forest Service and BLM contributions to the recovery of the northern spotted owl (Forest Service and Bureau of Land Management 1994, A-2). The Medford District ROD/RMP and the Northwest Forest Plan provide a network of late-successional reserves (including 100-acre activity centers), connecting riparian corridors, connectivity/diversity blocks, and 15% late-successional forest retention on Federal lands in fifth-field watersheds.

Known Northern Spotted Owl Activity Centers

The Northwest Forest Plan designated 100 acres of the best habitat on Federal lands to be retained as close as possible to the spotted owl nest site, or activity center, for all sites known as of January 1, 1994. This was intended to preserve an intensively used portion of the breeding season home range close to a nest site or center of activity (Bureau of Land Management 1995a, 32; Forest Service and Bureau of Land Management 1994, C-10). These known spotted owl activity centers are managed as late-successional reserves. Two, 100-acre activity centers (Ginger and Bowen West) are located within the Project Area in T35S, R2E, sections 23 and 25.

Provincial Home Range

The home range is a circular area around a spotted owl center of activity. The size of the home range is based on the geographic province in which it is located. The Double Bowen project is located within the Cascades West province. The provincial home range for the Cascades West province is a 1.2-mile radius from the northern spotted owl center of activity. Based on studies, suitable habitat coverage of at least 40% or higher at the home range scale (Bart and Forsman 1992; Bart 1995) and 50% or higher at the core area scale (Dugger, et al. 2005) is likely necessary for maintaining spotted owl life history functions. As the amount of suitable habitat in an owl's home range decreases, so does site occupancy, reproduction, and survival. A combination of forest fires, severe wind storms, timber harvest on private and BLM lands, and detection of barred owls has occurred in these home ranges. Each home range currently contains less habitat than the best available information indicates are the habitat amount values important to spotted owl habitat fitness at the home range (40%) and core use area (50%) scales.

Proposed projects are located within the provincial home ranges of seven known spotted owl sites (Table 3-4). A known spotted owl site is defined as a location with evidence of historic or current use by spotted owls. Evidence includes breeding, repeated location of a pair or single bird during a single season or over several years, presence of young before dispersal, or some other strong indication of occupation. Two of the known spotted owl sites were discovered after January 1, 1994 and do not have established 100-acre activity centers (Forest Service and Bureau of Land Management 1994, C-10). Of the five sites with 100-acre activity centers, two are located within the Project Area. Five of the seven known sites had a pair of spotted owls in the past 10 years, with one known site having a pair in the past 5 years. Three known sites have had a single owl detected during surveys in the past five years. Each of the owl sites is a mixture of private and public lands.

Table 3-4. Northern Spotted Owl Sites within the Double Bowen Project Area

	Site Number and Location Name						
	0887O Esmond Mountain	1830O Ginger[1]	2005A Bowen West	2223A Bowen Creek	2680O Indian Creek (USFS)	3256O Double Prentice[1]	4380O Hukillberry Beak
100-acre Known Spotted Owl Activity Center	Yes	Yes[2]	Yes[2]	No[2]	Yes	Yes	No[2]
Pair Status (year)	1991	1990–2007	1990–2002	1990, 1998, 2009	1990–1992 1994–2003	1992–1994 1996–2000 2002–2008	1995–2001 2003–2007
Single Owl (year)	1999, 2010, 2012	2007	2003, 2009, 2012	2000, 2005, 2007	2004	2008	2008, 2011–2014
Confirmed Nesting (year)	None	1988, 1992, 1994, 1995, 1997, 2000, 2002, 2005	1992, 2000	1998 2009	1991	1994, 1997, 2000	1998, 2001, 2004
Number of Young Fledged	None	8	2	3	1	5	6
Barred Owl (year)	None	None	2014	None	2004, 2006–2012	None	2008
Affected by 2008 Windstorm?	Yes	Yes	Yes	Yes	No	Yes	No
Affected by 2008 Wildfire?	No	Yes	No	No	No	No	No

[1] The 0.5-mile core areas of these two sites are no longer suitable for nesting as a result of the 2008 winter windstorm or wildfire.

[2] The center of activity is located within the Project Area.

Late-Successional Forest

The ROD/RMP and Northwest Forest Plan require that 15% of all Federal forestlands within fifth-field watersheds retain late-successional forest conditions, generally defined as stands 80 years or older. Late-successional forest conditions allow for spotted owl dispersal, foraging, or nesting opportunities. Currently, 62% of BLM forested land in the Big Butte Creek fifth-field watershed is in late-successional condition.

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. These blocks may be a combination of northern spotted owl non-habitat and NRF, dispersal, and capable habitat. The Project Area contains one connectivity/diversity block in T35S, R2E, section 25. Currently, 67% of forested land in the connectivity block is in late-successional condition.

3.3.3.2 Northern Spotted Owl Population Trends

Spotted owl productivity varies widely year-to-year, depending on how spring weather conditions affect prey availability (reproduction) (Franklin, et al. 2000, 539). Ongoing demographic monitoring of two study areas located east and northwest of the Project Area indicates the population of spotted owls in southwest Oregon is statistically stable (Forsman, et al. 2011).

3.3.3.3 Barred Owls

Barred owls (*Strix varia*) are native to eastern North America, but have moved west into spotted owl habitat. The barred owl's range now completely overlaps that of the northern spotted owl (Gutierrez, et al. 2004, 7–12). Barred owls are considered generalists and make use of a variety of vegetation and forage species (Wiens, Anthony, and Forsman 2014). Existing evidence suggests that barred owls compete with northern spotted owls for habitat and prey with near total niche overlap and that interference competition (Dugger, Anthony and Andrews 2011; Wiens, Anthony, and Forsman 2014; Van Lanen, et al. 2011) is resulting in increased northern spotted owl site abandonment, reduced colonization rates, and likely reduction in reproduction (Olson, et al. 2005; Dugger, Anthony, and Andrews 2011; Forsman, et al. 2011; Wiens, Anthony, and Forsman 2014), ultimately resulting in probable range-wide population reductions (Forsman, et al. 2011). Barred owl effects on spotted owl survival and colonization appear to be substantial and additive to effects of reduction and fragmentation of habitat in spotted owl home range area. The magnitude of the barred owl effect may increase somewhat as habitat quantity decreases and fragmentation increases (Dugger, Anthony, and Andrews 2011).

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

The BLM did not conduct surveys specifically for barred owls in the Project Area, but the species was detected during spotted owl surveys. BLM biologists observed barred owls at three locations within the Project Area.

3.3.4 Environmental Consequences

3.3.4.1 Effects of Alternative 1 (No Action) on Northern Spotted Owl Habitat

Direct and Indirect Effects

Under Alternative 1, no forest management activities would occur. Stands providing suitable northern spotted owl habitat would remain owl habitat. With no thinning (restoration thinning, small diameter thinning, selection harvest, or density management), the trajectory of some stands to grow into suitable habitat would continue at a slower rate. With no forest management actions, stands would remain overstocked and at a higher risk of stand-replacement fire. Pockets of root rot and mistletoe would continue to spread within the Project Area. Without treatment, laminated root rot would continue to spread throughout Douglas fir and true fir tree species, thus weakening them, killing them directly, or making them more susceptible to pine beetles and windthrow. Over time, the stand would have a tree species shift to more resistant species such as pine, cedar, and hardwood species, and spotted owls would be less likely to use the stand for nesting.

Cumulative Effects

No change from current trends in the Project Area is expected. Most timber company lands that are interspersed with land managed by the BLM will remain in early to mid-seral conditions as harvesting will

likely continue on them. Timber company lands are managed for timber production and harvested as trees reach 40 to 60 years of age. Timber company lands within Double Bowen continue to be logged and very little nesting/roosting/foraging habitat remains on those lands.

Timber harvest on intermingled private lands is expected to continue. The private lands are not currently considered suitable owl habitat due to previous timber harvest, but they do provide some dispersal habitat.

Suitable spotted owl habitat removed in the last decade by BLM timber sales in the Project Area was included in the analysis for consultation with US Fish and Wildlife Service. Within the last 10 years, dispersal; roosting/foraging; and nesting/roosting/foraging habitat was removed on 60 acres through regeneration harvest. Additionally, BLM biologists documented removal of 32 acres and downgrade of 236 acres of nesting/roosting/foraging habitat as a result of a windstorm in January 2008 within the Project Area. A stand-replacing wildfire in late summer 2008 also downgraded and removed suitable owl habitat in the area. The change in habitat was included in the basin-wide update of the baseline situation and is reflected in Figure 3-6, Existing Northern Spotted Owl Habitat in the Project Area. As thinned canopies continue to grow, some of these stands will return to being dispersal habitat in the next 30 years and nesting/roosting/foraging habitat within 80 years.

Barred owls have been detected within two of the seven known home ranges in the Project Area during spotted owl surveys. Their total numbers in the area are unknown, however. The range of the barred owl completely overlaps that of the northern spotted owl. Barred owls may take advantage of spotted owl habitat disturbance (Courtney, et al. 2004), although it is unclear how the proposed action would affect barred owl presence in the watershed. Even though barred owls are rapidly expanding their range in North America, Courtney, et al. (2004, 7-31) 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)."

There are varied opinions among biologists concerning the possible negative effects barred owls may have on spotted owls. Several authors have addressed the effects of barred owls on spotted owl occupancy, persistence, and reproductive success (Courtney, et al. 2004). The report by Courtney, et al. indicated studies on the Olympic Peninsula in Washington found no difference in the reproductive success of spotted owls with and without the presence of barred owls within 1.5 miles of spotted owl activity centers. Other modeling studies, however, found that the presence of barred owls was negatively correlated with spotted owl presence in Coastal Oregon (Weins, et al. 2007). While neither study was able to conclusively determine effects, Courtney, et al. concluded that further study of the demographic consequences of barred owl presence or competition is needed.

The updated methodology presented in the *2011 Protocol for Surveying Proposed Management Activities that May Impact Northern Spotted Owls, Revised in 2012* (2011 NSO Survey Protocol) is meant to increase the likelihood of detecting the presence of spotted owls in areas where there may be barred owls. Additionally, RA32 in the 2011 Revised NSO Recovery Plan is meant to provide spotted owls with refugia from barred owls. Stands that were identified as RA32 habitat would be preserved, decreasing the competition between barred and spotted owls for shared resources. The RA32 stands will contribute to maintaining forest with large diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees.

The following reports identified greater than expected northern spotted owl population declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and

northern California: *Scientific Evaluation of the Status of the Northern Spotted Owl* (Courtney, et al. 2004); *Status and Trends in Demography of Northern Spotted Owls, 1985–2003* (Anthony, et al. 2006); *U.S. Fish & Wildlife Service 5-Year Status Review* (U.S. Fish and Wildlife Service 2004); *Northwest Forest Plan–The First Ten Years (1994–2003): Status and Trends of Northern Spotted Owl Populations and Habitats from 1994 to 2008* (Davis, et al. 2011), and *Population Demography of Northern Spotted Owls* (Forsman, et al. 2011). The reports were inconclusive as to the cause of the declines. Lag effects from prior harvest of suitable habitat, competition with barred owls, seasonal weather patterns, and habitat loss from wildfire were identified as current threats, while West Nile virus and sudden oak death were identified as potential new threats. West Nile virus is transmitted to birds through the bite of infected mosquitoes. Some birds that are predators (such as hawks and owls) or scavengers (such as crows) may become infected after eating sick or dead birds that were already infected with West Nile virus. Sudden oak death-induced changes in vegetation structure and tree community composition may cascade to affect vertebrate communities. Complex interactions are likely among the various factors.

The status of the northern spotted owl population and increased risk to spotted owl populations because of the uncertainties surrounding barred owls and other factors were reported as not sufficient to reclassify the species as endangered at this time. Barred owls may continue to immigrate into the Project Area, even without proposed actions on BLM lands. Since 1990, the emergence of barred owls as invasive competitors with spotted owls suggests an increase in risk to spotted owls. Barred owls are more of a habitat and diet generalist, occupy a wider diversity of habitat types, and have smaller home ranges than spotted owls. The displacement of spotted owls by barred owls is likely occurring, but the rate and extent of this is unknown. Predictions of the potential impacts and long-term threats posed by seasonal weather patterns, barred owls, West Nile virus, and sudden oak death are beyond the scope of this analysis.

3.3.4.2 Effects on Northern Spotted Owl Habitat Common to All Action Alternatives

The following proposed projects are the same in each action alternative: small diameter thinning (76 acres), riparian thinning (14 acres), road renovation (31 miles), road decommissioning (3.3 miles), water source restoration (2 sites), and meadow restoration (21 acres).

Direct and Indirect Effects

Northern Spotted Owl Habitat

The BLM wildlife biologist evaluated and identified approximately 30 acres of highly suitable, structurally complex RA32 habitat in areas initially proposed for harvest. These acres were subsequently dropped from further consideration for the activities proposed in this project.

Logging activity disrupts ground-level shrub and woody debris habitat for northern spotted owl prey species; however, the shrub layer would fill back in within 2 to 5 years and current down woody debris would be left on site. The impacted prey species would rebound within a few years. During harvest operations, patches of sapling size trees would be worked around to avoid damage to naturally regenerating trees. The habitat disturbance for prey species is of relatively short duration.

Small diameter thinning would treat and maintain 76 acres of dispersal habitat. Young stands would be thinned to promote stand health, create structural diversity, and increase landscape resiliency to environmental disturbances. Thinning would reduce the number of trees per acre to levels the site has resources to sustain. A minimum or 40% canopy cover would remain after the harvest. These stands of trees currently consist of even-aged trees with no diversity of tree structure.

Riparian thinning would treat and maintain 2 acres of roosting, foraging and 12 acres of dispersal habitat. Thinning would reduce stand densities by thinning from below, removing smaller trees and leaving trees 20 inches in diameter or larger. After harvest, these stands would remain roosting, foraging or dispersal habitat because they would retain at least 60% or 50% canopy cover, respectfully. If present, existing understory tree layers and existing snags and coarse woody debris would be retained. Riparian thinning would improve individual tree and stand health, reduce risk for stand-replacing wildfires, restore ecosystem functions by accelerating the growth of healthier trees, and provide an increase of large wood.

Underburning to reduce hazardous fuels would treat and maintain 63 acres of dispersal habitat and 2 acres of capable habitat. These acres are within proposed timber harvest units. Woody debris accumulated as a result of the harvest operations would be burned to reduce the risk of potential future wildfire. Overstory canopy covers would be maintained and the function of these stands would still provide dispersal opportunities for spotted owls. Additionally, reducing the fire danger in areas adjacent to high quality nesting/roosting/foraging habitat and known owl activity centers would protect owl nesting opportunities from habitat-degrading, severe wildfires.

Meadow restoration treatments are proposed within and adjacent to a 6-acre natural, grassy opening. Meadow restoration would cut, burn, or both small conifers and areas of older or decadent brush in an effort to rejuvenate brush species that would benefit wildlife for browse. ROD/RMP direction (p. 49) is to use management practices, including fire, to obtain desired vegetation conditions in special habitats such as meadows. Restoring the natural opening would encourage growth of new forage for deer and elk and create foraging habitat for great gray owls and other meadow-dependent species. Approximately 8 acres of dispersal habitat would be treated and maintained. Approximately 2 acres of nesting, roosting, foraging habitat would be included in the underburn treatment and these 2 acres would become the more simplified roosting, foraging habitat.

The District has determined the proposed maintenance within spotted owl habitat from small diameter thinning, riparian thinning, and hazardous fuels reduction would have an insignificant effect to spotted owls and is not likely to adversely affect habitat.

Road renovation and decommissioning and water source restoration projects are outside of spotted owl habitat and would not contribute to spotted owl critical habitat modification or destruction. A seasonal restriction for projects that may cause a noise disturbance to nesting spotted owls would be implemented.

Critical Habitat

Small diameter thinning, riparian thinning, underburning, and meadow restoration would treat and maintain 165 acres of dispersal and 2 acres of roosting, foraging habitat within spotted owl CHU 10, subunit KLE-5. This represents 0.4% of the subunit. The District has determined the proposed maintenance within critical habitat would have an insignificant effect to spotted owls and is not likely to adversely affect critical habitat because

- canopy cover would be retained at or above 40% in dispersal and 60% in roosting/foraging habitat;
- decadent woody material in the treatment area, such as large snags and large, down wood, would remain post-treatment;
- patches of naturally regenerating trees would be retained and shrub layers would regenerate within a few years;
- no spotted owl nest trees would be removed;

- spotted owl surveys would be conducted in suitable habitat prior to harvest operations; and
- seasonal restrictions would be implemented within 0.25 mile of nesting owls.

Known Northern Spotted Owl Activity Centers

No vegetation treatments would occur within the 100-acre known spotted owl activity centers. If owls are found to be nesting, seasonal restrictions for noise disturbance would be in effect up to 0.25 mile from these activity centers during the nesting season.

Provincial Home Ranges

Within the seven, 1.2-mile provincial home ranges, harvest treatments would maintain the function of nesting, roosting, and foraging habitat. Meadow restoration burning would alter the lower tree layer in approximately 2 acres of nesting roosting, and foraging habitat within one owl home range, changing the habitat to the more simplified roosting, foraging habitat. Up to a total of 1 acre of dispersal habitat would be removed for temporary route construction within 3 home ranges.

Connectivity/Diversity Blocks

The actions proposed under all alternatives meet Medford District ROD/RMP requirements for retaining 25% late-successional forest in connectivity/diversity blocks. Within the connectivity/diversity block, thinning treatments proposed on 123 acres of stands greater than 80 years old would maintain the current stand ages. As a result, there would be no reduction in late-successional forest within the connectivity/diversity block.

Cumulative Effects

See also section 3.3.4.1, Effects of Alternative 1 on Northern Spotted Owl Habitat, Cumulative Effects.

3.3.4.3 Effects of Alternative 2 on Northern Spotted Owl Habitat

Direct and Indirect Effects

Northern Spotted Owl Habitat

In addition to the projects analyzed in section 3.3.4.2, Effects on Northern Spotted Owl Habitat Common to All Action Alternatives, the following timber harvest activities are proposed on 782 acres in Alternative 2: density management (507 acres), selection harvest (233 acres), and shelterwood retention (42 acres). Habitat assessments in the field identified approximately 370 of these acres were generally lacking more than one tree layer. These simplified stands do not currently offer suitable nesting structure for spotted owls. Treatments in these stands would open the overstory and encourage new tree growth, allowing for the development of additional tree layers and structure important for nesting habitat. Late-successional stands reserved from harvest at this time that contribute to meeting late-successional habitat requirements include 100-acre known northern spotted owl activity centers. Structurally complex RA32 stands, which are also late-successional forest, would be reserved from harvest at this time as well.

Alternative 2 meets Medford District ROD/RMP and Northwest Forest Plan requirements for management on matrix and riparian reserve lands, while also considering the Northern Spotted Owl Recovery Plan.

Density management on 121 acres of roosting/foraging and 386 acres of dispersal habitat would thin trees from below to maintain or enhance forest health, stand structure, and function for northern spotted owl habitat. After harvest, these stands would remain roosting/foraging or dispersal habitat because they would

retain at least 60% or 40% canopy cover, respectfully. If present, existing understory tree layers and existing snags and coarse woody debris would be retained.

Selection harvest would downgrade 21 acres of nesting/roosting/foraging and 22 acres of roosting/foraging habitat. Post-treatment, those acres would function as dispersal-only habitat. Spotted owls could no longer use these stands for nesting for 20 to 30 years until the canopy cover returns to above 60%. Without treatment in these stands, however, laminated root rot would continue to spread throughout Douglas-fir and true fir tree species, thus weakening them, killing them directly, or making them more susceptible to pine beetles and windthrow. Over time, the stand would have a tree species shift to more resistant species such as pine, cedar, and hardwood species, and spotted owls would be less likely to use the stand for nesting in the future. Selection harvest would treat and maintain 154 acres of dispersal, 7 acres of nesting/roosting/foraging, and 24 acres of roosting/foraging habitat. Selection harvest would also occur in 5 acres of capable habitat. This treatment would remove poor vigor trees from all diameter classes. Stand densities would be reduced and site resources (water, sunlight, nutrients, and growing space) would be available for the remaining trees. The stand structure would be multi-aged and multilayered.

Shelterwood retention harvest would temporarily remove 4 acres of nesting/roosting/foraging and 38 acres of roosting, foraging and habitat; it would become capable habitat. Regeneration harvest using shelterwood retention prescription guidelines would retain 12 to 25 green trees per acre greater than 20 inches DBH and provide protection for newly planted and natural seedlings in areas with growing-season frosts. The spatial distribution of trees would be more uniform. After harvest, canopy cover would be 20 to 30%. Spotted owls could no longer use these stands for nesting for up to 80 years until larger diameter trees (21 inches and greater) are present and the canopy cover returns to above 60%. These acres are outside of known owl home ranges and critical habitat and will be surveyed for owls to protocol. If spotted owls are located in new areas, the project will either be modified to avoid negatively affecting owls, or the BLM will reinitiate consultation with the US Fish and Wildlife Service.

Construction of 0.4 mile of temporary routes up to 30 feet wide would occur within the Project Area under Alternative 2. Temporary route construction would remove approximately 1 acre of dispersal habitat. Canopy cover would be removed within the footprint of the roads; however, the overall average canopy cover for the entire stands in which these routes would occur would be at least 40%.

Following proposed harvest, the amount of nesting/roosting/foraging and roosting/foraging habitat would decrease by 85 acres (2%) while dispersal habitat (42 acres or 1%) and capable habitat (43 acres or 1%) would increase by 85 acres in the entire Project Area (Figure 3-9). Spotted owls can still use the remaining nesting/roosting/foraging; roosting/foraging; and dispersal habitat for dispersing through the landscape. Spotted owls can disperse across a fragmented mosaic of nonforested areas and a variety of forest age classes (Forsman, et al. 2002).

Timber harvest proposed in Alternative 2 would likely adversely affect spotted owl habitat because 21 acres of nesting/roosting/foraging and 22 acres of roosting/foraging would be downgraded to dispersal habitat; 4 acres of nesting/roosting/foraging, 38 acres of roosting/foraging, and 1 acre of dispersal would be removed.

Prior to harvest, the BLM will conduct surveys following the 2011 NSO Survey Protocol (final revision in 2012) in all nesting/roosting/foraging and roosting/foraging habitat on Federal lands in the Project Area. If spotted owls are located in new areas, the project would be modified to avoid negatively affecting owls, or the BLM would reinitiate consultation with the US Fish and Wildlife Service.

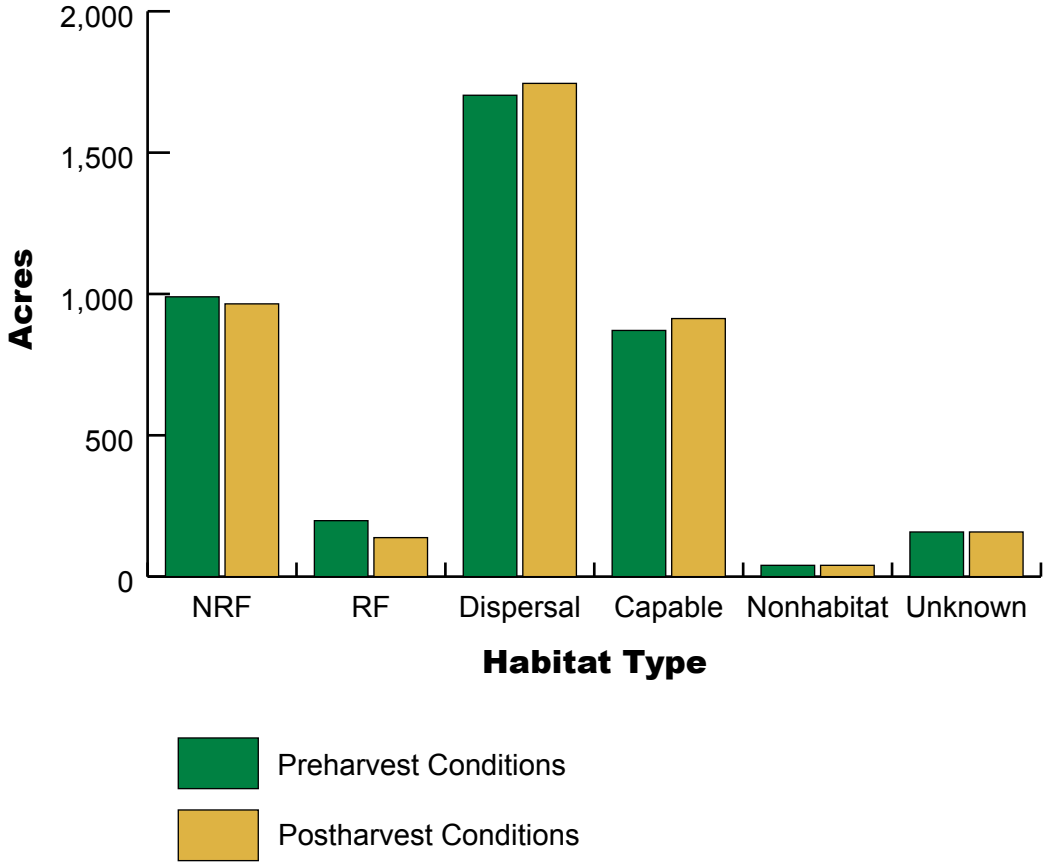


Figure 3-9. Change in northern spotted owl habitat on Federal land from actions proposed in Alternative 2.

Late-successional forest, RA32 habitat, and 100-acre known northern spotted owl activity centers would remain post-harvest, allowing opportunities for future dispersal and nesting. Expansion of the owl population, however, would be slowed in the 42 acres of shelterwood retention harvest for up to 80 years as suitable habitat begins to return. Within the 43 acres of nesting/roosting/foraging and roosting/foraging downgrade, nesting opportunities would return in 20 to 30 years as the canopy cover returns to over 60% and additional tree layers fill in the gaps.

Critical Habitat

Of the 692 acres of owl habitat that would be treated and maintained under Alternative 2, 573 acres are within northern spotted owl CHU 10, subunit KLE-5 (8 acres of nesting/roosting/foraging, 145 acres of roosting/foraging, and 420 acres of dispersal habitat). The BLM has determined the proposed projects that would maintain spotted owl habitat within critical habitat would have an insignificant effect to spotted owl critical habitat and would not adversely affect critical habitat because

- canopy cover within treated nesting/roosting/foraging, roosting/foraging, or dispersal stands would be retained at or above 60%, 60%, and 40%, respectively;
- decadent woody material, such as large snags and down wood, would remain post-treatment;
- multicanopy, uneven-aged tree structure that was present prior to treatment would remain post-treatment;
- no spotted owl nest trees would be removed; and
- all nesting/roosting/foraging and roosting/foraging habitat on Federal lands in the Project Area would be surveyed for spotted owls prior to stand treatments. If spotted owls are located in new

areas, the project will either be modified to avoid negatively affecting owls, or the BLM will reinitiate consultation with the US Fish and Wildlife Service.

According to the 2012 Final CHU rule (77 Federal Register 46:14062–14165), Section 7 consultations need to consider the temporal and spatial scale of impacts a proposed action may have on the primary constituent elements of critical habitat. The US Fish and Wildlife Service recommends using a scale that is relevant to the needs and biology of the spotted owl and believes the 500-acre core area scale is a reasonable metric for land managers to use as a screen when assessing effects on critical habitat. This 500-acre analysis approach was recommended in the critical habitat rule. To conduct this recommended analysis, the BLM delineated 500-acre (800-meter radius) circles around centroids of proposed treatment units that would remove or downgrade nesting/roosting/foraging habitat acres within critical habitat. These units represent the areas of critical habitat that would be most impacted by the proposed action and were used to determine potential localized effects to the critical habitat. Pre- and post-treatment nesting/roosting/foraging habitat amounts within the 500-acre analysis areas were compared to determine effects to the primary constituent elements and primary biological features of critical habitat.

Within spotted owl CHU 10, 21acres of nesting/roosting/foraging and 22 acres of roosting/foraging habitat would be downgraded to dispersal habitat. If present, existing understory tree layers and existing snags and coarse woody debris would be retained. Based on the 500-acre analyses, the BLM has determined the habitat downgrade associated with the Double Bowen project within critical habitat is likely to adversely affect spotted owl critical habitat because it would result in a lower canopy cover within two stands of trees to the extent that they would not function as potential nesting habitat for the short term, but would return to potential nesting habitat within 20 to 30 years as the canopy cover returns to above 60%. At the 500-acre scale, the impacts to proposed critical habitat primary constituent elements are detectable and adverse impacts would occur in the short term until the canopy cover returns to 60% or more. However, substantial habitat would be retained in CHU 10, subunit KLE-5 to maintain the intended north-south connectivity function of the subunit.

These acres of habitat downgrade in CHU would occur in stands where pockets of laminated root rot and mistletoe are spreading. Treatments that would control the spread of these diseases would have a short-term negative effect on potential nesting habitat by decreasing canopy cover to 40%, but a long-term benefit to stand health and resiliency by reducing stand loss from disease and retaining a species composition resistant to these diseases. Improving the stand's survivability by decreasing disease and resulting mortality would allow canopy cover to increase over time as disease-resistant conifer species reoccupy the stands.

Late-Successional Forest

Timber harvest proposed in Alternative 2 would reduce the amount of late-successional habitat by 42 acres in the Project Area. The Big Butte Creek watershed would retain 62% of the watershed in late-successional habitat after harvest, well over the 15% retention requirement. Most existing, coarse down wood and snags, except for those that are identified as safety hazards or are located in new temporary routes, would be maintained. Areas of closed canopy would remain in each section.

Cumulative Effects

See also section 3.3.4.1 Effects of Alternative 1 (No Action) on Wildlife, Cumulative Effects and section 3.3.4.2 Effects Common to All Action Alternatives.

The Project Area contains seven known northern spotted owl sites whose home ranges overlap proposed project units. Five of those known sites had a pair of spotted owls in the past 10 years, with one known site

having a pair in the past 5 years. Three known sites have had a single owl detected during surveys in the past five years. Each of the owl sites is a mixture of private and public lands. A combination of forest fires, severe windstorms, timber harvest on private and BLM lands, and detection of barred owls has occurred in these home ranges. The Double Bowen project would remove a total of 1 acre of dispersal habitat within four overlapping home ranges.

Cumulative effects to the current spotted owl population from implementing this project would be minimal. Late-successional forest, RA32 habitat, and 100-acre spotted owl activity centers would remain post-harvest, allowing opportunities for future dispersal and nesting. Expansion of the owl population, however, would be slowed in the 42 acres of shelterwood retention harvest for up to 80 years as suitable habitat begins to return. Within the 43 acres of nesting/roosting/foraging and roosting/foraging downgrade, nesting opportunities would return in 20 to 30 years as the canopy cover returns to over 60% and additional tree layers fill in the gaps.

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

Modeling of the relationship between northern spotted owl site extinction probability and proportion of habitat at the core scale indicates that decreasing amounts of old forest increases extinction rates for spotted owls, and when barred owls are detected in spotted owl core use areas the extinction rate is 2–3 times higher than it would be if barred owls were not detected. The relative effect of barred owls on extinction probability increases as the proportion of older forest habitat at the core area scale decreases (Dugger, Anthony, and Andrews 2011). Based on the modeling done by Dugger, et al. (2011), when there is 95% habitat within the core circle, the extinction probability for spotted owl sites is 0.11, increasing to 0.33 with barred owls present. At 50% habitat, the extinction probability is 0.17, increasing to 0.42 with barred owl. At 20%, it is 0.21, increasing to 0.5 with barred owls. This is likely because any reduction of real habitat increases the effect of the effective habitat loss disproportionately (real habitat reduction plus the effect of exclusion from habitat due to barred owl competition) .

Historic and future timber harvests cumulatively affect wildlife. The lands being analyzed for commercial harvest are matrix and riparian reserve allocations and all alternative proposals fall within the goals and guidelines of the Medford ROD/RMP and Northwest Forest Plan. The Northwest Forest Plan was designed to provide a network of reserves of late-successional forests surrounded by younger, managed forests. Harvest on matrix lands would continue.

Most existing coarse down wood and snags, except for those considered safety hazards or located in new temporary spur routes, would be maintained. Areas of closed canopy would remain in each section.

3.3.4.4 Effects of Alternative 3 on Northern Spotted Owl Habitat

Direct and Indirect Effects

Northern Spotted Owl Habitat

In addition to the projects analyzed in section 3.3.4.2, Effects on Northern Spotted Owl Habitat Common to All Action Alternatives, the following forest management activities are proposed on 782 acres: restoration thinning (638 acres) and selection harvest (144 acres). Habitat assessments in the field identified approximately 370 acres of the proposed treatment units as generally lacking more than one tree layer. These simplified stands do not currently offer suitable nesting structure for spotted owls. They currently function as either dispersal or roosting/foraging habitat. Treatments in these stands would open the overstory and encourage new tree growth, allowing for the development of additional tree layers and the structure important for nesting habitat. Late-successional stands reserved from harvest at this time that contribute to meeting late-successional habitat requirements include 100-acre known northern spotted owl activity centers. Structurally complex RA32 stands, which are also late-successional forest, would be reserved from harvest at this time as well.

Alternative 3 meets Medford District ROD/RMP and Northwest Forest Plan requirements for management on matrix and riparian reserve lands, while also considering the Northern Spotted Owl Recovery Plan. Restoration thinning on 595 acres would maintain existing habitat types on 5 acres of nesting/roosting/foraging, 164 acres of roosting/foraging, and 426 acres of dispersal habitat. Restoration thinning in nesting/roosting/foraging and roosting/foraging habitat stands would retain at least 60% canopy cover after harvest. Existing understory tree layers, snags, and coarse woody debris would be retained. These stands could still be used by spotted owls for roosting/foraging, nesting, or both. Restoration thinning in dispersal habitat would leave at least 40% canopy cover after harvest and would retain the characteristics that allow owls to disperse through them. Restoration thinning units would have skips (areas of no harvest) around unique features such as patches of hardwoods, snags, saplings, or large coarse wood, and would strive to retain trees 150 years old and greater (Figure 3-10). Maintaining stand diversity through the retention of skips and older trees would provide habitat features important to the spotted owl's prey base while also providing for future nesting opportunities. Restoration thinning on 43 acres would downgrade 21 acres (2%) of nesting/roosting/foraging and 22 acres (11%) of roosting/foraging habitat under Alternative 3. The overall canopy cover in the stand would range from at least 40% to less than 60% following treatment and would then be classified as dispersal habitat. These acres are outside of known owl home ranges and would be surveyed for owls to protocol before harvest. If spotted owls are located in new areas, the project will either be modified to avoid negatively affecting owls, or the BLM will reinitiate consultation with the US Fish and Wildlife Service.

Figure 3-10. Stand containing one tree layer in Project Area with potential skip location (snag) for restoration thinning. Photo by David Roelofs

Selection harvest on 144 acres would maintain existing habitat types on 7 acres of nesting/roosting/foraging, 18 acres of roosting/foraging, 114 acres of dispersal, and 5

acres of capable habitat. Canopy cover of at least 40% in dispersal and 60% in nesting/roosting/foraging and roosting/foraging habitat would be retained. This treatment would remove poor vigor trees from all diameter classes, which would preserve the multiaged and multilayered stand structure after harvest. Stand densities would be reduced and there would be less competition among the remaining trees for the available site resources (water, sunlight, nutrients, and growing space). In the long term, selection harvest in these stands would benefit owls by allowing the remaining trees to grow larger at a faster rate, including creating larger canopies important for nesting structure and prey species.

Prior to harvest, the BLM would conduct surveys following the 2011 NSO Survey Protocol (final revision in 2012) in all nesting/roosting/foraging and roosting/foraging habitat on Federal lands in the Project Area. If spotted owls are located in new areas, the project will either be modified to avoid negatively affecting owls, or the BLM will reinitiate consultation with the US Fish and Wildlife Service. Following proposed harvest, the amount of nesting/roosting/foraging and roosting/foraging habitat in the Project Area would decrease by 1% with an increase in dispersal habitat of 1% (Figure 3-11). Spotted owls can still use the remaining nesting/roosting/foraging, roosting/foraging, and dispersal habitat for dispersing through the landscape. Spotted owls can disperse across a fragmented mosaic of nonforested areas and a variety of forest age classes (Forsman, et al. 2002). Temporary route construction would occur within the Project Area under Alternative 3. Within the footprint of the roads, the canopy cover would be removed. This project proposes construction of 0.4 mile of temporary route up to 30 feet wide. Temporary route construction would remove approximately 0.5 acre of nesting/roosting/foraging and 1 acre of dispersal habitat. The overall average canopy cover for the entire stands in which these roads would occur would be at least 60% in nesting/roosting/foraging and 40% in dispersal habitat. The footprint of the route where trees would be removed would be up to 30 feet

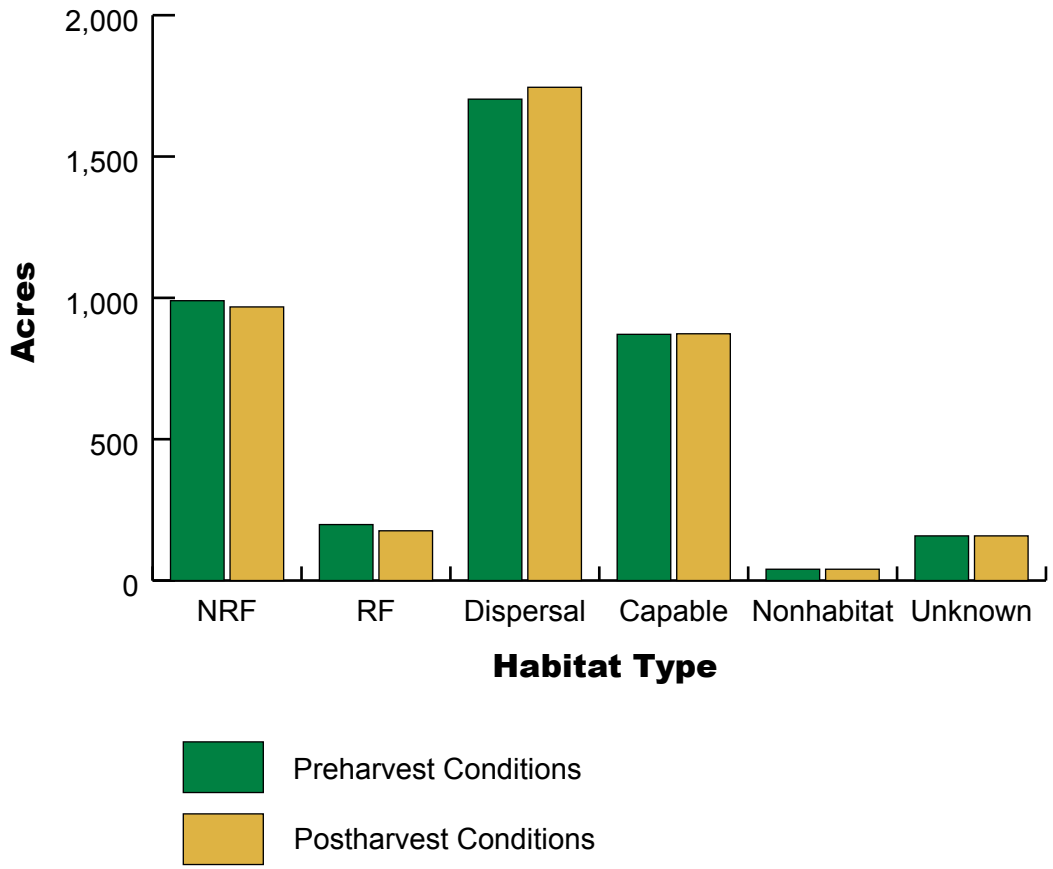


Figure 3-11. Change in northern spotted owl habitat on Federal land from actions proposed in Alternative 3.

wide, but owls could continue to disperse across these areas and the overall function of the stands would still function as nesting/roosting/foraging or dispersal habitat.

Critical Habitat

Of the 734 acres of owl habitat that would be treated and maintained under Alternative 3, 573 acres are within northern spotted owl CHU 10, subunit KLE-5 (8 acres of nesting/roosting/foraging, 145 acres of roosting/foraging, and 420 acres of dispersal habitat). The BLM has determined the proposed maintenance of northern spotted owl habitat within critical habitat would not adversely affect critical habitat because

- canopy cover within treated nesting/roosting/foraging, roosting/foraging, or dispersal stands would be retained at or above 60% for nesting/roosting/foraging and roosting/foraging habitat and 40% for dispersal habitat;
- decadent woody material, such as large snags and down wood, would remain post-treatment;
- multicanopy, uneven-aged tree structure that was present prior to treatment would remain post-treatment;
- no spotted owl nest trees would be removed; and
- all nesting/roosting/foraging and roosting/foraging habitat on Federal lands in the Project Area would be surveyed for spotted owls prior to stand treatments. If spotted owls are located in new areas, the project will either be modified to avoid negatively affecting owls, or the BLM will reinitiate consultation with the USFWS.

According to the 2012 Final CHU rule (77 Federal Register 46:14062–14165), Section 7 consultations need to consider the temporal and spatial scale of impacts a proposed action may have on the primary constituent elements. The USFWS recommends using a scale that is relevant to the needs and biology of the spotted owl and believes the 500-acre core area scale is a reasonable metric for land managers to use as a screen when assessing effects on critical habitat. This 500-acre analysis approach was recommended in the proposed critical habitat rule. To conduct this recommended analysis, the BLM delineated 500-acre (800-meter radius) circles around centroids of proposed treatment units that would remove or downgrade nesting/roosting/foraging habitat acres within critical habitat. These units represent the areas of critical habitat that would be most impacted by the proposed action and were used to determine potential localized effects to the critical habitat. Pre- and post-treatment nesting/roosting/foraging habitat amounts within the 500-acre analysis areas were compared to determine effects to primary constituent elements and primary biological features of critical habitat.

The 21acres of nesting/roosting/foraging and 22 acres of roosting/foraging habitat that would be downgraded to dispersal by restoration thinning are within spotted owl CHU 10. Based on the 500-acre analyses, the BLM has determined the habitat downgrade associated with the Double Bowen project within critical habitat would adversely affect spotted owl critical habitat because it would result in a lower canopy cover within two stands of trees to the extent that they would no longer function as potential nesting habitat for the short term. At the 500-acre scale, the impacts to proposed critical habitat primary constituent elements are detectable and adverse impacts would occur in the short term until the canopy cover returns to levels of 60% and higher. Substantial habitat would be retained in the subunit to maintain the intended north-south connectivity function of the KLE-5 subunit, however.

The habitat downgrade in CHU would occur in pockets where laminated root rot and mistletoe are spreading. Treatments that would control the spread of these diseases would result in a short-term impact

on potential nesting habitat. Restoration thinning units would leave skips around unique features such as patches of hardwoods, snags, saplings, or large coarse wood, and would retain trees 150 years old and greater.

Late-Successional Forest

Temporary route construction proposed in Alternative 3 would reduce the amount of late-successional habitat in the Project Area by 2 acres. The watershed would retain 62% after harvest, well over the 15% retention requirement in the ROD/RMP (p. 47).

Cumulative Effects

See also section 3.3.4.1 Effects of Alternative 1 (No Action) on Wildlife, Cumulative Effects and section 3.3.4.2 Effects Common to All Action Alternatives.

Cumulative effects to the current spotted owl population from implementing this project would be minimal. Late-successional forest, RA32 habitat, and 100-acre spotted owl activity centers would remain post-harvest, allowing opportunities for future dispersal and nesting. Within the 43 acres of nesting/roosting/foraging and roosting/foraging downgrade, nesting opportunities would return in 20 to 30 years as the canopy cover returns to over 60% and additional tree layers fill in the gaps.

Historic and future timber harvests cumulatively affect wildlife. The lands being analyzed for commercial harvest are matrix and riparian reserve allocations and all alternative proposals fall within the goals and guidelines of the Medford ROD/RMP and Northwest Forest Plan. The Northwest Forest Plan was designed to provide a network of reserves of late-successional forests surrounded by younger, managed forests. Harvest on matrix lands would continue.

Most coarse down wood and snags, except for those considered safety hazards or located in new temporary spur routes, would be maintained. Areas of closed canopy would remain in each section.

3.4 Economics

ISSUE: *How can the BLM provide an economical timber sale while maintaining healthy, diverse, and productive ecosystems?*

This section analyzes the potential impacts from the proposed forest management activities on economics. Terms used in this section are defined as follows:

bone dry ton. Wood pulp or residue that weighs 2,000 pounds at 0% moisture content.

pond value. The amount a mill will pay for a log delivered to the mill location.

stocking. Related to the number and spacing of trees in a forest stand.

3.4.1 Methodology

Economics focuses on the ROD/RMP objective of providing a sustainable supply of forest commodities from matrix lands to provide jobs and contribute to community stability (Bureau of Land Management 1995a, 38). In addition to commodity supply, evaluation of the economic feasibility of management actions is a consideration in project design (Bureau of Land Management 1995a, 179–180).

Economic values that are assessed include total commodity output (wood fiber harvested), total dollar return to the Federal Treasury, and dollar value per unit of output. Units of output are measured as MBF

(thousand board feet) of harvest for sawlog material and BDT (bone dry ton) for forest biomass that is used. The values used per MBF of harvest are based on March 2014 prices for Douglas-fir ($574 per MBF). Level of commodity output provides the basis for assessing commodity supply, resultant employment levels, and estimates of net revenue and revenue per unit of output to the Federal Treasury. Positive net revenue serves as an indicator of economic feasibility and revenue per unit of output indicates the level of economic efficiency.

The economic effects of noncommodity-based activities are only assessed where there is a correlation to commodity supply. Management actions, such as habitat improvement or fuel hazard reduction, have economic effects; however, the primary focus of these actions is not for inputs to the economy but to provide for resource enhancement. As a result, the economic effects of these actions are recognized but are not a primary decision factor in considering implementation of an action alternative.

3.4.2 Assumptions

- Affected employment levels per MMBF (million board feet) processed is 9.07 jobs in the solid wood products industry (Forest Service and Bureau of Land Management 1994a, 3&4-293).
- Economic values are static and intended to provide for a relative comparison among alternatives.
- Average harvest levels are from historical yields of treatments in the Butte Falls Resource Area similar to those proposed in the Double Bowen Project Area. Assumed harvest levels range from 15 MBF per acre, for more intensive regeneration harvest prescriptions, to 5 MBF per acre for lower volume harvest areas such as riparian thinning, density management, and commercial thinning prescriptions.
- The estimated return to the Federal Treasury is based on current pond values excluding estimated logging costs. Logging costs are based on average yarding distances as well as average road renovation, and temporary route construction and reconstruction costs for each alternative.
- Volumes used in this analysis are estimates and actual average volume from the proposed action alternatives is estimated to range from 5 to 10 MMBF.

3.4.3 Affected Environment

A regional perspective of the economic setting is provided in the Northwest Forest Plan (Forest Service and Bureau of Land Management 1994a, 3&4 261–319). One primary variation from the economic setting regarding commodity production from Federal lands is that actual timber harvest levels have lagged behind levels projected in the Northwest Forest Plan (Bureau of Land Management 2005, 36). During the first 10 years of Northwest Forest Plan implementation (1995–2004), the total BLM timber volume offered for the Medford District averaged 77% of the planned 571 MMBF levels. Between the years 2005 and 2013, the Medford District BLM has offered 44% of the target harvest level of 513 MMBF. The overall reduction in timber harvest across all ownerships in the region has resulted in a demand for logs in western Oregon that is being filled with log imports (Bureau of Land Management 2005, 35).

Historical and current uses of the Double Bowen Project Area are described in Section 3.1.3, Project Area Background. Over the past 70 years, an estimated 90% of BLM-administered lands in the Double Bowen Project Area have had some level of harvest activity. With implementation of the ROD/RMP in 1995, approximately 2,486 acres are currently designated as lands allocated for timber production (matrix), including 551 acres in a connectivity/diversity block.

Merchantable timber on matrix land is highly dispersed and the stocking levels of merchantable-size trees are variable. Individual tracts of BLM ownership within the Double Bowen Project Area are fragmented by a mixed ownership pattern with private lands. Individual BLM tracts range from 40 acres up to 640 acres

in size. Matrix lands within each tract are further fragmented by varying land use allocations under the ROD/RMP. This, in conjunction with past harvest treatments on these lands, has resulted in the existing stages of development with respect to potential timber supply. Stages of development by general age and merchantability class on BLM land within the Project Area are summarized in Figure 3-12.

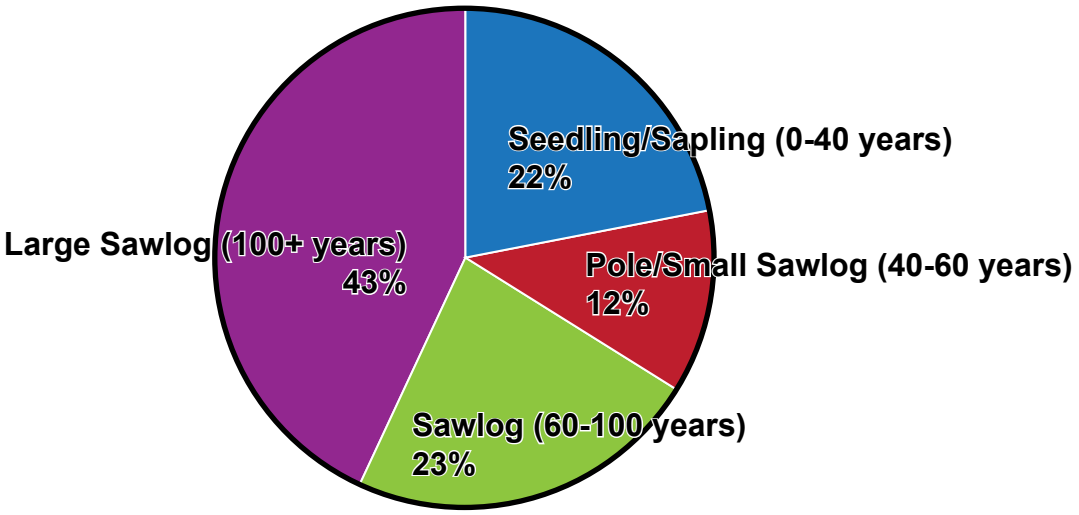


Figure 3-12. Distribution of matrix land by potential timber supply stage of development.

Figure 3-12 shows a fairly regulated condition with respect to commodity supply. Approximately 34% of the matrix land base exists in a precommercial (seedling/sapling) and developing commercial (pole/small sawlog) condition. Assuming no disturbance occurs, the larger size classes would be expected to increase in representation over time with younger stands becoming less prevalent on the land base. Treatment under existing management direction would tend to accelerate growth to the next development stage through thinning of the younger size classes. The seedling-to-pole size class would be maintained through regeneration of the large sawlog component.

Economic factors that affect supplying forest commodities in an economically feasible manner are the amount and distribution of material available for harvest, method of harvest, access to harvest areas, and associated costs to mitigate the effects of harvest such as slash treatment. These factors considered individually or collectively have an effect on the economic feasibility (positive net revenue) and economic efficiency (revenue per unit of harvest) of harvest proposals. The amount and distribution of commercial forest products existing on matrix lands is interrelated with access and method of harvest. Harvest of timber stands with a relatively higher harvest volume per acre in a concentrated area would result in lower access and removal costs compared to stands with relatively lower harvest volumes located in a more dispersed pattern.

Common methods of harvest (yarding trees from stump to truck) are primary factors affecting actual harvest costs. Tractor yarding is the least-cost method of removal with typical logging costs around $100/MBF, with cable yarding incurring a higher removal cost at around $200/MBF, and helicopter yarding the most costly removal method at approximately $400/MBF. Appropriate harvest methods vary and are generally based on management objectives in conjunction with site conditions such as access, topography, and available harvest volume. Where lower cost harvest methods can be used, economic efficiency is increased. Economic feasibility is affected when relatively lower harvest volumes or values are associated with higher cost yarding methods.

Tractor yarding is proposed on 819 acres in the Double Bowen project. Important factors to consider in determining economic feasibility of ground-based yarding systems (tractor, skidder) are the maximum

yarding distance and the average yarding distance to the landing. Maximum yarding distance varies by the type of ground-based equipment used. Typical logging operations in this area would use either crawler tractors or rubber-tired skidders. The maximum yarding distances are 700 feet for tractors and 1,000 feet for skidders (Washington State University Extension 1999, 8). Optimum average yarding distance is in the 500- to 700-foot range for this equipment. Slope is a limiting factor for tractor yarding in Double Bowen. Tractor yarding is limited to slopes generally less 35%. Felling costs would be minimized in all alternatives by using mechanized felling equipment in tractor yarding units.

Skyline-cable yarding is proposed on 53 acres of the steeper-sloped units within the Project Area. Strategically located existing roads or new routes, generally at the top of units, are necessary in order to feasibly harvest units using skyline-cable yarding systems. Optimum yarding distance for skyline-cable yarding systems is 1,000 feet with a maximum yarding distance capability of 4,000 feet. Harvest volume per acre, size of harvest trees, and move-in and move-out costs are other important factors that contribute to an economically feasible skyline-cable yarding operation. Limited road access and topographic features such as convex slopes, uneven terrain, and long, constant slopes can present difficulties for skyline-cable yarding systems. Where these difficulties cannot be engineered around or where environmental issues limit road construction or ground disturbance, then helicopter yarding can be considered if economically feasible. Helicopter yarding is not proposed in the Double Bowen project because of good road access to proposed harvest units.

Access to harvest areas is a factor with respect to the number of road systems needed and the condition of those roads. Cost factors include the level of road improvement needed for hauling material, road surface condition with respect to the length of the operating season, use restrictions during wet conditions, and move-in and move-out costs of equipment where multiple road systems are used for access. Economic feasibility and efficiency is reduced where road improvement costs and the number of road miles or road systems needed for harvest access increase.

Mitigation of harvest effects includes costs such as ripping compacted soils, decommissioning or closing roads, treating harvest slash, and operating under seasonal restrictions. The cost and level of mitigation needed is situation dependent.

3.4.4 Environmental Consequences

3.4.4.1 Effects of Alternative 1 (No Action) on Economics

Direct and Indirect Effects

Under the No Action Alternative, proposed management actions would be deferred. There would be no timber volume from the Project Area in fiscal year 2014 to contribute toward the Medford District's annual allowable sale quantity and there would be no return to the Federal Treasury. Under this alternative, timber harvest would not provide any forestry-related jobs. This would include jobs directly related to the timber harvest such as timber fallers, logging crews, log truck drivers, road crews, and sawmill employees.

The small diameter thinning project would not provide additional timber volume or special forest products, resulting in both direct and indirect loss of jobs. Forestry-related jobs for both commercial and noncommercial thinning would not be provided.

Indirectly, fire suppression costs would be higher because fuel loads on planned timber harvest and small diameter thinning units would not be reduced. Also, water source restoration would not occur, which would limit access and water availability if a fire occurred in the Project Area. No action would cause the potential

for increased fire suppression costs because of higher severity fires, limited safe access to areas, and reduced water availability.

Cumulative Effects

Under the No Action Alternative, there would be no contribution to the Medford District's Allowable Sale Quantity for fiscal year 2014. Given the management direction to produce a sustainable supply of timber from matrix lands, the supply and resulting economic effects would fall short of projected levels for fiscal year 2014. Opportunities for future timber harvest in the short- and long-term would remain unchanged in the Big Butte Creek fifth-field watershed. With no action, there would be a lost opportunity in maximizing growth potential in mature stands (100 years and older) and in younger stands where densities are high.

There are no known future actions within the Project Area in the next 5 years. However, there are forest management activities ongoing and proposed within the Big Butte Creek fifth-field watershed. Friese Camp and Middle Friese are active timber sales within the watershed. Friese Camp timber sale has harvested approximately 261 acres of the 576 acres on the contract. The remaining 315 acres are expected to be completed in 2014. The Middle Friese timber sale consists of approximately 343 acres within the Big Butte Creek watershed and is expected to be completed in 2014. A total of 7.0 MMBF will be harvested from both sales by 2014 with a return to the Federal Treasury of $2.0 million. Direct employment as a result of timber harvest and processing a commodity would result in approximately 63 full-time equivalent jobs.

Three timber sales are planned within the Big Butte Creek watershed in 2015 and 2016. Clark's Dog and Eighty Acre Creek timber sales, planned for 2015, include approximately 2,000 acres of timber harvest and are expected to produce approximately 12 MMBF. Flounce Back timber sale, planned for 2016, would include approximately 60 acres of timber harvest within the Big Butte Creek watershed.

The BLM's Ranch Stew/Ranch Stew II stewardship contract is currently active. The Ranch Stew project has thinned 1,739 acres of young stands (averaging 50–60 years old), and has an additional 100 acres of 40 to 50-year-old stands proposed for thinning.

3.4.4.2 Effects of Alternative 2 on Economics

Direct and Indirect Effects

Under Alternative 2, approximately 7.0 MMBF would be harvested on 796 acres resulting in an estimated harvest of 8.0 MBF per acre. The economic factor that varies by alternative and influences logging costs is volume harvested per acre and yarding system. Volume harvested per acre is a critical consideration in determining feasibility of yarding systems. All action alternatives consider ground-based and skyline-cable yarding systems with no difference in acres per alternative. Alternative 2 has the estimated maximum harvest volume per acre of the two action alternatives. Direct employment as a result of timber harvest and processing a commodity would result in approximately 63 full-time equivalent jobs. The estimated return to the Federal Treasury for timber harvest would be $361 per MBF for a total value of approximately $2.5 million for this alternative.

Small diameter thinning on 76 acres would remove an estimated 0.2 MMBF. The estimated employment resulting from the thinning and possible biomass utilization would be equivalent to 2 jobs.

Indirectly, fire suppression costs would be lower due to the reduced fuel loads on 830 acres of selection harvest, density management, riparian thinning, and small diameter thinning, along with the associated activity fuels treatment. Fire suppression costs would also be reduced in the 21 acres of meadow restoration.

Regeneration harvest of 42 acres is not expected to reduce fuel loads in the short term. Water source restoration would aid in reducing fire suppression costs by supplying firefighters with better access to larger quantities of water.

Cumulative Effects

Alternative 2 would meet ROD/RMP requirements direction to provide for harvest activity on timber stands available for harvest in the Project Area. This would maximize harvest volume and net revenue to the Federal Treasury from commercial stands, and improve future timber supply potential in developing stands through thinning treatments. Harvest would contribute 7.0 MMBF to the Medford District's Allowable Sale Quantity of 46 MMBF for fiscal year 2014.

Future timber supply from the 42 acres of proposed shelterwood harvest would consist of an entry in the next 15 to 30 years. Overstory trees greater than 20 inches DBH in excess of 6 to 8 trees per acre may be removed if the planted understory conifer trees are no longer susceptible to damage caused by late, growing season frosts. Otherwise, merchantable timber supply would not be provided again from this regeneration treatment until an initial commercial thinning treatment in 40 to 60 years. The 233 acres of selection harvest, 507 acres of density management, and 76 acres of small diameter thinning could be available for harvest again in 10 to 20 years. In the long-term, volume growth capability would be maximized on areas treated.

There are no known future actions within the Project Area in the next 5 years; however, forest management activities are ongoing and proposed within the Big Butte Creek fifth-field watershed. Friese Camp and Middle Friese are active timber sales within the watershed. Friese Camp timber sale has harvested 261 acres of the 576 acres on the contract. The remaining 315 acres are expected to be completed in 2014. The Middle Friese timber sale consists of 343 acres within the Big Butte Creek watershed and is expected to be completed in 2014. Approximately 7.0 MMBF will be harvested from both sales by 2014 with a return to the Federal Treasury of $2.0 million. Direct employment as a result of timber harvest and processing a commodity would result in approximately 63 full-time equivalent jobs.

Three timber sales are planned within the Big Butte Creek watershed in 2015 and 2016. Clark's Dog and Eighty Acre Creek, planned for 2015, include approximately 2,000 acres of timber harvest and are expected to produce approximately 12 MMBF. Flounce Back timber sale is planned for 2016 and approximately 60 acres of timber harvest would occur within the Big Butte Creek watershed.

The BLM's Ranch Stew/Ranch Stew II stewardship contract is currently active. The Ranch Stew project has thinned 1,739 acres of young stands (averaging 50–60 years old), and has an additional 100 acres of 40 to 50-year-old stands proposed for thinning.

3.4.4.3 Effects of Alternative 3 on Economics

Direct and Indirect Effects

Under Alternative 3, approximately 6.4 MMBF would be harvested on 796 acres resulting in an estimated harvest of 7.3 MBF per acre. Direct employment as a result of timber harvest and processing a commodity would result in approximately 58 full-time equivalent jobs. The estimated return to the Federal Treasury for timber harvest would be $350 per MBF for a total value of approximately $2.2 million for this alternative.

For this analysis, the same pond value was used to compare all alternatives. Pond value is influenced by the size and grade (quality) of the logs. In Alternative 3, restoration thinning treatments would strive to retain trees more than 150 years old. Typically, these older larger trees are of greater value because they would

have a greater percentage of higher grade wood than the smaller, younger trees. The economic value of this higher-valued wood would not be recovered in this alternative. This is likely to reduce the pond value of this alternative and lower the estimated return to the Federal Treasury.

Small diameter thinning on 76 acres would remove an additional estimated 0.2 MMBF. The estimated employment resulting from the combined thinning and possible biomass utilization would be equivalent to 2 jobs.

Indirectly, fire suppression costs would be lower due to reduced fuel loads on 872 acres of restoration thinning, selection harvest, riparian thinning, and small diameter thinning along with associated activity fuels treatment. Fire suppression costs would also be reduced in 21 acres of meadow restoration. Water source restoration would aid in reducing fire suppression costs by supplying firefighters with better access to more sources of water.

Cumulative Effects

Alternative 3 would contribute an estimated 6.7 MMBF to the Medford District's Allowable Sale Quantity of 64 MMBF for fiscal year 2014.

Future timber supply from the 858 acres of restoration thinning, selection harvest, and small diameter thinning proposed in this project could be available for harvest again in 10 to 20 years. In the long-term, volume growth capability would not be maximized but would be increased on the areas treated.

There are no known future actions within the Project Area in the next 5 years; however, forest management activities are ongoing and proposed within the Big Butte Creek fifth-field watershed. Friese Camp and Middle Friese are active timber sales within the watershed. Friese Camp timber sale has harvested 261 acres of the 576 acres on the contract. The remaining 315 acres are expected to be completed in 2014. The Middle Friese timber consists of approximately 343 acres within the Big Butte Creek watershed and is expected to be completed in 2014. A total of 7.0 MMBF will be harvested from both sales by 2014 with a return to the Federal Treasury of $2.0 million. Direct employment as a result of timber harvest and processing a commodity would result in approximately 63 full-time equivalent jobs.

There are three timber sales planned within the Big Butte Creek watershed in 2015 and 2016. Clark's Dog and Eighty Acre Creek are planned for 2015 and include approximately 2,000 acres of timber harvest and are expected to produce approximately 12 MMBF. Flounce Back timber sale, planned for 2016, would harvest approximately 60 acres of timber within the Big Butte Creek watershed.

3.5 Summary of Effects on Other Resources

The following resources did not pertain to the issues identified and analyzed in the EA. A summary of the effects on these resources is included below.

3.5.1 Botanical Resources

See Appendix G for more information on Botanical Resources.

3.5.1.1 Special Status and Survey and Manage Plants and Fungi

Approximately half of the Double Bowen project is within the range of one Threatened and Endangered (T&E) plant, Gentner's fritillary (*Fritillaria gentneri*). In accordance with the protocol in the programmatic consultation (Bureau of Land Management 2013, 62–63) (U.S. Fish and Wildlife Service 2014), surveys were conducted in suitable habitat and no sites were discovered. Because actions proposed in Alternatives 2 and 3 would not impact T&E plants, they would be a no effect ESA determination for plants.

Surveys for Special Status and Survey and Manage (S&M) vascular and nonvascular plants were completed in all proposed project areas. Two Sensitive vascular plants (2 sites) were discovered, one in a timber harvest unit and one in the meadow restoration area. One of the vascular plants is also a category C S&M species. One S&M category B lichen (1 site) was also discovered in a timber harvest unit. These sites would be buffered to prevent direct or indirect impacts to plants. Therefore, the actions proposed in Alternatives 2 and 3 would not trend Bureau Sensitive plant species toward listing or prevent the persistence of S&M plant species.

Equivalent Effort surveys for category B S&M fungi are being conducted in project units 180 years and older. Surveys meet the December 2003 species list. Although predisturbance surveys are not required for Sensitive fungi species (Forest Service and Bureau of Land Management 2001, S&G 64–65), sites were documented when encountered during the Equivalent Effort surveys. Two additional surveys will be completed in fall 2014 and spring 2015 to meet the two year Equivalent Effort survey protocol. Surveys have documented two S&M fungi (3 sites). Surveys will be completed in early summer 2015. S&M and Sensitive Fungi sites would be managed to maintain population persistence in accordance with the S&M category requirements and management recommendations.

Habitat for Bureau Sensitive and S&M fungi also exists in stands less than 180 years old. If populations occur in those stands, they could be impacted by the actions proposed in Alternatives 2 and 3. Regeneration harvest, proposed on 42 acres in Alternative 2, would have the greatest impact on fungi because it would remove more trees that provide nutrients to fungi through mycorrhizae connections with tree roots. It would also reduce canopy cover to 10 to 40%, resulting in changes in environmental conditions that would indirectly impact fungi. However, the areas proposed for timber harvest are on matrix lands, which are available for timber production. It is anticipated that protecting known and future found sites of Sensitive and S&M fungi, conducting equivalent effort surveys in old growth stands to locate additional populations, and protecting habitat and sites in a system of reserves (riparian, late-successional, and other special management areas), would prevent Sensitive fungi from trending toward listing (Bureau of Land Management 2004, 5–2) and ensure the persistence of S&M fungi species.

3.5.1.2 Noxious Weeds

Three category B noxious weeds (Oregon Department of Agriculture 2013, 4) have been documented in the Project Area during surveys or from incidental sightings. The actions proposed in Alternatives 2 and 3 could potentially introduce or spread noxious weeds during implementation, although it is not possible to quantify

with any degree of confidence that amount or to distinguish it from the background risk of introduction from ongoing activities in the Project Area. However, because the BLM has an ongoing program of noxious weed treatments, applies project design features during project implementation, and conducts post-project monitoring, the risk is reduced that the proposed activities in the action alternatives would contribute additional cumulative effects to noxious weeds. Ongoing effectiveness of weed treatments in the Project Area are dependent on continued funding and available staff.

3.5.2 Soil

See Appendix D for more information on Soils.

The Double Bowen Project Area contains the Hukill, McMullin-Rock outcrop, Pinehurst, Farva, Freezener, and Geppert soils. The Double Bowen Forest Management Project would affect soils in the Project Area; however, the implementation of project design features would minimize soil impacts to within acceptable limits.

Both action alternatives would have 819 acres of ground-based yarding and 53 acres of skyline-cable yarding. Road work and temporary route construction, reconstruction, and renovation are also the same in both action alternatives. Therefore, the effects to soils are expected to be the same in both action alternatives.

3.5.2.1 Soil Compaction

Most of the Project Area is on stable ground with less than 35% slopes, which warrants ground-based yarding. Ground-based yarding has the potential to result in a high amount of area with soil compaction. Project design features that focus on limiting soil compaction in ground-based units would keep the effects on soil productivity (compaction) within the acceptable limit (12% of the area), as identified in the Medford ROD/RMP (p. 166).

In both action alternatives, 0.4 mile of temporary route construction would occur. In general, for every 1 mile of route constructed, 4 acres of land would be cleared and compacted. Therefore, a total of 1.6 acres would be compacted. Project design features would require mechanical decompaction after use. This would not fully return soil to its natural state and productivity levels but it would expedite the natural recovery time frame.

The temporary route proposed for reconstruction (0.2 mile) was previously mechanically decompacted. By using the route, impacts would be localized to an already disturbed area. The route would be decompacted after use. Recovery would be expected to be the same as the new temporary route construction.

The temporary route renovation would use 0.3 mile of an existing, overgrown jeep road. The compaction is already present; although, it is in the process of naturally recovering and vegetation is growing in the road bed. Route renovation would probably be slightly wider than the current tread in a few places.

3.5.2.2 Soil Erosion

Soil erosion from ground-based yarding is not expected to be a concern in the Project Area because yarding would mainly occur on gentle slopes. Where soil erosion does occur, it would be localized to skid trails and would not be displaced any distance because of the gentle slope, soil erodibility, and the adjacent undisturbed soils. The duff organic horizon and vegetation would catch displaced soil particles. Project design features would limit the amount of soil erosion and, if it is occurring, limit the distance soil particles would be displaced.

Route construction, reconstruction, and renovation have the potential to cause soil erosion. The ground would be disturbed and the soil would be compacted. The removal of topsoil exposes bare soil that may be easier to erode. The gentle topography of the area, the nature of the soil in these locations, and implementation of project design features would minimize the potential for soil erosion.

3.5.3 Water Resources

See Appendix E for more information on Water Resources.

3.5.3.1 Water Quantity—Peak Flows

Peak flow increases are not expected as a result of the Double Bowen project because none of the treatments would result in canopy cover below the range of natural variability within the transient snow zone. In addition, the Lower South Fork Big Butte Creek subwatershed has a low susceptibility of peak flow enhancement due to flat topography, low-energy streams, and low stream density.

In Alternative 2, timber harvest on 42 acres would result in canopy cover below the range of natural variability; none of those acres are within the transient snow zone. Because no proposed timber harvest would result in crown closure below the range of natural variability within the transient snow zone and because of the low susceptibility of the Lower South Fork Big Butte Creek subwatershed to peak flow enhancement, there would be a low risk for increased frequency and magnitude of peak flows resulting from rain-on-snow events in the Project Area.

3.5.3.2 Water Quality—Stream Temperature and Sediment

Stream temperatures would not be affected during riparian thinning because no shade would be removed in the primary shade zone on perennial streams.

Using existing and designated skid trails during ground-based yarding would minimize the area of soil disturbance. Implementation of project design features, the distance of skid trails to stream channels through riparian reserves, and the relative gentle topography of these units would minimize sediment transport and maintain water quality.

3.5.4 Fisheries

See Appendix I for more information on Fisheries and Aquatic Habitat.

Proposed activities that would be hydrologically connected to the stream network include riparian thinning, timber hauling, and associated road activities. In the short term (one to five years), there would likely be small inputs of sediment at channel crossings in the Double Bowen Project Area resulting from these actions. Direct inputs of fine sediment resulting from riparian thinning, timber hauling, and road activities would be of insufficient magnitude to meaningfully affect fish or fish habitat and would not be detectable above background levels. Project design features (EA, section 2.4, Project Design Features), site conditions, and the spatial separation of the management activities and most road work from SONCC (Southern Oregon/Northern California Coast) Coho Salmon or critical habitat, make it unlikely that SONCC Coho or Coho critical habitat will be exposed to measurable quantities of sediment. Over the long term, road renovation would improve drainage and reduce road-related sediment inputs.

Upland work, including timber harvest and follow-up activity slash treatments, would have no effect on fine sediment levels due to the filtering action of riparian reserve buffers and implementation of project design features designed to prevent overland sediment movement (EA, sections 2.4.1–2.4.7) and best management

practices contained in the ROD/RMP. Stream temperatures would not be affected as no riparian vegetation in the primary shade zone adjacent to perennial streams would be removed.

Future private timber harvest and land development are expected to continue at existing trends and rates in fine sediment production within the Project Area. The Double Bowen Project would, in the short term, contribute a small amount of sediment to stream channels within the Project Area, in addition to the sediment contributed annually from all other sources. In summary, no measurable changes in the aquatic habitat conditions are anticipated to result from implementation of this proposed project and, as such, there would not be a cumulative effect to aquatic habitats.

3.5.5 Fire and Fuels

The BLM would conduct a fuels assessment within each unit following harvest activity. This assessment would determine the fuel hazard and fire risk based on surface fuel loading, aspect, slope, access, and location of each unit. The fuel management specialist may modify the fuels treatments to meet the objective of fuel hazard reduction. The majority of fuels treatments would begin within 90 days after completion of harvest activities. Prescribed fire treatments may take another 1–3 years to complete due to the environmental parameters required for implementation.

Immediately following forest management activities and prior to slash disposal, fire behavior potential could increase from the current condition due to increased surface fuels. After slash disposal treatments have been completed, a reduction in potential fire behavior would occur due to the reduction in surface fuel loading and change in horizontal and vertical fuel arrangement.

Forest management activities generally increase the surface fuels within a stand. Whole tree harvesting with disposal of the tops at the landings is the most effective method of preventing surface fuel increases within the residual stand (Agee and Skinner 2005). Surface fuel loads would be reduced because a majority of the slash would be removed from the unit and placed at the landings. At the landings, slash would be piled, chipped, removed for biomass, sold for firewood, or burned. Slash remaining within the stands would be lopped and scattered, piled and burned, or underburned.

Lopping and scattering would reduce the vertical height and horizontal continuity of the fuel bed. However, it would temporarily increase the surface fuel loads. This would put the stand into a slash fuel model resulting in higher predicted flame lengths, fire duration, and intensity. In 10 to 15 years after lopping and scattering, the effect of the slash on fire behavior would be overcome by the effects of decomposition and new vegetation growth (McIver and Ottmar 2006).

Hand piling and burning would decrease fuel loading of material 1 to 6 inches in diameter by 85 to 95%. Fuels greater than 6 inches in diameter contribute to the coarse woody debris load and would be left on the surface. This treatment would move stands from a slash fuel type into a timber fuel type, which would result in a reduced rate of fire spread and average flame length.

Underburning would remove at least 60% of slash less than 3 inches in diameter and a lesser amount of larger fuel size classes in timbered stands. This treatment would move the stands from a timber understory to a timber litter fuel type, which would result in lower predicted flame lengths, fire duration, and intensity. Broadcast burning would be done in grasslands and brushlands without a timbered overstory. This treatment would remove heavy grass thatch, decadent brush, and encroaching tree species. These areas would be restored or maintained as low load grass fuel models, which would also result in lower predicted flame lengths, fire duration, and intensity.

The proposed fuels activities would reduce fire behavior such as flame length, rate of spread, and fire duration within treated stands. With the reduction of flame length and fire duration, the chance of a crown fire initiating in these stands would be reduced. The reduction in fire behavior would lessen the potential damage from a wildfire initiated within or adjacent to the Project Area and would increase tactical opportunities for firefighters to limit fire spread and damage to residential homes during a wildfire.

Renovation (including brushing) of roads would enhance firefighter access and egress during wildland fire suppression activities. Road renovation would improve firefighter and public safety. Improved access would shorten response time and could reduce resultant fire size.

Renovation and restoration of water sources would increase tactical fire fighting capability and potential success for wildland fire suppression objectives within the watershed. More available water would enhance the protection of private property, improvements, and forest resources from wildland fire effects. Resultant fire size may be decreased.

The proposed action could increase fire resiliency of vegetation within the Project Area. A forest that is fire-resilient has characteristics that allow it to readily recover from a fire event. A forest's resiliency to fire can be increased by managing surface fuels to limit the flame length, removing ladder fuels to keep flames from burning into tree crowns where trees have no defense against fire, and retaining larger diameter trees that are more fire resistant (Agee and Skinner 2005; Agee 1993; Agee 1996). Fire hazard and risk within the watershed would be reduced. Past, current, and future fuels reduction on private and federally managed public lands would result in the beneficial effect of increasing the landscape-scale effectiveness of fuels reduction treatments.

3.5.6 Air Quality

For all prescribed burning activities, the Medford District BLM is required to be in compliance with the Oregon Smoke Management Plan (OAR 629-048-0010). The Oregon Smoke Management Plan designates Smoke Sensitive Receptor Areas, which are areas designated for the highest level of protection under the smoke management plan, as described and listed in OAR 629-048-0140. The objective of the Smoke Management Plan is to prevent smoke from prescribed burns from entering Smoke Sensitive Receptor Areas. The Smoke Sensitive Receptor Areas closest to the Project Area are the Bear Creek Valley, Rogue River Valley, and Grants Pass Urban Growth Boundary, as described in OAR 629-048-0160.

Medford District BLM is also required to be in compliance with the Oregon Visibility Protection Plan (OAR 340-200-0040, Section 5.2), which mandates that prescribed burning does not affect the visibility of Class I areas. Class I areas are defined in the Clean Air Act as Forest Service wildernesses and national memorial parks over 5,000 acres, National Parks over 6,000 acres, and international parks. Local Class I areas include Crater Lake National Park, Kalmiopsis Wilderness, and Rogue Wilderness. The Project Area is not within a Class I area.

Prior to conducting prescribed burning activities, the BLM must register prescribed burn locations with Oregon Department of Forestry. The specific location, size of the burn, fuel loadings, ignition source, time, and duration of ignition are reported prior to ignition. Smoke management advisories or restrictions are generated on a daily basis by the State Meteorologist. This information is used to determine the appropriate time to conduct the planned prescribed burn. Most prescribed burning on the Medford District is accomplished by slash pile burning. Slash pile burning generally occurs throughout the winter months during storm events when unstable atmospheric conditions are present in order to maximize mixing and

lessen smoke impacts to localized areas. All piles would be covered with black 4 mil polyethylene plastic sheeting to facilitate rapid ignition and consumption of fuels to minimize residual smoke.

In all proposed alternatives, activity slash treatments include slashing damaged small trees, lopping and scattering, piling and burning, or underburning. Piles would be burned on less than 1,000 acres in the Project Area. All activity slash would not be treated at the same time.

Pile burning and underburning would affect air quality by adding carbon monoxide, PM10, and PM2.5 to the atmosphere. The project fuels specialist estimates that fuel loading to be burned would be less than 10 tons per acre.

Effects from activity slash burning would be short-term and localized. All units are not burned at the same time or even in the same year. A large portion of particulate matter emissions produced during prescribed burning are "lifted" by convection into the atmosphere where it is dissipated by horizontal and downward dispersion. At distances greater than 5 miles, the air concentrations for these emissions are expected to be small. Under these conditions and by following the prescribed fire management guidelines in the Oregon Smoke Management Plan, there would be negligible direct or indirect effects on air quality within the Project Area.

Prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan and the Visibility Protection Plan (OAR 340-200-0040, Section 5.2). As a result, prescribed burning emissions are not expected to adversely affect annual PM10 attainment within the Grants Pass and Medford/Ashland Smoke Sensitive Receptor Areas. In addition, the BLM does not expect prescribed burning to affect visibility within the Crater Lake National Park and neighboring wilderness smoke sensitive Class I areas (Kalmiopsis and Rogue Wilderness Areas) due to the distance from the Project Area and implementation of smoke management guidelines.

3.5.7 Recreation

There are no developed BLM recreation sites in the Project Area. The only developed facilities are a small community park located on the Butte Falls-Prospect Highway, and a city park located in the town of Butte Falls. Two main paved roads provide access into the Project Area—Butte Falls-Fish Lake Highway and Butte Falls-Prospect Highway. Numerous gravel and natural surface roads also provide access into the Project Area. The Butte Falls Discovery Loop Tour, a half-day-long drive into the Rogue River-Siskiyou National Forest that was initiated in the 1990s by the local community, begins in the city of Butte Falls.

Recreational use is generally low and dispersed in nature, consisting primarily of hunting, camping, and off-highway vehicle riding. The area is designated Open to off-highway vehicles and user-created off-highway vehicle routes have developed over the years.

Impacts to dispersed recreation under all alternatives would be similar. During harvest, noise from truck and helicopter activities would discourage recreational use in those areas. Harvest activity during the fall deer, elk, and bird hunting seasons may negatively affect hunters' experiences. Timber harvest on flatter ground has the potential to 'open up' land to off-highway vehicle intrusions. This would be mitigated with effective barricading adjacent to roadways using boulders, slash, and logs to block vehicle access. The decommissioning of user-created vehicle routes and the closing, gating, and decommissioning of BLM system roads would prevent off-highway vehicle access. Closed routes would still be available for hiking, equestrian, and bicycle travel opportunities.

3.5.8 Visual Resources

The lands in the Double Bowen Project Area were identified in the Medford District ROD/RMP as being managed as VRM (Visual Resource Management) Classes II, III and IV. The RMP designated the foreground/middleground of the county road from Butte Falls to Prospect (Butte Falls-Prospect Highway) as VRM Class II. No projects are proposed within the foreground/middleground of the Butte Falls-Prospect Highway.

Lands along the Butte Falls-Fish Lake Highway are designated as VRM Class III. Because the Butte Falls-Fish Lake Highway goes through numerous private properties with various levels of residential developments and vegetation treatments, the prescriptions proposed in the project may be noticeable to a traveler, but would not be out of character with the typical scenery found along the first 7 miles of the highway between the city of Butte Falls and the Forest Service boundary to the southeast. A harvest unit directly adjacent to the highway in T35S, R3E, section 19 would be visible, but would not attract attention; units further away from the highway would either not be visible, or would not be discernable to travelers. Less than 0.25 mile of shelterwood retention harvest directly adjacent to the highway would have the most noticeable difference to viewers. Harvest would increase the light filtering through the thinned canopy of the unit, allowing more visibility further into the trees. This would be most noticeable in the first 2 years after treatment. Another harvest unit located 0.25 mile away from the highway on the opposite side of South Fork Big Butte Creek in T35S, R3E, section 7 would not be noticeable to the casual observer due to the density of riparian vegetation and the curvilinear nature of the highway commanding the attention of drivers. Portions of additional units are located within 0.25 mile of the highway in T35S, R2E, section 13, but topography and vegetation would screen their visibility to highway travelers.

4.0 Consultation and Coordination

This section describes any public participation and consultation or coordination with agencies and organizations that occurred during the preparation of this project.

4.1 Public Involvement and Interagency Coordination

4.1.1 Scoping

The BLM promotes public involvement in the planning process by soliciting input to determine the scope of the issues to be addressed by the EA. This process, known as scoping, is also used to help identify impacts and potential alternatives that will be analyzed during the development of the project. Scoping input is both internal and external to the agency. Internal scoping uses and interdisciplinary team of resource specialists to identify issues, alternatives, and data needs.

External scoping involves notifying other agencies, organizations, tribes, local governments, and the public of the proposed project and providing opportunity for feedback. For the Double Bowen project, The BLM began external scoping on February 19, 2014 by mailing 66 scoping flyers to individuals, organizations, tribes, local governments, grazing lessees, and businesses. The flyer was also published on the BLM planning Web site. In response, the BLM received comments from three organizations—Klamath Siskiyou Wildlands Center, Oregon Wild, and American Forest Resource Council—and three individuals.

4.1.2 Interagency Coordination

4.1.2.1 ESA Consultation

Section 7 of the ESA requires the BLM to work with the US Fish and Wildlife Service (T&E plant and wildlife species) and NOAA Fisheries (T&E fish species) for actions the BLM funds, authorizes, or proposes to ensure the project is not likely to jeopardize the continued existence of listed plant, wildlife, or fish species, or destroy or adversely modify their designated critical habitat.

Before requesting consultation, the BLM determines whether or not the project may affect the listed species or critical habitat. If the project would affect the species, but the effect would be relatively minor, consultation is informal and the BLM submits a written request for informal consultation. If US Fish and Wildlife Service or NOAA Fisheries agrees with the BLM's determination, then informal consultation concludes with the US Fish and Wildlife Service or NOAA Fisheries issuing a letter of concurrence.

If the BLM determines a project is likely to adversely affect a listed species or critical habitat, then formal consultation is required and the BLM submits a written request, or biological assessment, for formal consultation to US Fish and Wildlife Service or NOAA Fisheries. During formal consultation, the US Fish and Wildlife Service or NOAA Fisheries reviews the project to determine if the project is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat. The agencies submit the results of the review to the BLM in a biological opinion.

T&E Wildlife

The federally threatened northern spotted owl is the only threatened and endangered wildlife species in the Double Bowen Project Area. The Medford District prepared a biological assessment for timber harvest projects proposed in the Double Bowen Project and mailed it to the US Fish and Wildlife Service on July 9, 2014. The biological assessment requested concurrence for the actions that may affect, are not likely to adversely affect the northern spotted owl or the owl's critical habitat. The BLM also requested formal consultation on the actions that may affect, are likely to adversely affect the northern spotted owl or the owl's critical habitat. The remainder of the actions would have no effect on northern spotted owls or their critical habitat.

T&E Plants

The Double Bowen Project is within the range of one threatened and endangered plant, the federally endangered Gentner's fritillary (*Fritillaria gentneri*). Suitable habitat for this species includes oak woodlands, chaparral shrublands, meadows, mixed hardwood-conifer woodlands, and the transition zones between these plant communities.

The BLM has a programmatic consultation for T&E plants that generically covers the activities proposed in this EA. The Biological Assessment and Letter of Concurrence prescribe measures, called project design criteria, to ensure that management actions will not likely adversely affect populations or habitat. One of the project design criteria for Gentner's fritillary for large-scale forest management projects is to conduct two years of surveys if the project is within the range of the species, contains suitable habitat, and the action would negatively impact the population. The proposed forest management units do not contain typical habitat for this species except the meadow restoration area and around the edges of units in two sections. These areas were surveyed two years for Gentner's fritillary, but no sites were discovered.

The project design criterion for road construction is to conduct a 1-year survey. If there is a Gentner's fritillary site within 1,500 feet of the proposed road or if indeterminate leaves are observed during the first survey, then a second-year survey would be conducted. Three fritillary species in our area produce identical

vegetative leaves, but often do not have flowering stems. They cannot be distinguished from each other without flowers. A second-year survey increases the likelihood of positively determining which species occurs at the site. The proposed temporary roads and landings in the Double Bowen project were surveyed in spring 2014 and no Gentner's fritillary or indeterminate leaves were discovered. No documented sites are located within 1,500 feet of the proposed roads. Therefore, the 1-year survey is sufficient in these areas.

The activities proposed in the Double Bowen Project would have no effect on threatened and endangered plants because the BLM surveyed the Project Area and did not discover any sites of this species.

T&E Fish

The Double Bowen Project Area contains one threatened and endangered fish species, the federally threatened Southern Oregon Northern California Coast Coho Salmon. The project fish biologist determined the actions proposed in this project would have no effect on coho salmon, coho critical habitat, or essential fish habitat; therefore, consultation was not required.

4.1.3 Tribal Coordination

The BLM mailed scoping letters to tribes with a connection to lands in southern Oregon. Letters were mailed to the Cow Creek Band of Umpqua Indians, Confederated Tribes of the Siletz Indians, and Confederated Tribes of the Grand Ronde Community of Oregon. These tribes will also receive notification from the BLM regarding the availability of the Double Bowen EA for review.

4.2 Document Availability

A letter or email announcing the availability of the EA for public review was mailed to those that submitted scoping comments, grazing lessees, tribes, Jackson County Commissioners, Association of O&C Counties, Oregon Department of Forestry, Oregon Department of Fish and Wildlife, and libraries at Southern Oregon University and Oregon State University.

The Double Bowen EA is available on the Medford District BLM Web site at http://www.blm.gov/or/districts/medford/index/php.

A notice of the EA availability published in the *Medford Mail Tribune* newspaper will begin the 30-day comment period for the Double Bowen Forest Management EA.

5.0 List of Preparers

This section lists the BLM staff involved in the preparation of the Double Bowen project and this document.

Jean Williams	Acting Butte Falls Resource Area Field Manager/ Environmental Coordinator	Authorized Officer/Team Co-Lead/ NEPA Compliance
Nick McDaniel	Forester	Team Co-Lead/Timber Sale Planning/ Economics
Jen Sanborn	Assistant Field Manager	Management Direction
Jason Tarrant	Forester	Forest Condition/Forest Health/ Silviculture Prescriptions
Dave Roelofs	Wildlife Biologist	Northern Spotted Owl Habitat/Wildlife
Shawn Simpson	Hydrologist	ACS Compliance/Water Resources
Alex Benavides	Hydrology Technician	Stream Buffers
Amy Meredith	Soil Scientist	Soil
Baker Holden	District Fish Biologist	Fisheries
Jessica Gallimore	Fuels Management Specialist	Fire and Fuels/Air Quality
Marcia Wineteer	Botanist	Botany/Noxious Weeds
Trish Lindaman	Outdoor Recreation Planner	Recreation/Visual Resources
Lisa Rice	Archaeologist	Cultural Resources
Jeff Brown	Engineer	Transportation
Leo Kalvels	Engineer	Transportation
Brandon Sikes	Engineer	Transportation
Lisa Meredith	Forester	Timber Sale Layout Design
Scott Loos	Forester	Contract Administration
Corey Parks	Forester	Timber Cruising and Appraisal
Jeff Darner	Forester	Timber Cruising and Appraisal
Andy Hill	Timber Clerk	Small Diameter Thinning Prescription
Steve Timmons	Natural Resources Management Specialist	GIS
Robyn Wicks	Natural Resource Specialist	Document Layout/Writing and Editing

Appendix A: Issues Considered but Eliminated from Detailed Analysis

The following issues were raised by the public or the BLM during the development of this project. The BLM considered these issues but did not include them in detailed analysis, often because the project's design or implementation of project design features would eliminate or reduce effects on the resource. The project design features are described in section 2.4, Project Design Features.

How would the proposed projects affect Survey and Manage species?

Surveys will be completed using current survey protocol for wildlife and botany Survey and Manage species. If sites are located during surveys, they will be protected with no-treatment buffers, seasonal restrictions, project design features, or a combination of these. Proposed projects will not negatively impact the persistence of Survey and Manage species because required surveys will be completed and appropriate measures applied before a decision record is signed for this project.

Would the proposed projects affect migratory bird species?

BLM has issued interim guidance for meeting BLM's responsibilities under the Migratory Bird Treaty Act and EO (Executive Order) 13186. Both the Act and the EO promote the conservation of migratory bird populations. The interim guidance was transmitted through IM (Instruction Memorandum) No. 2008-050. The IM relies on two lists prepared by the U.S. Fish and Wildlife Service 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 and *Game Birds Below Desired Condition* (GBBDC). In December 2008, the US Fish and Wildlife Service released *The Birds of Conservation Concern 2008*. This publication identifies species, subspecies, and populations of migratory and nonmigratory birds in need of additional conservation actions, updating the April 2008 Birds of Conservation Concern List. This list meets US Fish and Wildlife Service mandates for the conservation of migratory nongame birds.

Additionally, the US Fish and Wildlife Service and the BLM signed a Memorandum of Understanding in April 2010 that identified strategies to avoid or minimize adverse impacts on migratory birds. The Double Bowen Forest Management Project will follow these guidelines where feasible to reduce the impacts to migratory birds. For example, many of the project design features, such as seasonal restrictions, that would mitigate effects to some species would also benefit migratory birds.

The following species have been located, or are likely present, within the Project Area: Band-tailed Pigeon (GBBDC), Olive-sided Flycatcher (BCC), Purple Finch (BCC), Rufous Hummingbird (BCC), and Northern Goshawk (BCC).

The proposed projects would not negatively impact the persistence of these species of concern because of the use of project design features and habitat remaining in areas that are deferred from harvest in the Project Area. See Appendix H, Wildlife for additional information.

Would the proposed projects retain appropriate amounts of coarse woody material?

The projects proposed in all alternatives would meet ROD/RMP guidelines (p. 47) for coarse woody material on matrix land by leaving a *minimum* of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long (decay class 1 and 2) in regeneration harvest units. All other proposed timber harvest prescriptions would meet RMP guidelines for coarse woody material by

- leaving existing snags, stages 1–5. When available, green trees (any diameter) immediately adjacent to snags greater than 20 inches DBH would be left to provide additional structural and habitat diversity;
- leaving existing coarse woody debris, decay classes 1–5. When available, green trees (any diameter) immediately surrounding large (greater than 20 inches DBH and 8 feet long) pieces of coarse woody debris would be left to minimize coarse woody debris disturbance and maintain the functional integrity of the coarse woody debris; and
- minimizing the cutting of large (greater than 20 inches DBH), broken, forked-top, and deformed trees. Retain for plant and animal habitat and future sources of coarse woody debris and snags.

By maintaining at least the minimum amount of coarse woody debris in all action alternatives, the proposed projects would retain the appropriate amount of coarse woody material as specified in the RMP.

Can the BLM thin riparian reserves while meeting Aquatic Conservation Strategy (ACS) objectives?

Riparian reserve thinning in the Double Bowen project would maintain ACS objectives in the short-term and long-term at both the site and watershed scales (see Appendix F—Aquatic Conservation Strategy). Thinning within 14 acres of riparian reserves would promote the development of large diameter conifer trees in the riparian reserve thinning areas, allow riparian reserves to continue to function, and protect streams within the Lower South Fork Big Butte Creek sixth-field watershed.

Thinning would encourage healthy native riparian forests by reducing stand densities to levels the sites have the resources to support. No riparian hardwood species would be cut and healthy Douglas-fir, incense cedar, ponderosa pine, and sugar pine would be left.

Riparian reserves would continue to provide stream shade, sources of large wood, streambank stability, and habitat for native riparian species. No trees would be harvested within the primary shade zone of perennial, fish-bearing stream channels, lakes, ponds, springs, wetlands, and meadows. Ground-based equipment would be restricted within riparian reserve boundaries in timber harvest units. Trees felled within riparian reserves would be bull-lined into upland timber harvest units or to existing roads. Trees needing to be cut in the no-treatment buffer for operational reasons would be felled toward the stream and left on the ground.

Riparian thinning would retain a minimum of 50% (60% in northern spotted owl nesting, roosting, and foraging habitat) overstory canopy cover outside the no-treatment area.

Full riparian reserves would continue to provide shade to streams. Proposed actions would maintain an adequate distance from streams to avoid sediment deposition harmful to fish habitat. Any effects from proposed actions are expected to be negligible and within the range of natural variability for maintenance of fish populations and habitat.

How do proposed temporary route construction and reconstruction, landing construction, ground-based yarding, timber harvest, and timber hauling affect peak flows, flow timing, and sediment loading?

Peak flow increases are not expected as a result of the Double Bowen project because none of the treatments would result in canopy cover below the range of natural variability within the transient snow zone. In addition, the Lower South Fork Big Butte Creek subwatershed has a low susceptibility of peak flow enhancement due to flat topography, low-energy streams, and low stream density.

Alternative 2 would harvest approximately 42 acres that would result in canopy cover below the range of natural variability; none of those acres are located in the transient snow zone. Because no treatments would result in crown closure below the range of natural variability within the transient snow zone and because the Lower South Fork Big Butte Creek subwatershed has a low susceptibility to peak flow enhancement, there would be a low risk for increased frequency and magnitude of peak flows due to rain-on-snow events.

Using existing and designated skid trails during ground-based yarding would minimize the area of soil disturbance. Implementation of project design features, the distance of skid trails to stream channels through riparian reserves, and the relative gentle topography of these units would minimize sediment transport and maintain water quality.

Temporary route construction, reconstruction, and renovation have the potential to result in soil erosion. However, temporary routes would be constructed during the dry season on stable locations, used, and decommissioned within the same operating season. The routes use existing routes, previously decommissioned roads, extensions of existing roads, or short spurs off existing roads. Route work would occur during the dry season and routes would be located outside riparian reserves. The routes are temporary and the effects would be mitigated by ripping and water barring to minimize the potential for sediment entering streams.

Landings would be constructed outside of riparian reserves during the dry season and would be placed on stable locations such as ridge tops, stable benches, or flats with gentle to moderate side slopes. Landing operations would be suspended whenever soil moisture conditions or rain events could result in the transport of sediment to stream channels. In addition, landings associated with new temporary routes would be ripped, water barred, blocked, and seeded in the same season of use to minimize the potential for sediment to enter streams.

Possible sediment inputs into streams from timber hauling would only occur during a precipitation event following a season of hauling and would be spatially spread over many input locations. Short-term, small inputs of sediment would occur at steam crossing. Roads would be renovated prior to use, which would improve drainage and reduce sediment inputs by reducing erosion to the road surface and ditches. Hauling Sediment increases would be minor and undetectable relative to existing sediment levels.

How does timber harvest affect larger trees?

In the development of the Double Bowen project, BLM foresters conducted stand inventories in the Double Bowen Project Area. The inventory provided information about canopy cover, relative density, basal area, number of trees per acre, and the aspect and slope of proposed harvest units. The stand inventory data provided a general description or measure of stand density, composition, and structure to be used in the development of silviculture prescription for each timber stand. Each alternative has specific objectives for the stands to be treated. Silviculture prescriptions for each stand take into consideration the stand inventory data as it relates to objectives of the alternative.

Regeneration harvest using shelterwood prescription guidelines would retain 12 to 25 green trees per acre greater than 20″ DBH to provide protection for newly planted and natural seedlings in areas with growing-season frosts. The spatial distribution of trees would be more uniform. After harvest, canopy cover would be 20 to 40%.

Density management would thin high-density stands from below (smallest trees are removed and largest trees are retained) to maintain or enhance forest health, stand structure, and function for northern spotted

owl habitat. The residual canopy cover would be a minimum of 40% or 60%, depending on the current owl habitat designation (dispersal or nesting, roosting, and foraging).

Selection harvest would remove poor vigor trees from across all diameter classes in order to reduce stand densities in overstocked stands and make site resources (water, sunlight, nutrients, and growing space) available for remaining trees. The desired basal area and tree crown ratio and form are the primary factors used to determine which trees would be left or removed. A minimum of 40% or 60% canopy cover would remain after harvest, depending on the current owl habitat designation (dispersal or nesting, roosting, and foraging).

Riparian thinning in overstocked, even-aged, second growth riparian stands would improve individual tree and stand health, reduce the risk for stand-replacing wildfires, restore ecosystem functions by accelerating the growth of healthier trees, and provide an increase of large wood sooner. Treatment would reduce stand densities by thinning from below, removing smaller trees; trees 20 inches in diameter or larger would not be extracted. A minimum of 50% canopy cover would remain in northern spotted owl dispersal habitat and a minimum of 60% canopy cover would remain in northern spotted owl nesting, roosting, and foraging habitat.

Because we have not cruised the stands for volume and defect, the number of large size trees that would be considered for harvest is unknown.

How would timber harvest affect snag reductions and impact wildlife, especially woodpeckers and cavity nesters?

RMP standards and guidelines require that, over time, one to two snags per acre will be present to meet the requirement for cavity nesting birds at 40% of potential population levels (ROD/RMP, p. 40). All deterioration stages of snags (see Appendix C, Table C-19) will be retained as part of the silviculture prescription. During harvest operations, existing snags will be reserved from felling where they are not a safety hazard, and, where necessary, additional green trees will be reserved to meet the target levels. If a snag needs to be fallen for safety concerns, the snag will be left on-site to function as coarse woody debris.

How would the proposed projects affect unauthorized off-highway vehicle trails, illegal firewood cutting, and poaching?

The BLM proposes to close and decommission roads that are not needed at this time but may be used in the future. Roads would be closed with a device similar to an earthen barrier or equivalent and would not be maintained in the future. Roads would be closed to vehicles on a long-term basis, but may be used again in the future. Closing and decommissioning roads in the Project Area would help reduce off-highway vehicle use, illegal firewood cutting, and poaching.

Can the Ginger Springs Municipal Watershed water quality be maintained?

The *Ginger Springs Watershed Analysis and Management Plan for BLM Lands within the Ginger Springs Recharge Area* (1998) contains specific recommendations for each operations inventory unit within the recharge area to maintain water quality in the municipal watershed. Following these recommendations, maintaining riparian reserves, and implementing project design features would maintain watershed health as it relates to water quality.

Appendix B:

Landscape Analysis and Restoration Recommendations for Lower South Fork Big Butte Creek Sixth-field Watershed

B.1 Introduction

The key goals of forest restoration, as outlined in *Restoration of Federal Forests in the Pacific Northwest: Strategies and Management Implications* (Johnson and Franklin 2009), include making forests "more resistant and resilient to wildfire and insects; conserving old-growth forest and trees; and creating an immediate and predictable timber flow to support locally-based restoration economies." The restoration strategy is based on a landscape approach that assesses the current forest structure, composition, and ecological processes and determines how and where management can occur to ensure the sustainability and resiliency of forest ecosystems now and in the future.

Determining restorative needs within a forest landscape begins with the establishment of baseline conditions at both the historic and current temporal scales. Comparing historic forest vegetation with existing conditions allows management direction to be focused on treatments that ensure spatial complexity, species diversity, and necessary ecological processes are present and trending toward levels that enhance landscape health and resiliency. Improving forest ecosystem health, diversity, and resiliency increases stand resistance to and tolerance of climatic extremes or fluctuations, reduces the potential for major insect and disease outbreaks, reduces the potential for large fires, reduces erosion, and increases soil productivity. Healthy landscapes have the ability to buffer and absorb the effects of disturbances such as wildfire, insects, and climate change; whereas, unhealthy landscapes tend to magnify the detrimental effects of those disturbances.

This analysis assesses the condition of forest vegetation in the Lower South Fork Big Butte Creek sixth-field watersheds and provides management recommendations that apply the concepts and principles of ecological restoration.

B.1.1 Watershed Location

The Lower South Fork Big Butte Creek sixth-field subwatershed within the Big Butte Creek fifth-field watershed is located 0 to 5 miles south and southeast of the city of Butte Falls, Oregon in the upper Rogue River Basin (Map B-1).

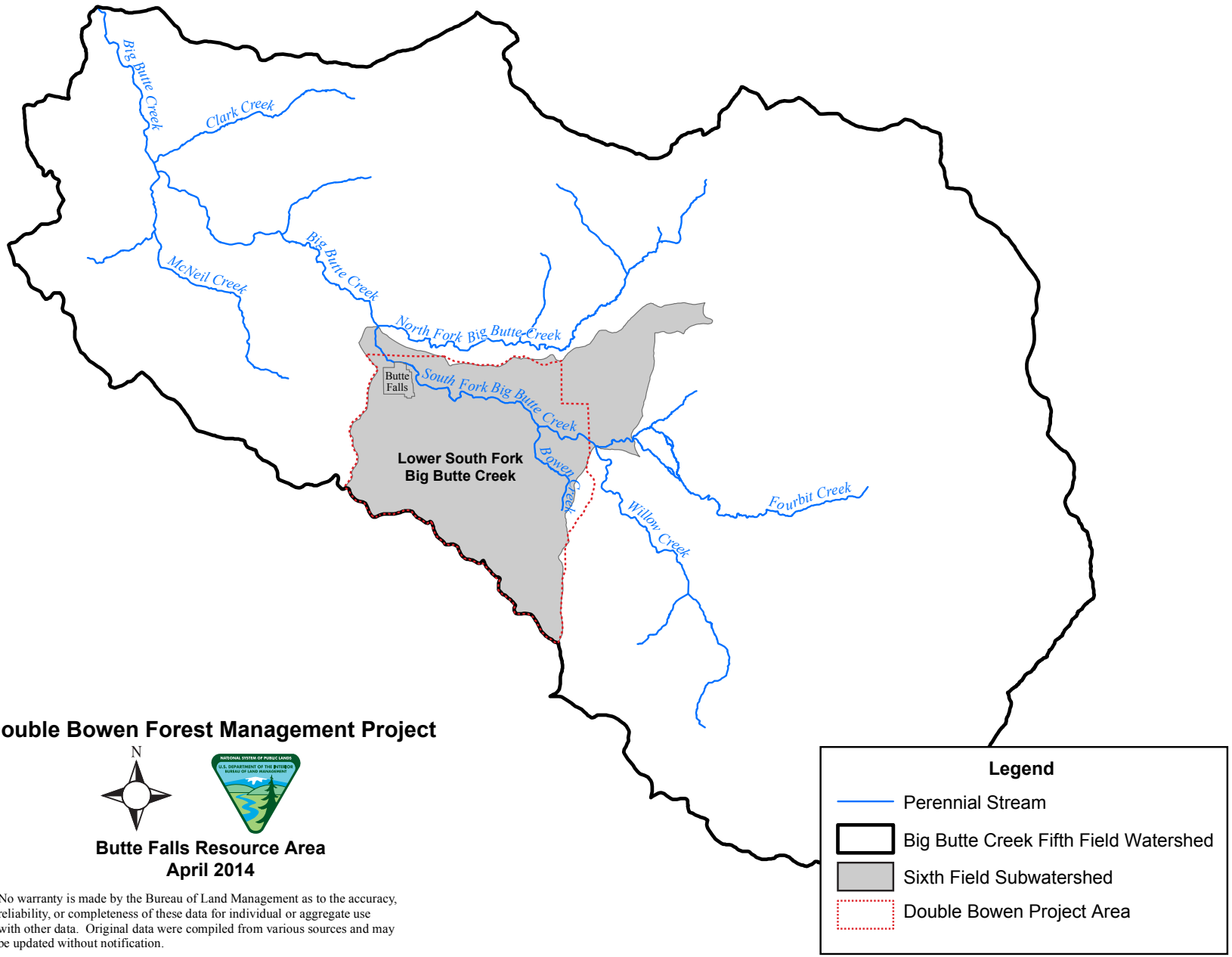
B.1.2 Ownership

The majority of the lands in this sixth-field subwatershed are under private land ownership, followed by public land ownerships that are intermixed in a checkerboard pattern (Figures B-1 and B-2). Public land ownership accounts for 29% of the Lower South Fork Big Butte Creek subwatershed.

B.1.3 Landscape Vegetation

The major vegetative zone within the watershed is mixed conifer. The mixed conifer zone (Franklin and Dyrness 1973) has forests containing Douglas-fir, sugar pine, ponderosa pine, incense cedar, white fir, Pacific madrone, and oak tree species. The mixture and abundance of species varies from stand to stand. Typically,

Map B-1. Double Bowen Project Location



Double Bowen Forest Management Project

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Butte Falls Resource Area
April 2014

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.

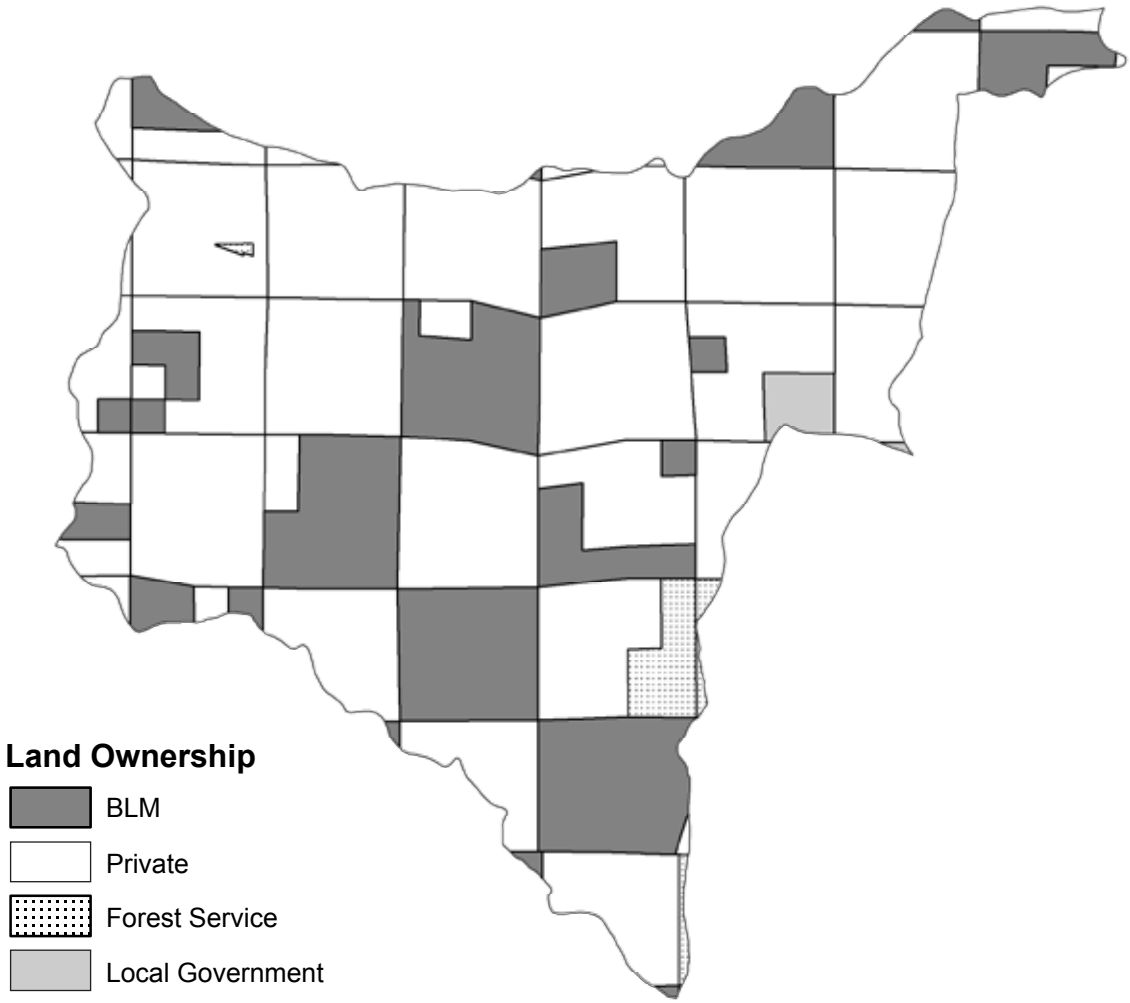


Figure B-1. Lower South Fork Big Butte Creek subwatershed land ownership—15,787 acres.

Douglas-fir is the most common tree species, followed by white fir, and incense cedar with lesser amounts of ponderosa pine, sugar pine, and hardwood species.

Within this forest zone, further classification of plant series and plant associations have been described in *Field Guide to the Forested Plant Associations of Southwestern Oregon* (Atzet, et al. 1996). Plant series are based on plant species, geology, soils, terrain, topographic features, and plant response to management activities. Using this guide, two plant series, Douglas-fir and white fir, are present in the watershed. White fir and Douglas-fir are the predominant plant series that fall within the dry forest classification (Johnson and Franklin 2009). Although the white fir plant series "spans the threshold between the dry and moist forest," climate change is expected to increase the occurrence of wildfire and drought to levels more characteristic of drier forests.

B.1.4 Seral Stages

The landscape pattern of seral stages has largely been the result of timber harvest. The interface between private and federally managed lands typically represents the area of greatest contrast of stand structure. The existing vegetative condition (age/size/density) affects the diversity, vigor, and resiliency within the watershed. The distribution of age classes (forest structure) across the landscape is described below (see Table B-1 and Figure B-3).

Figure B-2. Aerial photograph of Lower South Fork Big Butte Creek subwatershed.

Table B-1. Stand Age Classes in Lower South Fork Big Butte Creek Sixth-field Subwatershed for all Ownerships.

Stand Age Class (years)										
0-10		20-40		50-80		90-200		200+		
acres	%	acres	%	acres	%	acres	%	acres	%	Total Acres
2,994	19	3,489	22	5,781	36	2,608	17	915	6	**15,787**

NOTE: Acres estimates are based on aerial photograph interpretation and BLM inventory data.

B.2 Landscape Pattern

Three structural elements—matrix, patches, and corridors—within a forest ecosystem are essential in maintaining ecological diversity and complexity. The structure, amount, and spatial arrangement of these three elements affect the resiliency, species diversity, and biological and physical processes within a forest landscape (Bureau of Land Management 1995b, 25).

Note: As used here, *matrix* is **not** the same as the matrix land use allocation used in the Northwest Forest Plan and 1995 ROD/RMP.

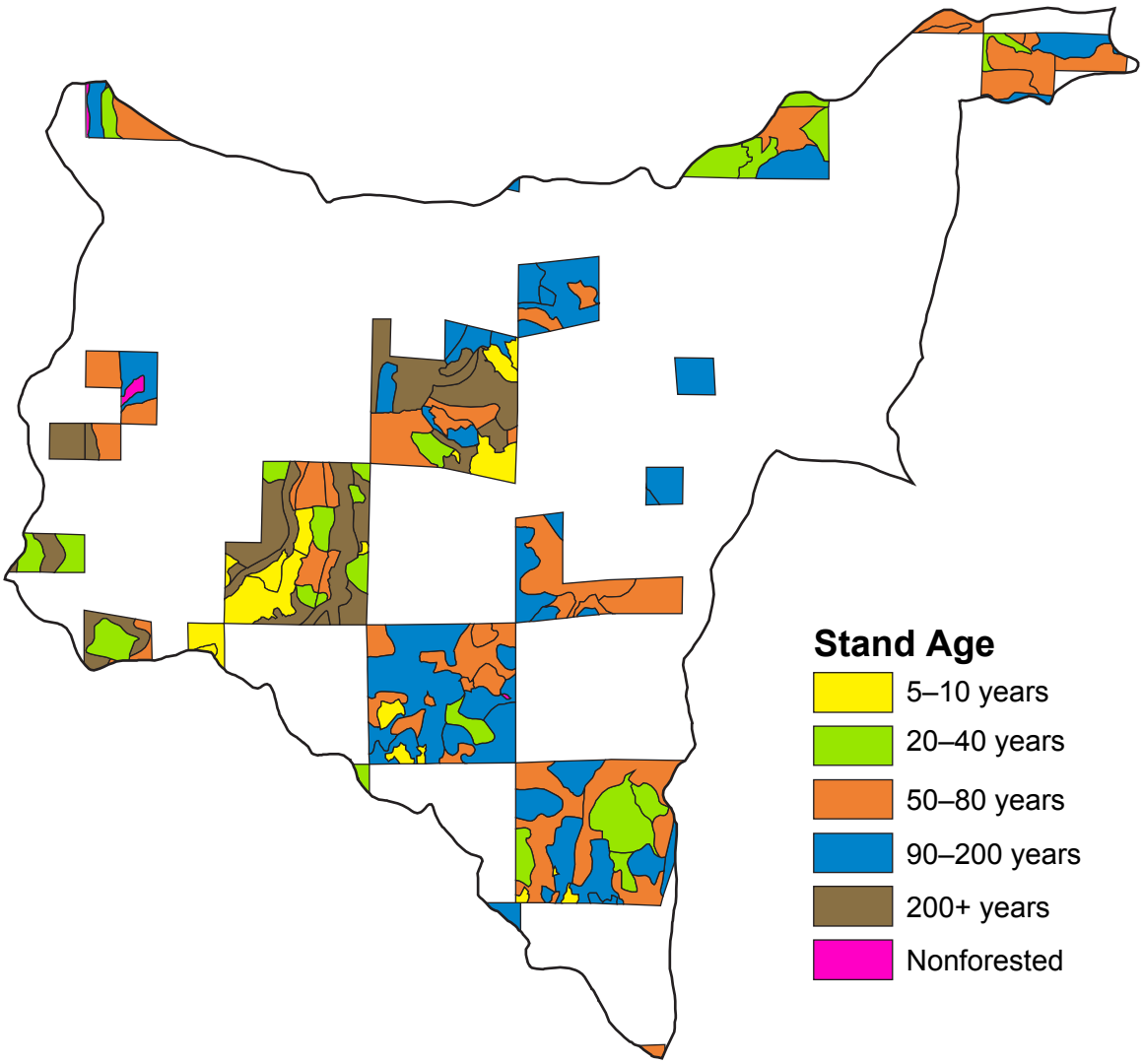


Figure B-3. Stand age classes on BLM-administered lands Lower South Fork Big Butte Creek subwatershed.

B.2.1 Matrix

The matrix is the most connected portion of the landscape. It is the predominant vegetative type and therefore exerts the strongest influence over the movement of living and nonliving things across the landscape (fire, wind, plant, animals, people, insects, disease). The matrix pattern is largely determined by the checkerboard ownership boundaries.

Approximately 71% of the Lower South Fork Big Butte Creek subwatershed is privately owned. Most of the private land is owned by industrial timber companies and has been heavily harvested. The majority of merchantable trees have been removed in some locations. This has resulted in younger stands with high amounts of submerchantable Douglas-fir and lesser amounts of ponderosa pine, incense cedar, sugar pine, white fir, and scattered hardwoods. Most of the private industrial lands are currently 80 years old or less. Short rotations and intensive harvest practices are likely to shift any remaining older stands towards early successional conditions. Few private stands are expected to contribute to late-successional conditions within the subwatershed.

BLM-administered lands occupy about 26% of the Lower South Fork Big Butte Creek subwatershed. Harvest practices have ranged from individual tree salvage to clear-cuts. Approximately 54% of BLM-

administered lands in the Lower South Fork Big Butte Creek subwatershed consist of stands 80 years old or less. Forest Service and City of Butte Falls lands occupy about 3% of the Lower South Fork Big Butte Creek subwatershed and have had harvest practices ranging from individual tree salvage to clearcuts. Approximately 35% of the City of Butte Falls and Forest Service lands in the Lower South Fork Big Butte Creek subwatershed consist of stands 80 years old or less.

The dominant vegetative types (matrix) on all lands in the subwatershed are early successional forests (less than 80 years old) created through past harvest practices (Forest Service 1993) (Ripple 1994) (Johnson and Franklin 2009). These stands provide the strongest influence over landscape processes (e.g., fire, tree growth, nutrient cycling, disease, insects, wind, snow storms, water flow, and erosion). These stands are either recent clear-cuts or small diameter, even-aged type stands that have little structural diversity. The species composition, structure, and function in these early successional stands are different than conditions created by natural causes such as fire. These young stands have fewer large snags, greater soil disturbance and compaction, lower amounts of large coarse woody debris, linear versus random tree spacing, fewer hardwoods or shrubs, and lack of large remnant overstory trees. These stands have typically been planted with a species mix containing a high percentage of ponderosa pine.

The rate of structural change in young stands is relatively rapid compared to slow-changing mature or old growth stands. Tree growth and vigor within young stands is generally good until tree canopy closure. Crown closure and crown cover reduce sunlight. Reduced sunlight, along with increased tree competition for nutrients and moisture, results in slower growth and sometimes tree mortality. As tree vigor declines, insect and disease problems can begin to play a role in stand health.

B.2.2 Patches

Patches are areas distinctly different from the landscape around them. As a result of past harvest practices, stands of mature timber (>80 years old) have become the patches within the Lower South Fork Big Butte Creek subwatershed. These stands are the result of periodic fires, both low to moderate underburns and stand-replacement fires. These older patches are considered stable in the absence of disturbance. As these older stands age, there is less likelihood the structure and composition of the stand will change quickly; although, unexpected disturbances such as fire, insects, disease, and windstorms can quickly alter this stability.

The checkerboard ownership pattern has resulted in a highly fragmented landscape, with the majority of the mature stands located on federally managed lands. The location and amount of older stands within the matrix has created a high degree of contrast, porosity, and edge effect across the watersheds. Contrast is the degree of difference between adjacent forest stands and is typically represented by changes in the tree species or structural attributes present. Porosity is the amount of fragmentation present within the landscape. Edge represents the interface area between two distinctive vegetative size classes. Environmental conditions (e.g., temperature, light, wind, and humidity) are different within this area, resulting in a drier, windier microclimate along the stand edge. Generally a 500-foot-wide strip adjacent to the edge is affected. The altered microclimate in this area causes a change in species mix and density of herbaceous vegetation and shrub species. Patches that are 25 acres or less are, in effect, all edge.

B.2.3 Corridors

Corridors provide travel routes for plants, animals, and people between similar size classes or vegetative types. Roads, riparian reserves, and streams are the primary corridors in the Lower South Fork Big Butte Creek subwatershed.

B.3 Historic Vegetation Conditions

Forest ecosystems are complex and dynamic. Changes occur as elements and processes are altered by both coarse filter (i.e., stand-replacement fires) and fine filter (i.e., individual tree mortality) events. Ecosystems can adapt to these changes and can function well under a range of conditions. Within this "natural range of variability," biological and ecological functions are sustainable. When an element or process is outside of this range, that element and those depending on it may not be sustainable (Forest Service 1993).

Using fire history information, existing age-class distribution, and forest survey documents, general vegetative conditions prior to logging can be re-created. From this baseline information, assumptions and inferences specific to individual elements, processes, or components and how they may have functioned under *natural* conditions can be made. In the Lower South Fork Big Butte Creek watershed, it has been estimated that prior to logging, approximately 71% of the forest land within the watershed contained large-size forests. Large-size class is defined as Douglas-fir and ponderosa pine greater than 20 inches in diameter, and white fir greater than 16 inches diameter. This estimate is based on detailed forest surveys completed during the 1930s. The prelogging time frame includes the period prior to late 19th century and early 20th century logging (Bureau of Land Management 1995b, 36).

The natural range of variability is further defined in the Central Big Butte Watershed Analysis, which contains information on the Lower South Fork Big Butte Creek, Upper South Fork Big Butte Creek, and North Fork Big Butte Creek subwatersheds. Analysis in this document addressed the historic range of aquatic, riparian, and terrestrial elements within the Big Butte Creek fifth-field watershed. The historic range was defined as the conditions that existed before timber harvest began in the early 1900s. The study uses data sets from early forest surveys that conclude the *historic* landscape supported contiguous stands of primarily older forests (Table B-2).

Table B-2. Historic Range of Riparian and Terrestrial Vegetation Conditions in Lower South Fork Big Butte Creek Subwatershed

Riparian Vegetation—Percent of the Stream Length	
Early successional conditions	10 to 40%
Late-successional conditions	45 to 75%
Landscape Vegetation—Percent of the Landscape	
Early successional/no snags	< 2%
Early successional/snags	10 to 40%
Late-successional/single layer	< 2%
Late-successional/multiple layers	45 to 75%

In this analysis, stands that are 80 years old and less are considered early successional, while stands over 80 years old are considered late-successional.

Early successional conditions are the stages in forest development that includes seedlings, saplings, and poles. Late-successional conditions are the stages in forest development that includes mature stands, generally greater than 80 years old.

The landscape pattern was uniform with late-successional forests providing large contiguous areas of interior forest habitat. Fragmentation of late-successional forests was limited and occurred in areas where stand-replacement fires left large patches of "green" stands interspersed within fire-killed stands. The amount of edge between early and late-successional vegetation was low and occurred in areas where stand-replacement

fires provided the abrupt transition between early and late-successional forests. Canopy openings were not uniform, but variable in size.

Widespread vegetative changes due to disease, insects, or both were most likely minimal. Mortality was probably limited to individual trees or small groups of trees. Dwarf mistletoe, specifically in the Douglas-fir overstory, was likely common but with minimal intensification. Periodic underburning maintained open stands of mixed conifers and hardwoods. Mistletoe brooms on smaller Douglas-fir trees probably increased torching and tree mortality, thereby regulating mistletoe severity and spread in the understory. Some insect populations may have increased to moderate levels following fires due to fire-induced stress (cambial damage or crown scorch) or during long periods of drought. Root diseases were present and provided small gaps in the forest canopy. Large areas of root rot were probably minimal due to periodic underburns that maintained disease-resistant seral species and wider tree spacing.

Summary

The historic range of variability provides insight into landscape conditions in which organisms and populations evolved and persisted prior to widespread human intervention. Although forest conditions are dynamic and organisms and populations have the ability to adjust to changes, certain limits exist. The ability to adapt is not limitless, and when certain thresholds are reached the behavior of organisms and populations may fundamentally change and ecosystems may begin to unravel.

B.4 Landscape Changes from Historic Conditions

The trend within the Lower South Fork Big Butte subwatershed over the past 70 years has been one of structural, habitat, and species simplification; some of the changes from historic levels include the following (Bureau of Land Management 1995b, 47–48):

- The current landscape pattern has been shaped predominantly by past harvest practices. Historically, the landscape pattern was a result of disturbances such as fire, wind throw, insects, and disease that were partially regulated by environmental gradients such as climate, soils, and landform.
- Past harvest practices and road construction have created a landscape that is more fragmented and has greater edge and patch densities than historic levels. Large blocks of mature forests are now mosaics of young plantations, mature forests, and stands modified in varying degrees by past harvest practices.
- Reduced interior habitat is available for species associated with late-successional forests.
- A shift in abundance and species composition of soil and canopy arthropods towards those most associated with early successional stands.
- In older forests, a shift from stands containing early seral species, such as ponderosa pine and sugar pine, to mid- to late seral species, such as Douglas-fir and white fir, due to fire exclusion and the harvest of high value early seral overstory trees.
- Post-harvest treatments have modified the natural process of vegetative succession; the temporal and spatial occurrence of herbaceous, shrub, and hardwood species has been altered by management treatments (e.g., slashing, burning, brushing, girdling, applying herbicides, scalping, and fertilizing). The treatments are not always representative of natural processes, and their effects upon long-term forest health and ecological processes are unclear.

- In remaining older stands, densities have increased, thereby increasing soil moisture and nutrient demands resulting in increased tree stress and larger numbers of trees predisposed to insect or disease attack.
- The low thinning effect of fire is absent.
- Vertical canopy structure has increased in existing late-successional stands.
- Simplification of forest landscape pattern, structure, and diversity tends to increase pest populations, disease, and pathogen occurrence. Larger areas of early successional stands are present today than historically occurred. These stands have limited structural and species diversity and, if stressed, may be more susceptible to insect and disease outbreaks.
- Homogenizing forest landscapes reduces natural controls and barriers that regulate the kind and extent of insects and disease. Climate change may exacerbate these problems.

Cumulatively, these changes have affected the ecological processes within this landscape. The extent and degree of change can be assessed by comparing the current conditions with the "natural range of variability." Within this "natural range of variability," biological and ecological functions are sustainable. Elements and processes outside of this range and those depending on it may not be sustainable (Table B-3).

Table B-3. Historic Range of Conditions and Current Conditions in the Lower South Fork Big Butte Creek Subwatershed for All Ownerships

Landscape Forest Condition	Historic Range	Current Conditions
Early Successional/No Snags	< 2%	40%
Early Successional/With Snags	10–40%	5%
Late-Successional/Single Layer	< 2%	10%
Late-Successional/Multiple Layers	45–75%	35%

Information shown is from the 1995 Central Big Butte Watershed Analysis that contains the Lower South Fork Big Butte Creek, Upper South Fork Big Butte Creek, and the North Fork Big Butte Creek subwatersheds. The percentages shown for current conditions are from 1995 and are estimates based on aerial photograph interpretation and BLM stand data, and assumes the average rotation length on private industrial lands is 60 years. In this analysis, stands that are 80 years old and less are considered early successional, while stands over 80 years old are considered late-successional.

B.5 Restoration Strategy

Simplification of forest structure and pattern in the Lower South Fork Big Butte Creek subwatershed has reduced biological diversity, connectivity, and landscape function. Ecological processes inherent to the landscape have been altered to levels different than the historic range of natural variability. The kind, amount, and spatial distribution of plants, animals, and forest organisms across the landscape may affect long-term landscape health and sustainability and the ability to adapt to the effects of climate change and environmental disturbances.

Assumptions:

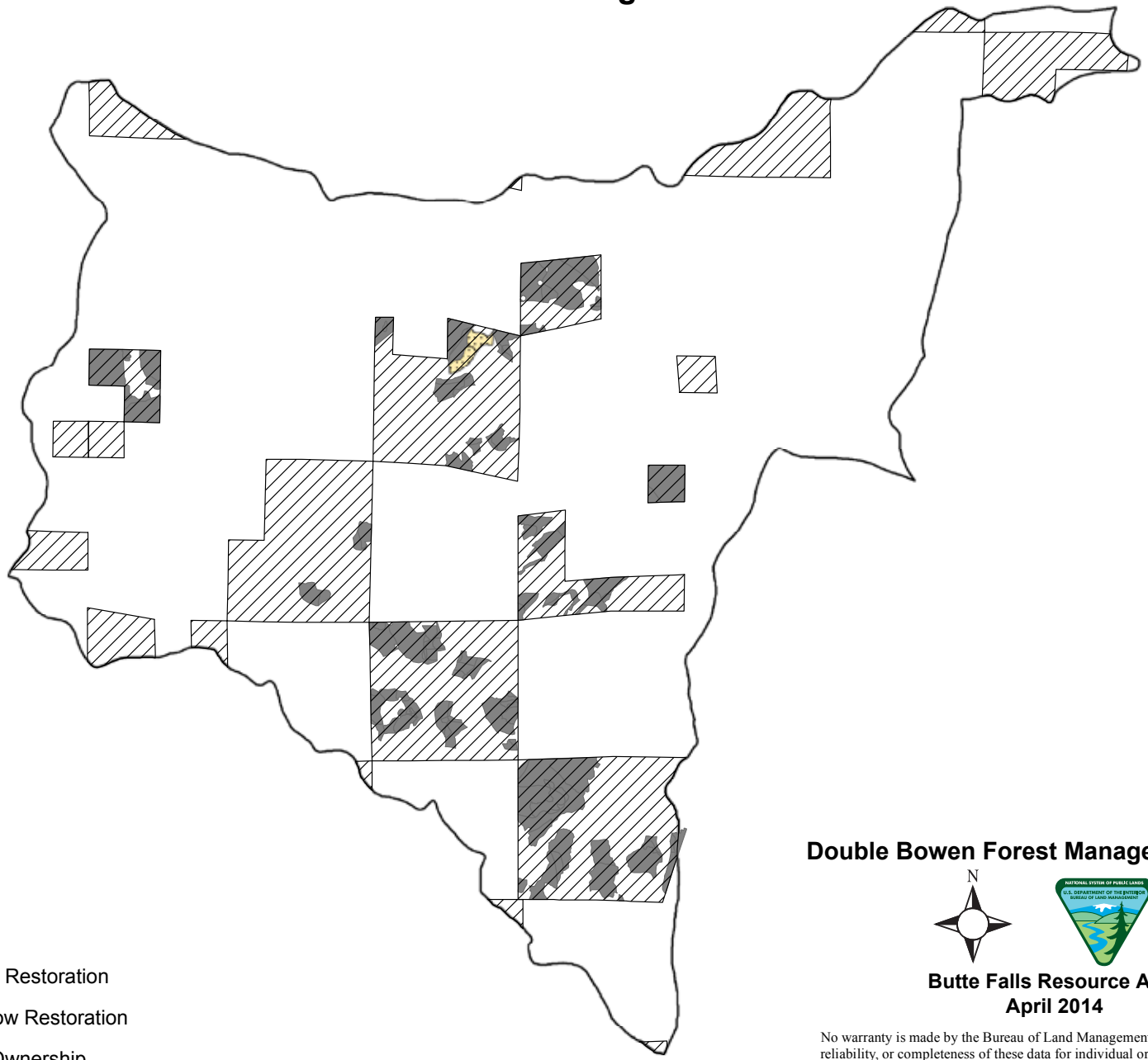
- Intensive harvest practices on private timber company lands will likely continue to shift any remaining older stands toward earlier successional conditions. The amount of late-successional forests on private lands is expected to decrease from existing levels.
- Older, structurally diverse stands within the subwatershed will predominantly occur on federally managed lands.

- Ownership patterns and differing management objectives, past and present, have dictated and will continue to dictate landscape pattern and condition.

Restoration Recommendations:

- Retain or develop multilayer, late-successional stands containing a variety of tree diameters, heights, and species, and varying amounts of snags and coarse woody debris. Create within-stand diversity by promoting structural heterogeneity. Reduce stand densities to the levels the site has resources to support. Consider treating stands that have relative densities of 45% or greater (see forest restoration prescriptions and Map B-2). The long-term benefits of treatment should outweigh any short-term effects.
- Maintain a diversity of age and size classes throughout the landscape. Promote contiguous areas of mature forest stands. Use existing McKelvey 1 stands, RA32 stands, and northern spotted owl cores to delineate areas in the watersheds to provide habitat for late-successional plant and animal species (see Map B-3). In areas with high quality late-successional habitat, evaluate landscape conditions and, where possible, apply management treatments that reduce the potential for the loss or degradation of the habitat.
- Minimize the creation of early seral stands on BLM-administered lands. Limit to areas experiencing epidemic levels of insects or disease, large fires, or stands that are deteriorating to the point that the integrity of the stand is threatened.
- Within designated northern spotted owl critical habitat, focus management activities toward treat and maintain management actions unless an ecological condition exists in need of mitigation measures to increase forest health and longevity. Where dispersal and nesting, roosting, and foraging habitats exist, maintain the primary constituent elements unless there is an ecological benefit identified to do otherwise, allowing activities that increase stand health and resiliency to environmental disturbances. Short-term negative impacts may occur if the actions provide long-term benefits to the sustainability of spotted owl habitat.
- Promote and improve species diversity by encouraging natural levels of diversity found in native plant communities; use plant association principles to describe and define desired levels of species diversity. Species diversity is a key component of healthy forests by providing unique habitats, increased genetic variability, and vegetative conditions that are more resilient to environmental extremes and disturbances. Favor early successional species (ponderosa pine, sugar pine, incense cedar, Douglas-fir, black oak, and madrone) within the Douglas-fir and white fir plant series.
- In 50-year-old pine plantations, 30- to 40-year-old Douglas-fir plantations, and 50-year-old mixed-conifer stands, assess the physical attributes of conifer species to evaluate overall tree vigor. Some of the conifers, especially ponderosa pine in the plantations planted in the 1960s, were planted with seedlings from an unknown seed source that often did not adapt well to the site. Seedlings planted outside of their seed zone are often more susceptible to environmental extremes and insect and disease problems. Within plantations that exhibit off-site characteristics (ponderosa pine in particular) such as trees with thin, chlorotic foliage and slow growth rates, thin to release established natural regeneration of Douglas-fir, incense cedar, and sugar pine or to create space for planting site-adapted ponderosa pine, Douglas-fir, and incense cedar.
- Improve or maintain horizontal and vertical diversity in young, dense, homogenous stands, and encourage species diversity (hardwoods and conifers). High stand densities have resulted in slow or stagnant growth rates. These stands are overstocked with more trees than the site has water, nutrients,

Map B-2. Restoration Units in Lower South Fork Big Butte Creek Subwatershed



Forest Restoration

Meadow Restoration

BLM Ownership

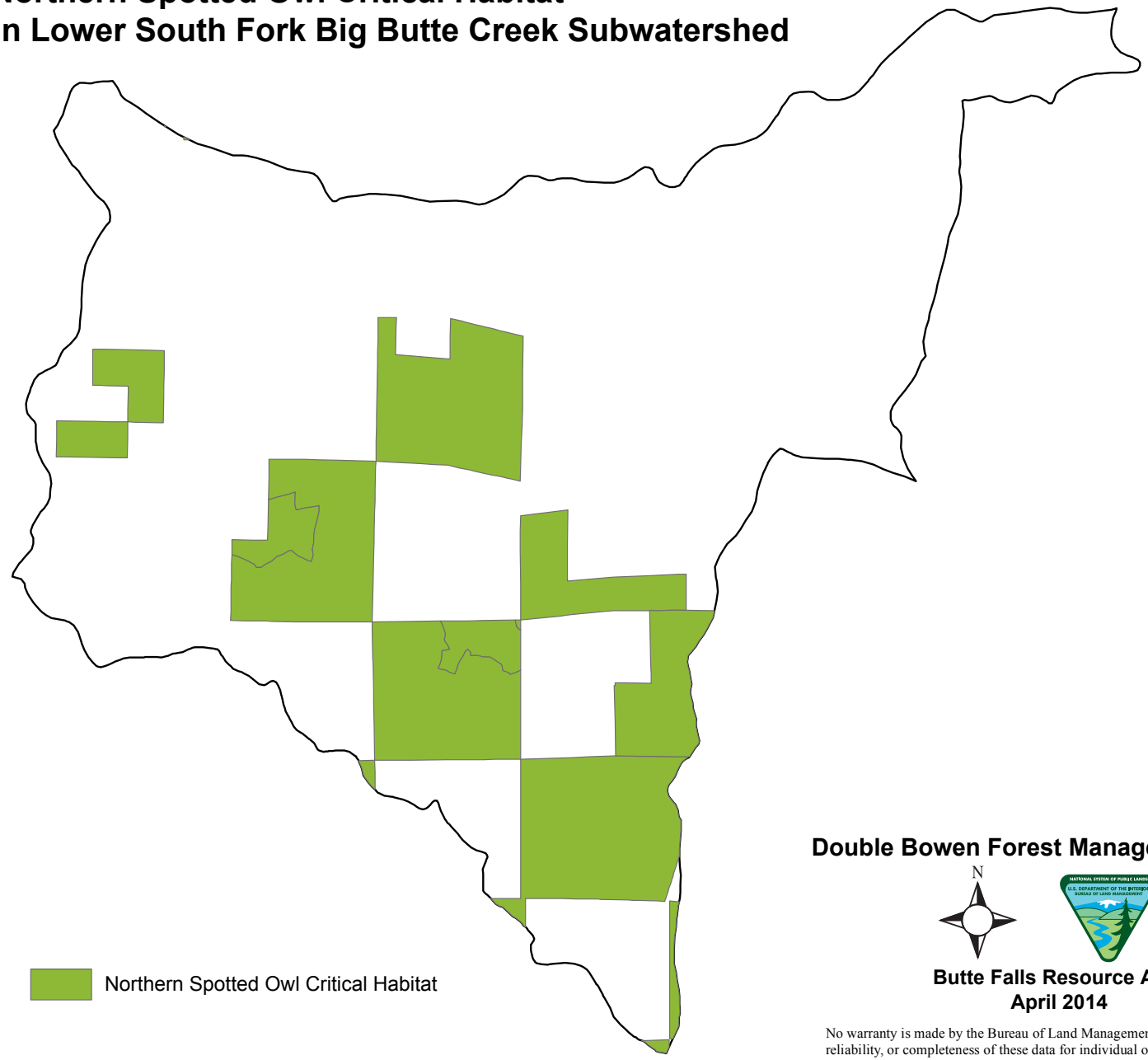
Double Bowen Forest Management Project

N

Butte Falls Resource Area
April 2014

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.

Map B-3. Northern Spotted Owl Critical Habitat in Lower South Fork Big Butte Creek Subwatershed



Double Bowen Forest Management Project

N

Butte Falls Resource Area
April 2014

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.

and growing space to sustain. Thin to differing residual densities, depending on site productivity and conifer species targeted.

- Reduce detrimental impacts to important invertebrates, fungi, mosses, and lichens by minimizing litter and topsoil disturbance during management activities. Use predesignated skid trails, cable systems, and small ground-based equipment, and winter log on slopes less than 35% when snow depth is sufficient to provide ground protection.
- Provide environmental conditions that are beneficial for insect predators (salamanders, bats, birds) by leaving woody debris, down logs, and snags for habitat. Minimize the movement/disturbance of existing large coarse woody debris and snags.
- Stabilize soil by reducing compaction and erosion; use harvest systems that minimize impacts during harvest activities.
- Root rot areas may be areas of intense harvest practices or untreated areas. Intense management or gaps created will be used to mitigate pathogen spread; within these areas or gaps, retain any nonsusceptible tree species. When root rot areas are left as nontreated areas or skips, it is anticipated they would provide a short-term periodic pulse of large snags and coarse woody debris.
- In high quality owl habitat, owl cores and designated RA32 stands, accept natural disturbances that cause mortality. Do not remove large snags or logs from the site.

B.5.1 Restoration Thinning Prescription

- reduces stand density
- retains old trees
- favors drought-tolerant species
- provides for structural diversity
- increases average stand diameter
- maintains canopy cover (40% or more)

The objective of restoration thinning is to increase stand resiliency to environmental disturbances (e.g., fire, insects, disease, and climate change). High stand densities, high surface and ladder fuels, and low tree vigor tend to magnify rather than buffer the effects of environmental disturbances or changes. Density reduction that emphasizes the removal of smaller trees and vegetation reduces competition for nutrients and water and increases overall tree and stand vigor.

- Trees 150 years or older would be targeted for retention. Determination of tree age would be made using a variety of sources such as increment core samples, rating systems for determining the general age of trees (Van Pelt 2008), counting tree stump rings, or stand birthdate from the Micro*Storm database. In most instances, visual attributes (Van Pelt rating system) would be used to determine if a tree is younger or older than 150 years of age. The visual rating system is not absolute but it is generally a reliable indicator of tree age. In rare instances, an older tree may be considered for removal if the tree's removal would benefit the long-term health and resiliency of the stand.
    - Removal of competing vegetation (<150 years old) underneath the drip line of healthy Douglas-fir and incense cedar trees to increase survival potential would be beneficial.
    - Specific to healthy, full-crowned ponderosa and sugar pine, removal of all trees less than 150 years old within the root zone below the drip line and 10 feet from the edge of the drip line

(approximately 20 to 30 feet from the bole of the tree) is a treatment goal. Pine species are more sensitive to high stand densities particularly on sites less than 3,500 feet in elevation.

  - Trees 150 years and older that have poor crowns (crown ratio less than 25% and a crown that has a thin, ragged appearance when viewed against the sky, along with poor needle color and dead and dying twigs or branches forming holes in the crown) should not be removed, but have the trees below the drip line thinned.

- The largest hardwoods with full vigorous crowns would be retained for species diversity, canopy layers, and natural drought tolerance. Removal of competing vegetation underneath the drip line would increase survival potential.
- Within-stand structural diversity would be increased by leaving small, unthinned patches and creating small openings. Unthinned patches and small openings would range in size from 0.1 to 0.25 acre (equal to 37- to 59-foot radius). The patch size recommendation is an approximation, and the use of the inherent diversity within a stand to identify and locate patches and openings would be used. The shape of patches and openings would be irregular and spatially random in occurrence within the stand.
  - Approximately 10 to 15% of the area would be a combination of unthinned patches and small openings. For example, a 20-acre stand would have 2 to 3 acres of patches and openings. In previously logged stands, canopy gaps are typically present so most of the structural diversity should be added by retaining unthinned patches.
  - When available, the use of existing stand characteristics to locate unthinned patches and openings would be used. For example, unthinned patches could be left adjacent to snags; large coarse woody debris; deformed trees; and existing dense pockets, seeps, or hardwood clumps. Overstory canopy openings could be created where vigorous understory regeneration is present, in root rot pockets, or in areas of lower site productivity.

- Stocking would be reduced to relative density targets averaging 35%. Leave tree spacing would vary and depend on the **existing** spatial arrangement of the desired trees within the stand. Uniform spacing is not desired; meeting the target basal area with trees having the desired characteristics (crown class, species, and vigor) is the primary objective. Relative densities and residual basal areas would be determined considering stand attributes such as site class, aspect, elevation, available precipitation, habitat thresholds, and plant series. Residual canopy cover would be at least 40% under all relative density targets.
- Dominant, codominant, and intermediate trees with the best crown ratios would be retained.
- Species preference would emphasize healthy ponderosa pine, sugar pine, incense cedar, and Douglas-fir, over white fir.
- Crowns of the retained pines and cedars would be full, with a minimum crown ratio of 35%. Needles would be dark green, crown tops would be pointed (not rounded), and there would be no evidence of resin flow on the upper bole of sugar pine. Pine species with poor crowns, characterized by a ragged appearance as well as foliage which is bunchy and of poor color, would be removed if less than 150 years old.
- A *leave* tree that is joined with another tree originating from the same root collar should both be retained regardless of crown class or condition.
- Neighboring trees that have their crowns intertwined with *leave* trees would be retained. Removing these associated trees can cause crown damage, reduce wind stability, and increase overall tree stress.

- Existing snags, stages 1–5, would be retained. When available, green trees (any diameter) immediately adjacent to snags greater than 20 inches DBH would be retained. These trees will provide additional structural and habitat diversity.
- Existing coarse woody debris, decay classes 1–5, would be left for retention. When available, green trees (any diameter) immediately surrounding large (>20 inches DBH and 8 feet long) pieces of coarse woody debris would be retained. Retention of green trees would minimize coarse woody debris disturbance and maintain the functional integrity of the coarse woody debris.
- Large (>20 inches DBH), broken, forked-top, and deformed trees would be targeted for retention. Retention would provide for plant and animal habitat, as well as future sources of coarse woody debris and snags.
- Smaller understory trees would be maintained for stand diversity and complexity. Small trees (<8 inches in diameter) would be thinned to reduce tree competition for site resources. Smaller trees contain a larger proportion of sapwood (living tissue) and require more site resources (nutrients and water) compared to older trees that proportionally have more nonliving heartwood.

B.5.2 Density Management Prescription

- Density reduction would maintain northern spotted owl dispersal habitat (40% canopy cover minimum) and nesting, roosting, and foraging habitat (60% canopy cover minimum). Density reduction would accelerate growth of dominant and codominant, and minor amounts of intermediate, trees. Second growth stands/clumps would be thinned from below; low vigor codominant or dominant trees may be removed to reduce density and if tree vigor is lower than adjacent trees.
- Stocking would be reduced by thinning from below to an average relative density of 35%. Spacing would vary depending on tree diameter and vigor.
  - Retains dominant and codominant trees with the best crown ratios.
  - Favors healthy ponderosa pine, sugar pine, Douglas-fir, and incense cedar over white fir.
  - Favors large (>20 inches DBH), healthy ponderosa and sugar pine over equally healthy Douglas-fir. The crowns of the retained pines should be full, with a minimum crown ratio of 35%. Needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. Pine species with poor crowns, characterized by a ragged appearance as well as foliage which is bunchy and of poor color, should be removed not retained.
- Existing snags, stages 1–5, would be retained. When available, green trees (any diameter) immediately adjacent to snags greater than 20 inches DBH should be retained. These trees will provide additional structural and habitat diversity.
- Existing coarse woody debris, decay classes 1–5, would be retained. When available, green trees (any diameter) immediately surrounding large (>20 inches DBH and 8 feet long) pieces of coarse woody debris would be retained. Retention of green trees minimizes coarse woody debris disturbance and maintains the functional integrity of the coarse woody debris.
- Harvest of large (>20 inches DBH), broken, forked-top, and deformed trees would be minimized. Retention for providing plant and animal habitat, as well as future sources of coarse woody debris and snags, is a treatment goal.

B.5.3 Selection Harvest Prescription

- Primary objectives for selection harvest are to reduce stand densities by removing high risk trees across all diameter size classes, accelerate the growth of the remaining trees, and improve stand health. Tree vigor, as defined by crown form and crown condition, would be the primary factors used in determining high risk trees. Thinning of even-aged pockets, where appropriate, is another function of this treatment. Residual canopy cover would be at least 40% under all relative density targets.
- Drought- and fire-tolerant tree species, such as ponderosa pine, incense cedar, Douglas-fir, sugar pine, and hardwood species, would be the favored leave species. Leave trees would be the largest full-crowned, healthy trees. In areas of root rot, healthy codominant and dominant Douglas-fir, incense cedar, sugar pine, and hardwood species would be favored.
- Larger (>20 inches DBH), healthy ponderosa and sugar pines would be favored over equally healthy Douglas-fir. The crowns of the retained pines should be full, with a minimum crown ratio of 35%. Needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. Pine species with poor crowns, characterized by a ragged appearance as well as foliage that is bunchy and of poor color, should be removed and not retained.
- In stands infected with Douglas-fir mistletoe, the infected Douglas-fir would be targeted first for removal.
- Existing snags, stages 1–5, would be retained. When available, green trees (any diameter) immediately adjacent to snags greater than 20 inches DBH would be retained. These trees provide additional structural and habitat diversity.
- Existing coarse woody debris, decay classes 1–5, would be retained. When available, this treatment retains green trees (any diameter) immediately surrounding large (>20 inches DBH and 8 feet long) pieces of coarse woody debris. Retention of green trees minimizes coarse woody debris disturbance and maintains the functional integrity of the coarse woody debris.
- Removal of large (>20 inches DBH), broken, forked-top, and deformed trees would be minimized. Retention for providing plant and animal habitat, as well as future sources of coarse woody debris and snags, is a treatment goal.

B.5.4 Riparian Thinning Prescription

- Riparian thinning would occur adjacent to upland stands to reduce stand density. Thinning would maintain northern spotted owl dispersal habitat (50% canopy cover minimum) and nesting, roosting and foraging habitat (60% canopy cover minimum). Riparian thinning accelerates growth of dominant, codominant, and minor amounts of intermediate trees. Treatment would be a thin from below in second growth type stands with little if any structural diversity. Low vigor codominant or dominant trees could be removed to reduce density if tree vigor is lower than adjacent trees.
  - Stocking would be reduced to an average relative density of 35%. Spacing would vary depending on tree diameter and vigor.
  - Dominant and codominant trees with the best crown ratios should be retained.
  - Favoring healthy ponderosa pine, sugar pine, Douglas-fir, and incense cedar for retention over white fir is a treatment goal.
  - Large (>20 inches DBH), healthy ponderosa and sugar pines would be favored for retention over equally healthy Douglas-fir. Prime candidates for retention would be pines that have full crowns

with a minimum crown ratio of 35%. Needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. Pine species with poor crowns, characterized by a ragged appearance as well as foliage that is bunchy and of poor color, should be removed and not retained if less than 20 inches DBH.

- Existing snags, stages 1–5, would be retained. When available, leave green trees (any diameter) immediately adjacent to snags greater than 20 inches DBH. These trees will provide additional structural and habitat diversity.
- Existing coarse woody debris, decay classes 1–5, would be retained. When available, green trees (any diameter) immediately surrounding large (>20 inches DBH and 8 feet long) pieces of coarse woody debris would be retained. Retention of green trees would minimize coarse woody debris disturbance and maintain the functional integrity of the coarse woody debris.
- Large (>20 inches DBH), broken, forked-top, and deformed trees would be retained for plant and animal habitat, as well as, future sources of coarse woody debris and snags.
- No trees of any species 20 inches DBH or larger would be extracted.
- Riparian hardwood species, such as willow, ash, yew, maple, and California black oak, would not be removed.

B.5.5 Small Diameter Thinning Prescription

- The primary objectives of small diameter thinning include increasing species diversity and reducing stand densities. Variable thinning from below in mixed conifer stands to remove the suppressed component of the stand would accelerate the growth of dominant and codominant trees and release smaller understory seedling and saplings of species such as Douglas-fir, incense cedar, sugar pine, and white fir trees. In pine plantations, trees would be spaced on a grid pattern to ensure the release of smaller natural regeneration or to create space for the planting of Douglas-fir, incense cedar, and sugar pine.
- Treatment would maintain residual stocking with a relative density of 25% (ponderosa pine plantations) to 35% (mixed conifer stands) and a remaining canopy cover of 40% to 70%.
- Favored leave tree species in mixed conifer stands would be ponderosa pine first, then sugar pine, incense cedar, Douglas-fir, and white fir. Favored leave tree species in ponderosa pine plantations would be Douglas-fir, incense cedar, sugar pine, and white fir.
- Dominant and codominant trees with the best crown ratios would be retained.
- The crowns of the retained trees would be full, with a minimum crown ratio of 35%. Needles would need to be darker green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine.
- When present, trees less than 8 inches in diameter would be thinned to leave approximately 200 trees per acre (15-foot by 15-foot spacing). Favoring healthy Douglas-fir, incense cedar, sugar pine, and ponderosa pine over white fir would be a treatment goal.
- Existing snags, stages 1–5, would be retained. When available, green trees (any diameter) would be reserved immediately adjacent to snags greater than 16 inches DBH. These trees will provide additional structural and habitat diversity.
- Existing coarse woody debris, decay classes 1–5, would be retained. When available, green trees (any diameter) would be retained immediately surrounding large (>20 inches DBH and 8 feet

long) pieces of coarse woody debris. Retention of green trees would minimize coarse woody debris disturbance and maintain the functional integrity of the coarse woody debris.

- Small diameter thinning in riparian reserve stands would have a 35-foot no-treatment buffer adjacent to either side of a non-fish-bearing stream, and a 60-foot no-treatment buffer adjacent to either side of fish-bearing streams.
- Hardwoods 12 inches and greater would be reserved.
- In ponderosa pine plantations that do not have appropriate stocking of conifer, tree planting would occur with a species mixture of Douglas-fir, incense cedar, and sugar pine.

B.5.6 Shelterwood Prescription

- Stand densities would be reduced to a minimum number of remaining large (>20 inches DBH) overstory green trees, varying from 12 to 25 trees per acre. To the greatest extent possible, the spatial distribution of leave trees should be based on a grid pattern to provide shelter. Variances in spacing would be allowed in order to leave the best conifers with the largest crowns. Leave trees would have the following attributes: (a) low susceptibility to wind, snow, and ice damage, as measured by a height-to-diameter ratio of 70 or below; (b) crown ratio greater than 35% with a healthy crown, dark foliage, and dense needles; (c) disease free; and (d) healthy seral species such as Douglas-fir, ponderosa pine, sugar pine, and incense cedar.
- After harvest, canopy cover would range from 20 to 40%, depending on the number of 20 inches DBH trees (12–25) per acre retained.
- Douglas-fir, sugar pine, ponderosa pine, incense cedar, and hardwood species are the preferred leave species. Desired leave trees would be the largest full-crowned, healthy trees. In areas of root rot, healthy codominant and dominant Douglas-fir, incense cedar, sugar pine, and hardwood species would be favored.
- In stands infected with Douglas-fir mistletoe, the infected Douglas-fir would be targeted first for removal. If other conifer species (white fir, incense cedar, ponderosa pine, and sugar pine) cannot provide enough trees to meet the regeneration tree count, mistletoe-infected Douglas-fir trees would be retained as long as they are clumped near the perimeter and in the lowest topographic areas of the stand. If mistletoe-infected Douglas-fir trees are left within a unit, Douglas-fir seedlings would not be planted within 50 feet of the infected trees.
- Approximately 2 snags per acre (stage 1 or 2) and 120 linear feet of coarse woody debris (decay class 1 and 2) would be retained. Additional green tree retention would occur in place of deficit snag counts or coarse woody debris, if needed to meet the required 1 to 2 wildlife snags per acre, or to meet coarse woody debris requirements.
- Large hardwoods greater than 16 inches DBH would be retained.
- Tree planting after harvest would occur normally with a mix of ponderosa pine, Douglas-fir, sugar pine, and incense cedar with 300 to 500 trees per acre. Planted tree species mixtures may vary depending on their resistance to disease or pathogens known to a specific site.

Appendix C:

Double Bowen Forest Management Project Silviculture Prescription, Marking Guidelines, and Stand Inventory

Definitions

abiotic. Nonliving basic elements and compounds of the environment.

apical dominance. The dominance of the main central stem of a plant over side stems.

biotic. Living components of an ecosystem.

codominant trees. Trees with crowns forming the general level of the crown canopy and receiving full light from above but comparatively little from the sides.

crown ratio. The ratio between the length of the green crown of a tree and its total height.

dominant trees. Trees with crowns extending above the general level of the crown canopy and receiving full light from above and partly from the side.

inoculum. A pathogen or pathogen part (e.g., spores, mycelium) that infects plants.

intermediate trees. Trees shorter than dominant or codominants with crowns below or barely reaching into the main canopy.

ORGANON. An individual tree growth computer model developed for areas of the Pacific Northwest.

photosynthesis. The production of carbohydrates from carbon dioxide and water.

relative density. The degree of crowding in a forest stand. When two stands have the same relative density they can be thought of as being at the same degree of crowding, although they may differ in age, tree size, or site quality.

seral stages. The series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage. The age classes for the five seral stages are (1) early seral, 0–10 years; (2) mid-seral, 10–40 years; (3) late seral, 40–80 years; (4) mature seral, 80–200 years, and (5) old growth, greater than 200 years.

stomate. An opening in the surface of a leaf through which water vapor, carbon dioxide, and oxygen pass.

suppressed trees. Trees with crowns entirely below the general canopy receiving no direct light from either above or from the sides.

C.1 Management Direction and Objectives

C.1.1 Medford District RMP Management Direction

The management objectives on matrix lands as defined by the Medford District ROD/RMP (p. 38–39) are to

- produce a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability;

- provide connectivity (along with other allocations such as riparian reserves) between late-successional reserves;
- provide habitat for a variety of organisms associated with both late-successional and younger stands;
- provide for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees; and
- provide early successional habitat.

C.1.2 Treatment Objectives

Treatment objectives are dependent on the alternative chosen.

The primary objective of Alternative 2 is to apply silviculture treatments that would benefit stand health while maintaining owl habitat within the northern spotted owl home range and CHU, unless there is an ecological condition that warrants mitigation measures to increase stand health and longevity. Within the 1.2–mile home range and CHU, spotted owl habitat that is currently defined as structurally complex; dispersal; or nesting, roosting, and foraging would not be altered to the extent that the current habitat designation would be downgraded, except in harvest units 31-5 and 31-6. In units 31-5 and 31-6, potential downgrading of owl habitat is likely to occur to mitigate the spread of root rots (laminated, annosus, *Armillaria*) and Douglas-fir mistletoe. This objective applies to all proposed treatment area stands. Outside of the 1.2–mile home range or CHU, this alternative would implement Medford District RMP management direction for matrix land.

The purpose of Alternative 3 is to increase landscape resiliency to environmental disturbances (e.g., fire, insects, disease, and climate change) by reducing stand densities, favoring drought-tolerant species, and increasing structural complexity while maintaining northern spotted owl habitat in the home ranges and CHU. Northern spotted owl habitat and CHU that is currently defined as structurally complex; dispersal; or nesting, roosting, and foraging would not be altered within the 1.2-mile home range of northern spotted owls to the extent that the current habitat designation is downgraded except units 31-5 and 31-6. In units 31-5 and 31-6, potential downgrading of owl habitat is likely to occur to mitigate the spread of root rots (laminated, annosus, *Armillaria*) and Douglas-fir mistletoe. No regeneration harvests are proposed.

C.2 Site and Stand Condition

C.2.1 General Site Description

The proposed treatment area is located in Jackson County approximately 0 to 5 air miles south and southeast of the city of Butte Falls, Oregon. The Project Area is located in portions of sections 13, 15, 23, and 25 in Township 35 South, Range 2 East, and sections 7, 19, and 31 in Township 35 South, Range 3 East.

C.2.2 Drainage/Watershed

The proposed treatment area is located in the Lower South Fork Big Butte Creek subwatershed within the Big Butte Creek fifth-field watershed.

C.2.3 Abiotic Conditions

C.2.3.1 Soil Type

The dominant soil types are the Geppert and Freezner soil series. The Freezner-Geppert soil complex is defined as 60% Freezner soils and 35% Geppert soils with 5% inclusions. Freezner soils are very deep and well-drained, and have a clay-loam subsoil. The Geppert soil is moderately deep and is skeletal (>35% rock fragments in the subsoil) with an extreme cobbly clay subsoil.

C.2.3.2 Site Index

Site index is the average height of the dominant trees at 50 years. The site index average for Douglas-fir within the treatment area is 76 feet, based on Hann-Scrivani site index equations (Hann and Scrivani 1987). Height growth is relatively independent of stand density and provides a comparable measure of site productivity between different forest stands.

C.2.3.3 Topography/Precipitation

The land form within this area is not highly dissected and generally has flat to gentle slopes. The elevation ranges from 2,600 feet to 4,200 feet above sea level. Annual precipitation averages 45 inches, with approximately 7 inches of dry season precipitation.

C.2.3.4 Existing Site Problems

High growing season temperatures, high evaporative demands, and frequent frosts characterize the climate of this timber sale area. The high demand for moisture during prolonged hot and dry summer days increase tree stress, particularly in overstocked forest stands. During hot, dry periods, the uptake of moisture cannot keep up with the loss through transpiration. When this occurs, the plant closes leaf stomates to maintain adequate cell water content. Plants require at least 75% water content in functional cells (Bradford and Hsiao 1982). With the leaf stomates closed, carbon dioxide is not taken into the plant through photosynthesis and the conversion of carbon dioxide and water into carbohydrates, or “food,” does not occur. Without the creation of “food,” the life processes of the tree are interrupted resulting in increased tree stress and a higher risk of insect attack or disease infection. Reduced resin flow in water-stressed trees enables insects to successfully attack the tree (Kramer and Kozlowski 1979).

Frost can be a regeneration problem. Cold air often accumulates (puddles) in low lying areas with slopes less than 15%. Late frosts caused by excessive loss of heat through nighttime reradiation are a common occurrence in areas. The degree of vegetative frost damage is influenced by terrain, soil moisture content, and the amount and kind of ground cover present

C.2.4 Biotic Conditions

C.2.4.1 Plant Series

The north/south orientation of the Cascade Mountains provides the environmental gradient that influences the presence and abundance of vegetative species. Slope, aspect, elevation, soil depth, and geology further define the extent and occurrence of various species. Within the proposed timber sale area, white fir is the dominant plant series. The white fir series is one of the most widespread, diverse, and productive plant series of the Southern Oregon Cascades. Ponderosa pine, sugar pine, incense cedar, and Douglas-fir represent the early seral tree component of this series. Douglas-fir generally dominates the overstory of most stands before being replaced by white fir.

Four plant associations occur in the Project Area: white fir-Douglas-fir/piper Oregon grape (ABCO-PSME/BEPI), white fir/California hazel-western serviceberry (ABCO/COCOC-AMAL), white fir/vine maple/vanilla leaf (ABCO/ACCI/ACTR), and white fir-poison oak (ABCO/RHDI). The ABCO-PSME/BEPI association is the most common and the ABCO/RHDI association, the least common, is generally restricted to dry ridge tops.

All the plant associations are on the warm and dry end of the environmental gradient, with moisture limitations late in the growing season limiting biomass production. The understory is dominated by white fir, with Douglas-fir common. White fir, Douglas-fir, incense cedar, and sugar pine will establish on the site following disturbance. Hardwoods include minor amounts of California black oak, madrone (in areas of relatively recent fires), and golden chinquapin (on shallow, rocky soils). Shrub competition is generally moderate to severe following site disturbance in which the overstory canopy is opened (less than 60% crown closure). Vegetative management will be required to insure successful establishment and growth of conifer regeneration. Shrub species that are present in varying amounts are deerbrush ceanothus, oceanspray, vine maple, hazel, red stem ceanothus, serviceberry, Oregon grape, and thimbleberry. Common herbaceous vegetation includes pathfinder, western starflower, western twinflower, and white inside-out flower.

C.2.4.2 Stand History

Historically, fire was the primary large-scale natural disturbance event. Within the analysis area, both stand-replacement fires and less intense underburns were common prior to fire exclusion. The majority of timber stands commonly experience high temperatures, moderate precipitation, and low fuel moisture in the summer. Historically, this provided conditions conducive to frequent fire occurrence with variable levels of severity. Intense stand-replacement wildfires burned every 80 to 200 years or more; less intense underburns were more frequent. Frequent fire often provided for a low thinning effect and retention of seral fire-resistant species such as ponderosa pine, sugar pine and incense cedar. Intense stand-replacement fires have occurred occasionally in lower elevations and are evidenced by the development of stands dominated by madrone or even-aged Douglas-fir with little to no variation in structure. Moderate to high severity fires were more infrequent in occurrence and would typically occur on northern aspects and higher elevations (above 3,500 feet) where higher productivity levels, relatively cooler summertime temperatures, and higher levels of moisture would work in combination to provide for a longer fire-return interval.

During the past century, logging has replaced fire as the primary event that has shaped stand condition and structure. Timber harvest in the Project Area has consisted of individual tree selection, overstory removal, clear-cutting, commercial thinning, density management, regeneration harvest, and salvage of dead and dying trees (Theis and Sturrock 1995).

Since the implementation of the ROD/RMP in 1995, timber harvest has occurred on 9,178 acres of BLM-administered lands within the Big Butte Creek fifth-field watershed. Density reduction treatments (e.g., restoration thinning, commercial thinning, density management, and individual tree selection) occurred on approximately 63% of the treatment acres, regeneration harvest on about 4%, mortality salvage on about 32%, and overstory removal and clear-cut on the remaining 1%.

Density management redistributed growth from many small trees to fewer large healthy trees. The remaining trees have adequate site resources to maintain good growth rates with tree vigor at levels necessary to minimize mortality due to competition or insects and disease. Regeneration harvesting replaced stands that have passed the point of optimum wood production with young, fast-growing conifer stands that maximize the volume growth capability of the site. Mortality salvage removed scattered individual to large concentrations of wind thrown or wind-damaged trees. Approximately 43% (1,106 acres) of the mortality

salvage area sustained severe wind damage in 2008, resulting in stand conditions similar to a regeneration harvest. Within these stands, trees were uprooted, tops snapped off, and crowns defoliated by the loss of branches and needles. In some cases, canopy cover declined from approximately 80–100% to less than 30%. A mix of conifer seedlings was planted to insure full site occupancy. Overstory removal was the final stage of cutting where the remaining overstory trees were removed to allow the understory to grow. Clear-cutting removed trees to facilitate road construction associated with timber harvest.

C.2.4.3 Structure Description

The structural characteristics of the stands within the proposed treatment areas vary from single layer, even-aged stands to multilayer, uneven-aged stands. Where wildfires burned intensively, crown fires occurred and even-aged stands became established. The majority of the even-aged stands are 120 years old or less. When wildfires burned at a lower level of intensity and were confined to the ground level, multilayered, uneven-aged stands developed. Multiple canopy stand conditions are the norm where stands are mature (150 years or greater). In general, 2-storied and multistoried stands have understories that are suppressed and usually dominated by Douglas-fir or incense cedar. In most stands, widely scattered 30- to 40-inch or more Douglas-fir, sugar pine, ponderosa pine, and incense cedar trees are also present as fire remnants of previous stands. With decades of fire exclusion, stand development has stagnated and stand densities have increased.

C.2.4.4 Coarse Woody Debris

Coarse woody debris provides habitat for wildlife, invertebrate, microbial, and fungal species, as well as important ecological functions such as moisture retention, soil stabilization, and nutrient recycling. The amount and decay class of woody debris reflects the stage of stand development (Table C-24). In a natural cycle, two stages (stand initiation and old growth) typically have the greatest amounts of coarse woody debris. Older decay classes (3, 4, and 5) are more common and reflect coarse woody debris created since stand initiation wildfires in the early 1900s. Where coarse woody debris does occur, it will not be removed from the site and will be protected from disturbance. In forest stands identified for regeneration harvest, trees will be designated and reserved to meet the coarse woody debris requirements of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long, decay class 1 or 2 (Table C-25).

C.2.4.5 Snags

RMP standards and guidelines require that, over time, one to two snags per acre will be present to meet the requirement for cavity nesting birds at 40% of potential population levels (ROD/RMP, p. 40). All deterioration stages of snags (Table C-26) will be retained as part of the silviculture prescription. During harvest operations, existing snags will be reserved from felling where they are not a safety hazard, and, where necessary, additional green trees will be reserved to meet the target levels. If a snag needs to be fallen for safety concerns, the snag will be left on-site to function as coarse woody debris.

C.2.4.6 Tree and Stand Health, Insects, and Disease

Bark beetle activity is currently low within the Project Area. Flatheaded wood borers (*Melanophila drummond*), western pine beetles (*Dendroctonus brevicomis*), and fir engraver beetles (*Scolytus ventralis LeConte*) are active at natural levels in and adjacent to the Project Area. High stocking levels and low moisture availability will continue to create environmental conditions favorable to bark beetle infestation of stressed trees.

Root rots (annosus, Armillaria, and laminated) are present and are affecting white fir, ponderosa pine, sugar pine, and Douglas-fir. In T35S, R2E, section 25 and T35S, R3E, section 31, the occurrence of root rots (predominately S-group annosus) is common and has caused tree decline and white fir mortality.

Management options vary depending on the amount of root rot present. In stands where the inoculum is present in 20% or more of the stand, thinning is not recommended; a regeneration harvest with species conversion to resistant species is the most appropriate treatment. In stands with less than 20% of the area affected, thinning can benefit tree and stand vigor. If the inoculum occurs in small, discrete pockets or is limited to certain portions of the stand, thin the healthy portions and treat the diseased portions using one of the following options: (1) remove all trees in the disease centers and those within 50 feet of the center, or (2) if thinning will increase the probability that losses to windthrow will be greater than losses to disease, avoid the disease centers (Theis and Sturrock 1995). In all cases, favor the retention of trees that appear to be the most disease resistant; disease virulence and tree species susceptibility can vary from location to location. Root rots also create tree stress and can predispose trees to bark beetle attack. In the root rot areas described above, bark beetles have attacked and killed affected trees.

Stem rots (*Phellinus pini, Oligoporus amarus,* and *Phaelos schweinitzii*) are present in a small number of trees, but do not pose a serious concern for stand health. The trees infected with stem rots enhance forest diversity by providing trees with unique structural defects that serve as plant and wildlife habitat, as well as sources for future coarse woody debris.

Douglas-fir mistletoe is affecting tree vigor in T35S, R2E, sections 23 and 25 and T35S, R3E, section 31. Mistletoe is host-specific and may cause tree mortality; growth loss; alteration of crown and canopy structure; increased fire hazard; and increased susceptibility to bark beetles, root rots, and drought stress. Mistletoe brooms, although detrimental to tree growth, provide habitat for mammals and birds. Throughout the analysis area outside of the sections mentioned above, mistletoe occurs at lower levels and is a concern with respect to future stand development. Lightly infected mature stands with an understory of host species have the greatest potential for severe mistletoe infection and spread. Removal of infected trees, thinning to favor nonhost species, or regeneration of nonhost species will minimize the potential for increased levels of mistletoe infection.

High stand densities are affecting individual tree vigor and stand health. Overstocked stands contain more trees than the site has resources (e.g., moisture, nutrients, and growing space) to provide (Figure C-1). This leads to increased tree stress, particularly during prolonged hot summer days without precipitation. Decreased tree vigor is magnified during periodic drought years when the cumulative effects of below average amounts of precipitation cause the interruption of basic functional processes (e.g., photosynthesis, transpiration, respiration, translocation, and assimilation) over an extended period of time.

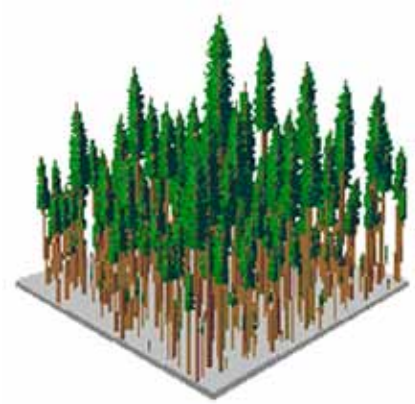
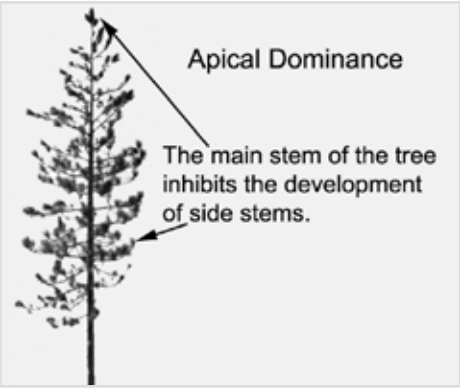


Figure C-1. Current Stand Conditions. Forest stands are overstocked with more trees than the site has water, nutrients, and growing space to sustain.

Relative density is a measure of crowding in a stand of trees. It compares the number of trees present to the number of trees the site has resources to support. In forest stands proposed for management entry, stand exams were completed to determine the relative density. The average relative density levels within the units proposed for thinning are approximately 73%. As a point of reference, crowns begin to close when the relative density approaches 15% and the mortality of suppressed trees begins after the relative density reaches 60% (Perry 1994; Hann and Wang 1990). Maintaining the relative density in forest stands between an upper end of 50% and a lower end of 25% prevents excessive tree loss from competition.

Tree senescence, or aging, also plays a role in the condition and vigor of individual trees. As a tree increases in size and builds up a complex branch system, it shows a decrease in metabolism; gradual reduction



in growth of vegetative and reproductive tissues; loss of apical dominance; increase in dead branches; slow wound healing; heartwood formation; increased susceptibility to injury from certain insects, diseases, and unfavorable environmental conditions; and loss of geotropic responses (growth of stems upward and of roots downward in response to gravity). There is also a decrease in the proportion of photosynthetic to nonphotosynthetic tissue; this reduction results in the production of fewer carbohydrates (Kramer and Kozlowski 1979). Movement of food, water, and minerals becomes more difficult as the distance from the roots to the top of the tree increases. This problem is magnified when water becomes a limiting resource in tall trees. Water deficits may cause needle and stem mortality as evidenced by snag tops or dead branches and needles in the upper part of the crowns

In addition to tree aging and the high numbers of trees per acre, other factors contribute to individual tree health and vigor. Factors such as the amount of understory shrub growth, soil type, precipitation, aspect, crown position in the canopy, topography, root pathogens, and insects combine to affect tree vigor and the tree's ability to maintain basic functional processes.

C.3 Analysis in Support of the Prescription

The target stand reflects not only what is planned for the future but also what is expected immediately after treatment. The target stand represents optimum conditions to strive for through management.

Depending on the alternative selected, one or more of the following silviculture prescriptions may be implemented: regeneration harvest, density management, riparian thinning, selection harvest, or restoration thinning. Individual operational inventory (OI) units are grouped under these categories based on the proposed treatment.

C.3.1 Regeneration Harvest

OI unit #19-8 in T35S, R3E, section 19 is proposed for regeneration harvest.

Shelterwood retention is the recommended regeneration harvest prescription. The target stand for this method would retain 12 to 25 green trees per acre greater than 20 inches DBH.

C.3.1.1 Present Conditions

Many of the stands were tractor logged in the past. Individual tree selection was the primary harvest method applied. This resulted in the development of stands with multiple canopy layers. Varying levels of the overstory tree component are declining due to high stand density levels, root pathogens, and tree senescence. Overstory tree species are primarily Douglas-fir with lesser amounts of white fir; the minor species include sugar pine, incense-cedar, and ponderosa pine. All stands have reached the targeted rotation age of 100 years on northern GFMA matrix lands. The rotation age is set at the culmination of mean annual increment, which is the peak of average yearly growth in the volume of a forest stand.

The shrub species present in most units are Oregon grape (dwarf and piper's), deerbrush ceanothus, hazel, service berry, oceanspray, and vine maple. In most units, shrub cover is low to moderate, occurring in patches or as a scattered vegetative component. Hardwood species include madrone and black oak.

Generally, the hardwoods are widely scattered or occur in small clumps and are a minor compositional component of the stands.

Natural regeneration (seedlings and saplings) in most units are dominated by Douglas-fir, followed by white fir, with lesser amounts of incense cedar, ponderosa pine, and sugar pine, with density levels varying from stand to stand.

C.3.1.2 Target Stand

The minimum number of remaining large (> 20 inches DBH), overstory green trees for shelterwood retention would vary from 12 to 25 trees per acre (Figure C-2). Douglas-fir, sugar pine, ponderosa pine, incense cedar, and hardwood species will be the preferred leave species. Leave trees will be the largest full crowned, healthy trees. In areas of root rot, healthy codominant and dominant Douglas-fir, incense cedar, sugar pine, and hardwood species will be favored. In stands infected with Douglas-fir mistletoe, remove all Douglas-fir. If other conifer species (e.g., white fir, incense cedar, ponderosa pine, and sugar pine) cannot provide enough trees to meet the regeneration tree count, mistletoe-infected Douglas-fir trees can be left as long as they are clumped near the perimeter and in the lowest topographic areas of the stand. If mistletoe-infected Douglas-fir trees are left within a unit, do not plant any Douglas-fir seedlings within 50 feet of the infected trees.

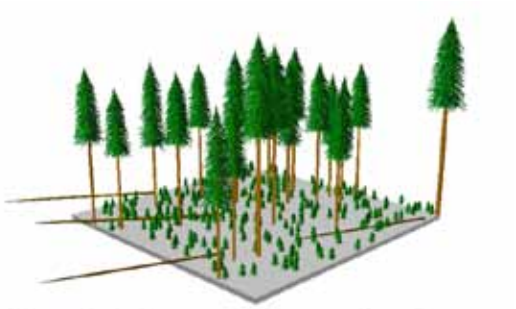


Figure C-2. Shelterwood Regeneration Harvest. Target stand structure is 12–25 green trees per acre >20" DBH, a minimum of 1.8 snags per acre, and a minimum of 120 linear feet of coarse woody debris.

Existing snags will be left and additional healthy or cull green trees greater than 20 inches DBH will be reserved if needed to meet the required 1 to 2 wildlife snags per acre, or to meet coarse woody debris requirements. Two to four of the largest hardwoods per acre will be reserved for wildlife and stand diversity. Tree form (height and crown condition) will determine which hardwoods to leave.

Special status species may occur within the stands. These species will be buffered and protected. These buffer patches will provide additional structural diversity within stands.

To prepare nonstocked sites for tree planting, logging slash would be underburned or hand or machine piled and burned. To promote species diversity within these units where planting is required, a mixture of Douglas-fir, sugar pine, ponderosa pine, and incense cedar will be planted following site preparation activities. Approximately 300 to 500 trees per acre will be planted. Species mix will be 70% Douglas-fir, 20% sugar or ponderosa pine, and 10% incense cedar. In stands containing laminated root rot, no Douglas-fir would be planted; instead, a mix of sugar pine, ponderosa pine and incense cedar would be planted. In stands with annosus root rot, no ponderosa pine would be planted, instead a mix of Douglas-fir, sugar pine, and incense cedar would be planted. *In regeneration harvest units adjacent to stands infected with Douglas-fir mistletoe, do not plant any Douglas-fir within 50 feet of the perimeter.* This will minimize the potential for mistletoe infection in newly planted Douglas-fir seedlings.

Table C-1. Regeneration Harvest Treatment Schedule

Year	Regeneration Harvest Treatment
0	**Harvest:** Leave target of 12 to 25 green conifer trees per acre greater than 20″ DBH Leave a minimum of 1.8 snags per acre (stage 1 and 2) and 120 linear feet of coarse woody debris (decay class 1 and 2, 16″ x 16′). **Site Preparation:** Slash trees 1 to 6″ DBH damaged from logging activities. Leave all healthy, unmerchantable trees. Treat brush and hardwoods by slashing. Underburn or hand or machine pile and burn. Limit piling of logging slash to pieces less than 16″ DBH.
0–1	Plant with a mix of ponderosa pine, Douglas-fir, sugar pine, and incense cedar. Apply appropriate maintenance (e.g., vexar tubing, mulching, shading, scalping, baiting) treatments to ensure planting success.
1	Conduct 1st year survival survey. Assess need for supplemental planting or additional maintenance treatment.
3	Conduct 3rd year survey. Assess need for replanting or additional maintenance needs.
5	Conduct 5th year stocking survey. Target stand will have a minimum of 280 well-spaced trees per acre. Competing vegetation will have been controlled, with trees growing rapidly.
10	Precommercial thin the understory if density is more than 400 trees per acre. Favor pine species, Douglas-fir, and incense cedar. Thin to approximately 200 trees per acre.
15–20	In shelterwood retention units, overstory trees in excess of 6–8 green trees per acre may be harvested after 15 to 30 years, if the understory is well established and frost damage is no longer a concern.
35	Trees average 10″ DBH. Commercial thin if stand density is appropriate. Otherwise, delay until crown cover and competition reduces growth rates. Thin to approximately 200 trees per acre.
45–80	Commercial thin, if appropriate. Favor leaving the pines, Douglas-fir, and incense cedar. Use relative density target of 35%; on low elevation sites on south or west aspects, the relative density target may be lowered to 25%.
100	Assess stand and watershed conditions for possible regeneration harvest.

C.3.2 Density Management and Riparian Thinning

The OI units proposed for these treatments are listed in sections C.5.2 and C.5.3.

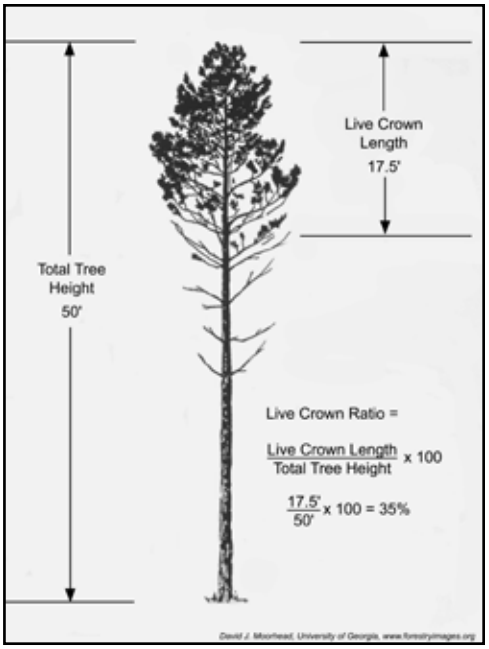
C.3.2.1 Present Conditions

Stand densities are high, with the number of trees per acre above the long-term carrying capacity of the site. In the forest stands identified for this type of treatment, the average relative density is 73% in the Double Bowen Project Area. At relative density levels greater than 60%, the following tree and stand changes begin to occur: competition-related mortality becomes significant, sensitivity to the effects of drought increases, self-thinning begins, growth declines, volume growth per acre is offset by mortality, and the susceptibility of trees to insect and disease attack increases. The tree species composition of these stands is a mixture of

Douglas-fir, white fir, and minor amounts of ponderosa pine and sugar pine. Hardwood species include madrone and black oak.

C.3.2.2 Target Stand

The main objective within these stands is to improve individual tree and stand health. Harvest within these units would be targeted toward reducing the stocking levels in those areas where overstocked conditions of sapling, pole, and mature timber exists. Density levels would be reduced by removing the suppressed crown class trees and increasing the spacing of the intermediate and dominant/codominant crown classes. Remaining trees would have crown ratios greater than 35% and would be the better formed trees. Ponderosa pine, sugar pine, incense cedar, and Douglas-fir would make up the preferred leave species. Large (>20 inches DBH), healthy ponderosa and sugar pine would be favored over equally healthy Douglas-fir (Figure C-3). The crowns of the retained pines should be full, with a minimum crown ratio of 35%, needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. The residual crown cover of these stands would range from a minimum of 40 to 60%.



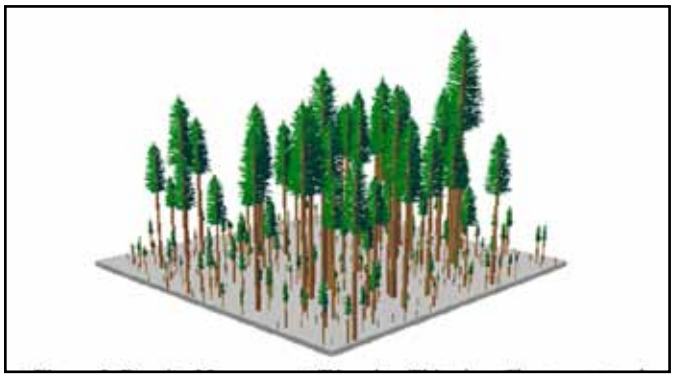


Figure C-3. Density Management/Riparian Thinning. The target stand has reduced density levels with healthy ponderosa and sugar pines >20" DBH favored.

Large (>12 inches DBH), healthy hardwoods (madrone and black oak) would remain as a scattered stand component. Removal of competing trees would provide the necessary top light required for the continued growth of these trees.

Survey and manage species may occur within the stands. Where species do occur, sites would be buffered and protected. These buffer patches would provide additional structural diversity within stands.

Stage 1 and 2 snags >20 inches DBH would remain for wildlife, future coarse woody debris, and structural diversity. To provide structural habitat and to maintain the existing microenvironment, trees immediately surrounding these stand components would be left.

Table C-2. Density Management and Riparian Thinning Treatment Schedule

Year	Treatment
0	**Harvest:** Thin from below first, removing the suppressed component of the stand, followed by thinning the main canopy to reduce densities and to remove any trees that are insect- or disease-infected or otherwise declining (based on crown ratio and form). Maintain residual stocking with a relative density of 35% or more, and crown cover with a minimum of 40% (50% riparian thinning) to a minimum of 60%. Favored leave species are ponderosa pine, sugar pine, incense cedar, and Douglas-fir. Reserve healthy ponderosa and sugar pine >20″ DBH to maintain genetic and structural diversity. No logging equipment is allowed within riparian thinning areas. Logs would be cable winched to adjacent upland matrix lands. Use existing, widely spaced skid trails and directional falling to reduce impacts to the site and residual stands. Reserve 2 to 4 of the largest hardwoods (12″ DBH or greater) per acre. Reserve all hardwoods in riparian thinning areas. As needed, hand pile heavy concentrations of slash; otherwise, lop and scatter. Slash all sprung, severely damaged, spindly crowned, low crown ratio (less than 40%) conifers and hardwoods between 1 and 7″ DBH outside of riparian reserves. No trees 20″ DBH and larger will be extracted from riparian reserves.
10–30	If the stand is less than 100 years old, conduct a stand exam to determine density levels. Evaluate the health of the stand for excess tree mortality and reduced radial growth. A second thinning entry would likely occur to maintain tree vigor and species diversity. If the stand is greater than 100 years old, it meets the RMP stand age requirement for a regeneration harvest. Evaluate for regeneration harvest.

In areas of annosus root rot, healthy codominant and dominant Douglas-fir, sugar pine, incense cedar, and hardwood species would be favored over white fir and ponderosa pine. In areas of *Armillaria* root rot, all conifer species with the exception of incense cedar are susceptible to infection. White fir is the most severely infected conifer with Douglas-fir, ponderosa pine, and sugar pine moderately affected. In areas of laminated root rot (*Phellinus*), healthy codominant and dominant ponderosa pine, sugar pine, incense cedar, and hardwood species would be favored for retention over white fir and Douglas-fir.

Douglas-fir mistletoe may be present within the stands. A measure of mistletoe infection severity is based on a rating scale. A tree's crown is divided into thirds and each third is rated. If less than 50% of the branches are infected in that third, the rating is 1. If more than 50% are infected, it is 2. If there are no visible infections, the rating for that third of the crown is 0. Add the rating of each third to get a total rating: 1 to 2 is light; 3 to 4 is moderate; 5 to 6 is heavy. Mistletoe-infected trees would be removed based on their mistletoe rating. Mistletoe-infected trees with a rating of 4 to 6 would be targeted first for removal, followed by the least infected Douglas-fir trees with a mistletoe rating of 3 or below if target basal area retention levels allow.

C.3.3 Selection Harvest

The OI units proposed for selection harvest are listed in section C.5.4.

C.3.3.1 Present Condition

In the stands recommended for selection harvest, stand structure and tree condition is highly variable due to past logging activities. The severity of Douglas-fir mistletoe is variable across the stands and will play a role in the spatial density and arrangement of the leave trees. Competition between trees for limited site resources is intense as the average relative density for these stands is high at 68%. The tree species composition is a mixture of predominantly Douglas-fir with lesser amounts of ponderosa pine, sugar pine, incense cedar, black oak, and madrone.

C.3.3.2 Target Stand

Following the harvest entry, these stands would be composed of the healthiest trees of all species and diameter classes (Figure C-4). When available, large healthy sugar and ponderosa pines would be retained to ensure their continued presence in the stand. Species composition would be dominated by Douglas-fir, followed by smaller amounts of incense cedar and white fir, and lesser amounts of ponderosa pine, sugar pine, and large hardwoods. Vertical and biological diversity would be present through the retention of trees of all ages and size classes. Douglas-fir mistletoe may be present within the stands. Mistletoe-infected trees with a rating of 4 to 6 would be removed, leaving the least infected Douglas-fir trees with a mistletoe rating of 3 or below.

Figure C-4. Selection Harvest. The target stand structure contains the healthiest trees of all species and diameter classes.

Survey and manage species may occur within the stands. Where sites do occur, patches of less than 1 acre would be buffered and protected. These patches would provide additional structural diversity within stands.

The estimated range of canopy cover would be from a minimum of 40% to a minimum of 60%. Coarse woody debris is present and provides conditions favorable for nutrient recycling, soil mychorrizae, and the development of nitrogen-fixing bacteria. Cull trees would be left to insure that a near-term "pulse" of coarse woody debris and snags would be available. Where available, large (>12 inches DBH), healthy hardwoods would remain as a scattered stand component.

Table C-3. Selection Harvest Treatment Schedule

Year	Selection Harvest Treatment
0	**Harvest:** Reduce stand densities by harvesting high risk trees in all diameter classes. Tree vigor, as defined by crown form and crown condition, is the primary factor to be used in determining high risk trees. Thin even-aged pockets where appropriate. Use widely spaced designated skid trails and directional falling to reduce site impacts. Treat logging slash by lopping heavy slash concentrations. Slash all sprung or severely damaged conifers and hardwoods between 1 and 6″ in diameter.
10-20	Conduct stand exam to assess stand conditions and determine if additional management treatments are needed.

In areas of annosus root rot, healthy codominant and dominant Douglas-fir, sugar pine, incense cedar, and hardwood species would be favored over white fir and ponderosa pine. In areas of *Armillaria* root rot, all conifer species, with the exception of incense cedar, are susceptible to infection. White fir is the most severely infected conifer with Douglas-fir, ponderosa pine, and sugar pine moderately affected. In areas of laminated root rot (*Phellinus*), healthy codominant and dominant ponderosa pine, sugar pine, incense cedar, and hardwood species would be favored over white fir and Douglas-fir.

C.3.4 Restoration Thinning

The OI units proposed for this treatment are listed in section C.5.5.

C.3.4.1 Present Condition

The tree species composition of these stands is a mixture of Douglas-fir, ponderosa pine, sugar pine, incense cedar and white fir at higher elevations. Hardwood species include madrone, chinquapin and lesser amounts of black oak.

The shrub species present consists of Oregon grape (dwarf and piper's), deerbrush ceanothus, hazel, and oceanspray. In most units, shrub cover is low to moderate, occurring in patches or as a scattered vegetative component.

Many of the stands have been partially harvested over the past 40 years, resulting in the development of stands with multiple canopy layers. Stand densities are high, with the number of trees per acre above the long-term carrying capacity of the site. In high density stands, the following tree and stand changes are beginning to occur: competition-related mortality becomes significant, sensitivity to the effects of drought increases, self-thinning begins, growth declines, volume growth per acre is offset by mortality, and the susceptibility of trees to insect and disease attack increases.

C.3.4.2 Target Stand

The objective of restoration thinning is to increase landscape resiliency to environmental disturbances (e.g., fire, insects, disease, and climate change). High stand densities, high surface and ladder fuels, and low tree vigor tend to magnify rather than buffer the effects of environmental disturbances or changes. Density reduction that emphasizes the removal of smaller trees and vegetation reduces competition for nutrients and water and increases overall tree and stand vigor. Restoration treatments reduce stand susceptibility to excessive mortality from environmental disturbances (fire, insects, and disease) and increase the ability of forests to adapt to long-term environmental changes (climate).

Following the harvest entry, stands would have reduced stand densities, continuous forest canopy and structural diversity (Figure C-5). Trees greater than 150 years old would be recommended for retention to provide structural complexity and a fire-resistant stand component.

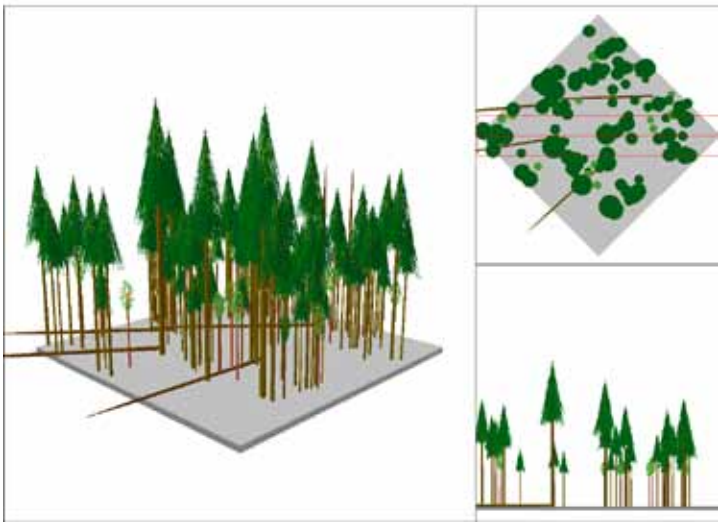


Figure C-5. Restoration Thinning. The target stand structure has reduced stand densities, strives to retain old trees >150 years, maintains continuous canopy cover, favors drought-tolerant species, provides for structural diversity, and increases the average stand diameter.

Table C-4. Restoration Thinning—40% or 60% Canopy Cover Treatment Schedule

Year	Restoration Thinning Treatment

0	**Harvest:**
	On sites that receive more than 35″ of precipitation per year, stocking should be reduced to a relative density of 35% with an average residual basal area of 120 to 150 square feet. Sites that receive more than 35″ of precipitation per year and have significant root rots or Douglas-fir mistletoe, stocking would be reduced to a relative density of 25% with an average residual basal area of 100 to 120 square feet. Leave tree spacing will vary and depend on the **existing** spatial arrangement of the desired trees within the stand. Residual canopy cover would be at least 40% under both relative density targets.
	• Strive to retain trees 150 years old or older regardless of condition.
	  ▪ Remove competing vegetation (<150 years old) underneath the drip line of healthy Douglas-fir and incense cedar trees to increase survival potential.
	  ▪ Specific to healthy, full-crowned ponderosa and sugar pine, remove trees less than 150 years old within the root zone that is below the drip line and 10 feet from the edge of the drip line (approximately 20-30 feet from the bole of the tree). Pine species are more sensitive to high stand densities, particularly on sites under 3,500 feet in elevation.
	  ▪ If the tree has a poor crown (crown ratio less than 25% and a crown that has a thin, ragged appearance when viewed against the sky along with poor needle color and dead and dying twigs or branches forming holes in the crown), do not remove all the understory trees below the drip line; instead, thin the trees.
	  ▪ Increase within stand structural diversity by leaving small unthinned patches and creating small openings. Unthinned patches and small openings should range in size from 0.1 to 0.25 acre. Use existing stand diversity to identify and locate patches and openings. The shape of patches and openings should be irregular and spatially random in occurrence within the stand. Approximately 10 to 15% of the area should be a combination of unthinned patches and small openings.
	• Leave dominant, codominant, and intermediate trees with the best crown ratios.
	• Favor healthy ponderosa pine, sugar pine, incense cedar, and Douglas-fir over white fir.
	• Favor healthy ponderosa pine, sugar pine, and incense cedar over equally healthy Douglas-fir. The crowns of the retained pines and cedars should be full, with a minimum crown ratio of 35%. Needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. Pine species with poor crowns, characterized by a ragged appearance as well as foliage that is bunchy and of poor color, should be removed if they appear less than 150 years of age; do not retain.
	• When a leave tree has an adjoining tree that originates from the same root collar, leave all trees regardless of crown class or condition.
	• Retain neighboring trees that have their crowns intertwined with leave trees. Removal of these associated trees can cause crown damage, reduce wind stability and increase overall tree stress.
	• Retain the largest hardwoods with full vigorous crowns for species diversity, canopy layers, and natural drought tolerance. Remove competing vegetation underneath the drip line to increase survival potential.
	• Leave existing snags, stages 1–5.
	• Leave all coarse woody debris, decay classes 1–5.
	• Leave large (>20″ DBH), broken, forked-top, and deformed trees. Retain for plant and animal habitat, as well as future sources of coarse woody debris and snags.

Table C-4. Restoration Thinning—40% or 60% Canopy Cover Treatment Schedule	
	• Thin or remove small trees (<8″ in diameter) to meet residual stand density targets. • Hand pile heavy concentrations of slash. Otherwise, lop and scatter. • Slash sprung, severely damaged, spindly crowned, low crown ratio (<40%) conifers and hardwoods between 1 and 7″ DBH.
20-30	Conduct a stand exam to determine density levels. Evaluate the health of the stand for excess tree mortality and reduced radial growth. A second thinning entry may occur to maintain tree vigor and species diversity.

Vegetation below and adjacent to these larger and older trees would be removed to reduce competition-related stress by increasing available site resources. Structural diversity would be provided by retaining small, unthinned patches and small openings (0.1 to 0.25 acre) within the stand. Coarse woody debris is present and provides conditions favorable for nutrient recycling, soil mychorrizae, and the development of nitrogen-fixing bacteria. Cull trees would be left to ensure a near-term "pulse" of coarse woody debris and snags would be available. Existing snags would be left and, where available, all large (>12 inches DBH), healthy hardwoods would remain as a scattered stand component. The estimated canopy cover following harvest would range from 45 to 75%.

In areas of annosus root rot, healthy codominant and dominant Douglas-fir, sugar pine, incense cedar, and hardwood species would be favored over white fir and ponderosa pine. In areas of *Armillaria* root rot, all conifer species with the exception of incense cedar are susceptible to infection. White fir is the most severely infected conifer with Douglas-fir, ponderosa pine and sugar pine moderately affected. In areas of laminated root rot (*Phillinus*), healthy codominant and dominant ponderosa pine, sugar pine, incense cedar, and hardwood species would be favored over white fir and Douglas-fir.

Douglas-fir mistletoe may be present within the stands. Mistletoe-infected trees with a rating of 4 to 6 would be targeted for removal as long as they do not appear to be 150 years old or older. The least infected Douglas-fir trees with a mistletoe rating of 3 or below would be left.

C.3.5 Small Diameter Thinning

The OI units proposed for this treatment are listed in section C.5.6.

C.3.5.1 Present Conditions

Ponderosa pine plantations proposed for thinning were established in 1965 after clear-cut harvests. These plantations were planted with pine species on sites that are of the white fir plant series. Douglas-fir is typically the dominant overstory tree, with lesser amounts of white fir, incense-cedar, ponderosa pine, and sugar pine. Over the past 50 years, the ponderosa pine has grown to an average dominant tree diameter of 14 inches. Naturally seeded and planted conifer regeneration is present in the understory, creating a 2-story stand structure. The understory of smaller seedling to sapling-size trees (0 to 8 inches diameter) and poles consists of Douglas-fir, incense cedar, ponderosa pine, and white fir. These stands have stocking levels that range from 115–120 trees per acre 8 inches DBH or greater, and 1,000–1,300 trees per acre less than 8 inches DBH.

The Douglas-fir progeny test sites were established in 1980 after clear-cut harvests. The plantations were established on white fir plant series sites where Douglas-fir is typically the dominant overstory tree, with

lesser amounts of white fir, incense cedar, ponderosa pine, and sugar pine. Over the past 30 years, the Douglas-fir has grown to an average dominant tree diameter of 11 inches. The stands have an even-aged structure, with few naturally seeded Douglas-fir, white fir, incense cedar, sugar pine, and ponderosa pine present. These stands have stocking levels that range from 220–260 trees per acre 8 inches DBH and greater, and 100–600 trees per acre less than 8 inches DBH.

Mixed conifer stands proposed for treatment are 50-year-old mixed conifer stands that remain from stands that were partially cut in 1965. At the time of harvest, selected merchantable trees were removed leaving pockets of trees greater than 8 inches in diameter. Trees less than 8 inches in diameter remained in pockets after harvest due to the mechanics of logging. Douglas-fir, ponderosa pine, hardwoods and other conifer species naturally seeded in. In some of the stands, ponderosa pine seedlings were interplanted following harvest. The average overstory diameter ranges from 12 to 15 inches. Currently, the stands are a mosaic of species, diameters, and density levels. These mixed conifer stands presently have a density of 110–120 trees per acre 8 inches DBH or greater, and 1,100–1,300 trees per acre less than 8 inches DBH.

C.3.5.2 Target Stand

The main objective within these stands is to improve individual tree health, increase species diversity, and create structural diversity with variable density levels within stands. This prescription aims to release forest conifer species to create a stand more resilient to stand-replacing wildfires and other environmental disturbances. Density levels will be reduced to levels that the site has resources to support.

Ponderosa pine plantations: The stand density of conifers 8 inches DBH or greater would be reduced to 60–90 trees per acre, with a basal area range between 90–120 square feet per acre. See Table C-17 for individual stand basal areas. Treatment would emphasize reducing pine displaying off-site characteristics or with smaller crowns, followed by reducing white fir and other species where density levels are above target. Thinning should be variable rather than a grid-type pattern with the leave tree spacing focused on retaining the healthiest and most vigorous trees. The species preference for retention trees should be (1) sugar pine, (2) Douglas-fir, (3) incense cedar, (4) ponderosa pine, and (5) white fir.

Hardwood tree species less than 12 inches DBH that are within 8 feet of conifers targeted for retention would be cut to reduce competition for site resources. Hardwoods greater than 12 inches in diameter would be retained. If ANY brush within an 8-foot radius of a leave conifer tree is more than half the height of the leave tree, then ALL the brush greater than 1-foot high within the 8-foot radius would be cut. However, if NO brush within an 8-foot radius of a leave conifer tree is more than half the height of the leave tree, then NO brush within the 8-foot radius would be cut. Survey and manage species may occur within the stands. Where species occur, sites would be buffered and protected. These buffer patches would provide for additional structural diversity within stands. Stage 1 and 2 snags greater than 16 inches DBH would remain for wildlife, future coarse woody debris, and structural diversity. No riparian species such as willow, ash, yew, maple, and California black oak would be removed.

Douglas-fir progeny test sites: The stand densities (currently 370–515 trees per acre 2 to 18 inches DBH) of the Douglas-fir dominated stands would be reduced to 140–150 trees per acre. The Douglas-fir and other conifer species would mainly be thinned from below, with variable retention levels that mimic natural and historical stand conditions. Treatment would focus on retaining a target basal area between 100–120 square feet per acre, increasing structural diversity, and increasing stand health. Increasing structural diversity and stand health would be achieved by creating gaps (20- to 40-foot radius from center of disease pocket) where laminated root rot is present and currently affecting Douglas-fir. It is estimated that 10% of the stand acreage would be in the creation of gaps. Created gaps would be planted with species resistant to laminated root

rot, such as ponderosa pine and incense cedar. Cut trees 4 inches DBH and greater would be extracted from stand and brought to the landing. Retention trees should vary in spacing but be roughly 16 feet by 16 feet, have healthy/vigorous crowns, and be disease free outside of root rot pockets.

Mixed conifer stands: The stand density of conifers 8 inches DBH and greater would be reduced to a relative density of 30–35%, or about 80 to 90 trees per acre with approximately 120 square feet basal area. See Table C-17 for individual stand basal areas. Leave tree spacing should be variable and dependent on the existing spatial arrangement of the desired tree species within the stand. Uniform grid spacing is not desired; meeting the target basal area averaged across the stand with trees having desired characteristics (crown ratios >35%, healthy tree/crown vigor, and species preference) are the primary objectives. The species preference for leave trees is (1) ponderosa pine, (2) sugar pine, (3) incense cedar, (4) Douglas-fir, and (5) white fir. If necessary, cut brush greater than 1 foot high and conifers and hardwood trees less than 12 inches DBH that are significantly competing with the residual trees. Natural regeneration of Douglas-fir, incense cedar, sugar pine, ponderosa pine, and white fir less than 8 inches DBH would be thinned to leave approximately 200 trees per acre (16-foot by 16-foot spacing) in the understory. The species preference for leave trees is as

Table C-5. Small Diameter Thinning Treatment Schedule

Year	Treatment
0	**Harvest:** • Thin from below first, removing the suppressed component of the stand, followed by thinning the main canopy to reduce densities and remove trees that are insect or disease-infected or otherwise declining (based on crown ratio, color, and form). In pine stands, remove pine showing off-site characteristics. Leave tree spacing will vary and be dependent upon the health of the trees, and those that show off-site characteristics. In mixed conifer stands, uniform spacing is not desired. Leave tree spacing should vary and be dependent on the existing spatial arrangement of trees with the desired leave tree characteristics (crown ratio, species, and vigor). • In mixed conifer stands that receive 35″ of precipitation per year or more and in Douglas-fir progeny test sites, maintain residual stocking with a relative density of 30–35% with a minimum crown cover of 40–60%. • In ponderosa pine plantations, maintain residual stocking with a relative density index of 25–30% and a minimum crown cover of 40%. • Increase within stand structural diversity by leaving unthinned patches and creating small gaps. Unthinned areas and gaps should range in size from 0.05 to 0.25 acre (equal to 25- to 59-foot radius). Approximately 10 to 15% of the treatment area should be a combination of unthinned patches and gaps. • Species preferences for the ponderosa pine plantations are sugar pine, Douglas-fir, incense cedar, ponderosa pine, and white fir. • Species preferences for mixed conifer stands are ponderosa pine, sugar pine, incense cedar, Douglas-fir, and white fir. • Avoid cutting trees >24″ DBH. • Use existing skid trails to reduce impacts to the site and the residual trees. • Reserve hardwoods 12″ DBH and greater. • Hand pile heavy concentrations of slash. Otherwise, lop and scatter.
30	Conduct a stand exam to determine density levels. Evaluate the health of the stand for excess tree mortality and reduced radial growth. A second thinning entry would likely occur to maintain tree vigor and species diversity

follows: (1) ponderosa pine, (2) sugar pine, (3) incense cedar, (4) Douglas-fir, and (5) white fir. Survey and manage species may occur within the stands. Where species do occur, sites would be buffered and protected. These buffer patches would provide for additional structural diversity within stands. Stage 1 and 2 snags greater than 16 inches DBH would remain for wildlife, future coarse woody debris, and structural diversity. Riparian species such as willow, ash, yew, maple, and California black oak would not be removed.

C.4 Monitoring

Implementation of the standards and guidelines in the Northwest Forest Plan and management direction contained within the Medford District ROD/RMP requires a monitoring system to insure effective on-the-ground results. The ROD/RMP (p. 99) states, "Monitoring is an essential component of natural resource management because it provides information on the relative success of management strategies. The implementation of the RMP will be monitored to ensure that management actions follow prescribed management direction (implementation monitoring), meet desired objectives (effectiveness monitoring), and are based on accurate assumptions (validation monitoring)."

Monitoring of the proposed actions will follow the outline in the Medford District's 1995 ROD/RMP (p. 225–248). Monitoring will be specific to the land allocations and resources affected in the Double Bowen Project Area.

Monitoring should

- detect changes in ecological systems from both individual and cumulative management actions and natural events,
- provide a basis for natural resources policy decisions,
- provide standardized data,
- compile information systematically,
- link overall information management strategies for consistent implementation,
- ensure prompt analysis and application of data in the adaptive management process, and
- distribute results in a timely manner.

Monitoring begins with resource assessment and data collection that describes the existing conditions prior to management actions. Data collection is in the form of sampling, which provides a representative description of the proposed treatment area. ORGANON data plots were established in the proposed sale area. Within stands, a systematic sampling grid was used to establish plot centers. From the plot centers a variable plot and two nested fixed plots were used to record tree and site data.

This information is used in the ORGANON program to generate a variety of analysis reports. These reports provide a description of stand characteristics (e.g., species composition, diameter distribution, densities, and canopy closure). Post-harvest monitoring can then be implemented, using the preharvest stand information to determine if the objectives have been met.

C.5 Double Bowen Marking Guidelines

Table C-6. Summary of Timber Harvest Objectives
Alternative 2: Maintain dispersal and NRF habitat within northern spotted owl home ranges and critical habitat units (CHU), except timber harvest units 31-5 and 31-6 where there is an ecological benefit for stand health and stand longevity to mitigate root rots (annosus, *Armillaria*, laminated) and Douglas-fir mistletoe. Outside of home ranges and CHU (approximately 42 acres), this alternative would implement Medford District ROD/RMP management direction for matrix land. **Alternative 3:** Increase landscape resiliency to environmental disturbances (e.g., fire, insects, disease, and climate change) by reducing stand densities, retaining old trees, favoring drought-tolerant species, and increasing structural complexity while maintaining northern spotted owl habitat within known home ranges and CHU, except in timber harvest units 31-5 and 31-6. An ecological benefit has been identified in units 31-5 and 31-6 to increase stand health and longevity by mitigating root rots (annosus, *Armillaria*, laminated) and Douglas-fir mistletoe.

Table C-7. Summary of Small Diameter Thinning Objectives
Management Direction from Medford District ROD/RMP
On Matrix lands, produce a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability. Emphasis would be placed on use of intensive forest management practices and investments to maintain a high level of sustainable resource production while maintaining long-term site productivity, biological legacies (retained green trees, snags, and coarse woody debris), and a biologically diverse forest matrix. In NGFMA forest stands less than 100 years old, small diameter thinning would reduce the density of forest stands with the objectives of increasing stand vigor, reducing mortality of desired stand components, increasing stand structure, and reducing susceptibility to insects and disease attack and spread.
Treatment Objectives
High stand densities in younger ponderosa pine plantations, Douglas-fir progeny test sites, and mixed conifer stands have resulted in slow or stagnant growth rates. These stands are overstocked with more trees than the site has water, nutrients, and growing space to sustain. High densities result in declining tree vigor and growth, increased tree mortality, and increased susceptibility to insect attack, root disease infection, and stand-replacing wildfires. To reduce competition-related mortality and to increase forest health and tree vigor, the number of trees per acre needs to be reduced. By decreasing stand densities, more water, nutrients, and growing space would be available for the remaining trees. To restore these stands toward a more natural species mix, thinning is needed to release established natural regeneration of Douglas-fir, incense cedar and pine, or to create space for the planting of Douglas-fir and incense cedar. Species diversity is a key component of healthy forests by providing unique habitats, increased genetic variability, and vegetative conditions that are more resilient to environmental extremes and disturbances.

C.5.1 Regeneration Harvest–Alternative 2

C.5.1.1 Shelterwood Retention

The following are minimum requirements for shelterwood retention regeneration harvest:

- 1.8 snags per acre. Snags are any standing dead (stage 1 and 2), partially-dead, or defective (cull) tree.
- 120 linear feet of coarse woody debris (see Table C-25).

- 12–25 green conifers per acre greater than 20 inches DBH (proportionally representing the total range of tree sizes greater than 20 inches DBH). To the greatest extent possible, the spatial distribution of leave trees should be based on a grid pattern to provide "shelter." Variances in spacing are allowed in order to leave the best conifers with the largest crowns. It is more important to leave a healthy, full-crowned overstory tree than to meet rigid spacing criteria. Leave trees should have the following attributes: (a) low susceptibility to wind, snow, and ice damage, as measured by a height-to-diameter ratio of 70 or below; (b) crown ratio greater than 35% with a healthy crown, dark foliage, and dense needles; (c) disease free; and (d) healthy seral species such as Douglas-fir, ponderosa pine, sugar pine, and incense cedar.
- Retain large hardwoods greater than 16 inches DBH.

Table C-8. Shelterwood Retention Regeneration Harvest Unit
T35S, R3E, section 19
19-8

C.5.2 Riparian Thinning–Alternatives 2 and 3

C.5.2.1 Riparian Thinning (minimum 50% or 60% Canopy Cover)

- Density reduction to accelerate the growth of dominant, codominant, and minor amounts of intermediate trees is the primary objective in these stands. Thin from below in second growth stands/clumps; low vigor codominant or dominant trees may be removed to reduce density and if tree vigor is lower than adjacent trees.
  - Stocking will be reduced to a relative density of 35% with the average residual basal area of treated stands between 120 to 140 square feet per acre. Spacing will vary depending on tree diameter and vigor. See Table C-9 for the target basal area for each stand.
  - Maintain a minimum of 50% canopy cover in northern spotted owl dispersal habitat and a minimum of 60% canopy cover in nesting, roosting, and foraging habitat.
  - Leave dominant and codominant trees with the best crown ratios.
  - Favor healthy ponderosa pine, sugar pine, Douglas-fir, and incense cedar over white fir.
  - Favor large (greater than 20 inches DBH), healthy ponderosa and sugar pine over equally healthy Douglas-fir. The crowns of the retained pines should be full, with a minimum crown ratio of 35%. Needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. Pine species with poor crowns, characterized by a ragged appearance as well as foliage which is bunchy and of poor color, should be removed; do not retain.
- Leave all snags, stages 1–5. When available, leave green trees (any diameter) immediately adjacent to snags that are greater than 20 inches DBH. These trees will provide additional structural and habitat diversity.
- Leave all coarse woody debris, decay classes 1–5 (Table C-24). When available, leave green trees (any diameter) immediately surrounding large (>20 inches DBH and 8 feet long) pieces of coarse woody debris. Retention of green trees would minimize coarse woody debris disturbance and maintain the functional integrity of the coarse woody debris.
- Minimize the harvest of large (>20 inches DBH), broken, forked-top, and deformed trees. Retain for plant and animal habitat, as well as future sources of coarse woody debris and snags.

- Restoration thinning, selection harvest and density management units are adjacent to riparian reserve areas to be thinned. Within riparian reserve thinning stands, a strip 100 feet wide or less will be treated and a 90-foot-wide or larger no-treatment area will be established on each side of the stream channel.
- No trees over 20 inches DBH will be marked for extraction in riparian thinning units.

Table C-9. Riparian Thinning Target Basal Area by Timber Harvest Unit

T35S, R3E, sections 7 and 31				
	7-2	31-1	31-7	31-8
Target Basal Area (square feet/acre)	140	120	130	130

C.5.3 Density Management—Alternative 2

C.5.3.1 Density Management (minimum 40% or 60% Canopy Cover)

- The primary objective for these stands is density reduction to maintain northern spotted owl dispersal habitat (minimum 40% canopy cover) and nesting, roosting and foraging habitat (minimum 60% canopy cover). Density reduction would accelerate growth of dominant, codominant, and minor amounts of intermediate trees. Thin from below in second growth stands/clumps; low vigor codominant or dominant trees may be removed to reduce density and if tree vigor is lower than adjacent trees.
  - Stocking will be reduced to a relative density ranging from 25 to 35% with residual basal area of treated stands ranging between 100 to 150 square feet per acre. Spacing will vary depending on tree diameter and vigor. See Tables C-10 and C-11 for the target basal area for each stand.
  - Leave dominant and codominant trees with the best crown ratios.
  - Favor healthy ponderosa pine, sugar pine, Douglas-fir, and incense cedar over white fir.
  - Favor large (>20 inches DBH), healthy ponderosa and sugar pine over equally healthy Douglas-fir. The crowns of the retained pines should be full, with a minimum crown ratio of 35%. Needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. Pine species with poor crowns, characterized by a ragged appearance as well as foliage which is bunchy and of poor color, should be removed; do not retain.
- Leave existing snags, stages 1–5. When available, leave green trees (any diameter) immediately adjacent to snags that are greater than 20 inches DBH. These trees will provide additional structural and habitat diversity.
- Leave all coarse woody debris, decay classes 1–5 (Table C-24). When available, leave green trees (any diameter) immediately surrounding large (>20 inches DBH and 8 feet long) pieces of coarse woody debris. Retention of green trees would minimize coarse woody debris disturbance and maintain the functional integrity of the coarse woody debris.
- Minimize the harvest of large (>20 inches DBH), broken, forked-top, and deformed trees. Retain for plant and animal habitat, as well as future sources of coarse woody debris and snags.

Table C-10. Density Management Target Basal Area by Timber Harvest Unit—40% Canopy Cover

T35S, R2E, sections 13 and 25 T35S, R3E, Sections 7, 19, and 31.										
	13-2	**13-3**	**25-1**	**25-4**	**25-5**	**25-7**	**25-9**	**25-10**	**25-11**	**7-1**
Target Basal Area (square feet/acre)	140	140	140	100	100	140	120	140	140	140
	7-2	**7-3**	**19-2**	**19-4**	**19-5**	**19-6**	**19-7**	**31-1**	**31-3**	**31-4**
Target Basal Area (square feet/acre)	140	140	130	120	130	130	130	120	120	100

Table C-11. Density Management Target Basal Area by Timber Harvest Unit—60% Canopy Cover

T35S, R2E, sections 13 and 25 T35S, R3E, sections 19 and 31						
	13-2	**13-3**	**25-1**	**25-6**	**25-7**	**25-10**
Target Basal Area (square feet/acre)	140	140	140	140	140	140
	25-11	**19-1**	**19-3**	**19-6**	**31-1**	
Target Basal Area (square feet/acre)	140	140	150	150	140	

C.5.4 Selection Harvest–Alternatives 2 and 3

C.5.4.1 Selection Harvest (minimum 40% and 60% Canopy Cover)

- Reducing stand densities, removing low vigor trees, maintaining canopy cover and accelerating the growth of the remaining trees are the primary objectives for these stands. Tree selection criteria should be based on tree vigor. Use *Characteristics of Low Vigor Trees* (Section C.6) to determine the trees to mark. See Tables C-12 and C-13 for the target basal area for each stand.
- Maintain a 40% canopy cover in northern spotted owl dispersal habitat and a 50% canopy cover in nesting, roosting, and foraging habitat.
- Favor drought- and fire-tolerant tree species, such as ponderosa pine, incense cedar, Douglas-fir, and sugar pine.
- Favor large (>20 inches DBH), healthy ponderosa and sugar pine over equally healthy Douglas-fir. The crowns of the retained pines should be full, with a minimum crown ratio of 35%. Needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. Pine species with poor crowns, characterized by a ragged appearance as well as foliage that is bunchy and of poor color, should be removed; do not retain.
- Leave snags, stages 1–5. When available, leave green trees (any diameter) immediately adjacent to snags that are greater than 20 inches DBH. These trees will provide additional structural and habitat diversity.
- Leave coarse woody debris, decay classes 1–5. When available, leave green trees (any diameter) immediately surrounding large (>20 inches DBH and 8 feet long) pieces of coarse woody debris. Retention of green trees would minimize coarse woody debris disturbance and maintain the functional integrity of the coarse woody debris.

- Minimize the marking of large (>20 inches DBH), broken, forked-top, and deformed trees. Retain for plant and animal habitat as well as future sources of coarse woody debris and snags.

Table C-12. Selection Harvest Target Basal Area by Timber Harvest Unit—40% Canopy Cover

T35S, R2E, sections 13, 15, 23, and 25; T35S, R3E, section 31							
	13-1	**13-4**	**13-5**	**13-7**	**15-1**	**15-2***	**15-3***
Target Basal Area (square feet/acre)	100	100	100	100	90	100	100
	23-1	**25-2**	**25-8**	**31-2**	**31-5***	**31-6***	**31-8***
Target Basal Area (square feet/acre)	100	100	90	60	100	110	100

*Unit would be selection harvested only in Alternative 2.

Table C-13. Selection Harvest Target Basal Area by Timber Harvest Unit—60% Canopy Cover

T35S, R2E, sections 13, 15, and 25 T35S, R3E, section 31							
	13-1	**13-6**	**15-4**	**23-1**	**25-2**	**25-3**	**31-7***
Target Basal Area (square feet/acre)	140	130	120	140	130	130	130

*Unit would be selection harvested only in Alternative 2.

C.5.5 Restoration Thinning—Alternative 3

C.5.5.1 Restoration Thinning (minimum of 40% or 60% Canopy Cover)

- The primary objective for these stands is to increase landscape resiliency to environmental disturbances (e.g., fire, insects, disease, and climate change) and create structural diversity. Density reduction will occur to maintain dispersal habitat (40% canopy closure minimum) and nesting, roosting and foraging habitat (60% canopy closure minimum) for the northern spotted owl. Density reduction will accelerate growth of dominant, codominant, and minor amounts of intermediate trees. Thin from below in second growth stands/clumps; low vigor codominant or dominant trees may be removed to reduce density and if tree vigor is lower than adjacent trees.
  - Stocking would be reduced to an average relative density of 35% in sites that have more than 35 inches of precipitation annually and 25% in sites that have 35 inches or less precipitation annually.
  - The residual basal area of treated stands would range between 100 to 150 square feet per acre. Spacing will vary depending on tree diameter and vigor. See Tables C-14 and C-15 for the target basal area for each stand.
  - Dominant and codominant trees with the best crown ratios would be left.
  - Healthy ponderosa pine, sugar pine, Douglas-fir, and incense cedar would be favored over white fir.
  - Large (>20 inches DBH), healthy ponderosa and sugar pine would be favored over equally healthy Douglas-fir. The crowns of the retained pines should be full, with a minimum crown ratio of 35%. Needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. Pine species with poor

crowns, characterized by a ragged appearance as well as foliage that is bunchy and of poor color, should be removed; do not retain.

  - Strive to retain trees 150 years old or older regardless of condition.

- Increase within stand structural diversity by leaving small unthinned patches and creating small openings.
  - Unthinned patches and small openings should range in size from 0.1 to 0.25 acre (equal to a 37- to 59-foot radius). They should be irregular in shape and be spatially random in occurrence within the stand.
  - Approximately 10 to 15% of the area treated should be a combination of unthinned patches and small openings.
  - Unthinned patches could be left adjacent to snags; large coarse woody debris; deformed trees; and existing dense pockets, seeps, or hardwood clumps. Canopy openings could be created where vigorous understory regeneration is present, in root rot pockets, or in areas of lower site productivity.
- Retain the largest hardwoods with full vigorous crowns for species diversity, canopy layers, and natural drought tolerance.
- Leave snags stages 1–5. When available, leave green trees (any diameter) immediately adjacent to snags that are greater than 20 inches DBH. These trees will provide additional structural and habitat diversity.
- Leave coarse woody debris, decay classes 1–5 (see Table C-24). When available, leave green trees (any diameter) immediately surrounding large (> 20 inches DBH and 8 feet long) pieces of coarse woody debris. Retention of green trees would minimize coarse woody debris disturbance and maintain the functional integrity of the coarse woody debris.
- Minimize the marking of large (>20 inches DBH), broken, forked-top, and deformed trees. Retain for plant and animal habitat, as well as future sources of coarse woody debris and snags.

Table C-14. Target Basal Area by Timber Harvest Unit for Restoration Thinning—40% Canopy Cover

T35S, R2E, sections 13, 15, and 25 T35S, R3E, sections 7, 19, and 31								
	13-2	**13-3**	**15-2/3**	**25-1**	**25-4**	**25-5**	**25-7**	**25-9**
Target Basal Area (square feet/acre)	140	140	110	140	100	100	140	120
	25-10	**25-11**	**7-1**	**7-2**	**7-3**	**19-2**	**19-4**	**19-5**
Target Basal Area (square feet/acre)	140	140	140	140	140	130	120	130
	19-6	**19-7**	**31-1**	**31-3**	**31-4**	**31-5**	**31-6**	**31-8**
Target Basal Area (square feet/acre)	130	130	120	120	100	120	110	100

Table C-15. Restoration Thinning Target Basal Area by Timber Harvest Unit—60% Canopy Cover

T35SR2E Sections 13 and 25 T35SR3E Sections 19 and 31							
	13-2	**13-3**	**25-1**	**25-6**	**25-7**	**25-10**	**25-11**
Target Basal Area (square feet/acre)	140	140	140	140	140	140	140
	19-1	**19-3**	**19-6**	**19-8**	**31-1**	**31-7**	
Target Basal Area (square feet/acre)	140	150	150	140	140	130	

C.5.6 Small Diameter Thinning—Alternatives 2 and 3

Increasing stand health by reducing stand densities, increasing stand structural and species diversity, reducing mortality of desired stand components by increasing stand vigor, favoring drought-tolerant species for retention, and increasing landscape resiliency to environmental disturbances are the primary objectives for these stands. Treatment would be a thin from below removing the suppressed component of stands to accelerate the growth of dominant and codominant trees and to release smaller understory seedling and sapling-sized Douglas-fir, incense cedar, sugar pine, and ponderosa pine.

- In ponderosa pine plantations, residual basal area would be reduced to a target basal area ranging from 90 to 120 square feet per acre. See Table C-17 for individual stand basal areas. This basal area target is flexible and allows heavier thinning in parts of the stand that have ponderosa pine with off-site characteristics such as see-through crowns, multiple tops, fox tail bunching of needles at branch ends, branch dieback, and light green foliage. Remove pine that show off-site characteristics and reduce white fir when possible. Retain all healthy Douglas-fir, sugar pine, and incense cedar. In areas that plantation pine does not exist, reduce stocking to a target basal area ranging from 120–130 square feet per acre.
- In Douglas-fir progeny plantations, reduce stocking to a residual basal area ranging from 100 to 120 square feet per acre. See Table C-17 for individual stand basal areas. Douglas-fir retained should be the largest trees with the most vigorous crowns. Stand densities (currently 370–515 trees per acre 2 to 18 inches DBH) of the Douglas-fir dominated stands should be reduced to 140–150 trees per acre. The Douglas-fir and other conifer species should be primarily thinned from below removing the suppressed component of the stand with variable retention levels that mimic natural and historical stand conditions. Increased structural diversity and stand health would be achieved by creating gaps (20- to 40-foot radius from center of disease pocket) where laminated root rot is present and currently affecting Douglas-fir. Approximately 10% of the stand acreage should be in the creation of gaps. Created gaps would be planted with species resistant to the laminated root rot such as ponderosa pine and incense cedar. Cut trees 4 inches DBH and greater would be extracted from stand and brought to the landing. Retention trees should vary in spacing but be roughly 16 feet by 16 feet, have healthy/vigorous crowns, and be disease free outside of root rot pockets.

In mixed conifer stands, reduce stocking to a 30–35% relative density index for conifers 8 inches DBH and greater, or about 80 to 90 trees per acre with a residual basal area target of 120 square feet. See Table C-17 for individual stand basal areas. Leave tree spacing should be variable and dependent on the existing spatial arrangement of the desired tree species within the stand. Uniform grid spacing is not desired; meeting the target basal area averaged across the stand with trees having desired characteristics (crown ratios >35%, healthy tree/crown vigor, and species preference) are the primary objectives. The species preference for leave

trees is (1) ponderosa pine, (2) sugar pine, (3) incense cedar, (4) Douglas-fir, and (5) white fir. If necessary, cut brush greater than 1 foot high and cut conifers and hardwood trees less than 12 inches DBH that are significantly competing with the residual trees. Natural regeneration of Douglas-fir, incense cedar, sugar pine, ponderosa pine and white fir less than 8 inches DBH would be thinned to leave approximately 200 trees per acre (16 foot by 16 foot spacing) in the understory. The species preference for leave trees is as follows: (1) ponderosa pine, (2) sugar pine, (3) incense cedar, (4) Douglas-fir, and (5) white fir. Survey and manage species may occur within the stands. Where species do occur, sites would be buffered and protected. These buffer patches would provide for additional structural diversity within stands. Stage 1 and 2 snags greater than 16 inches DBH would remain for wildlife, future coarse woody debris, and structural diversity. Riparian species such as willow, ash, yew, maple, and California black oak would not be removed.

- Leave dominant and codominant trees with the best crown ratios.
- Favor healthy ponderosa pine, sugar pine, incense cedar, and Douglas-fir over white fir. The crowns of the retained trees should be full, with a minimum crown ratio of 35%. Needles should be dark green, crown tops should be pointed (not rounded), and there should be no evidence of resin flow on the upper bole of sugar pine. Leave trees greater than 24 inches DBH.
- Increase within-stand structural diversity by leaving unthinned patches and creating small gaps. Patch and gap size should range from 0.05 to 0.25 acre (equal to 25- to 59-foot radius). Approximately 10–15% of the treatment area should be in unthinned patches and gaps. The gaps can be created by clearing around large, healthy forest species such as ponderosa pine, sugar pine, and incense cedar. Gaps or openings may also be created in pockets of trees with short, see-through crowns, and in insect or disease pockets.
- In post-harvest stands that have a dense conifer understory, thin trees less than 8 inches in diameter to leave approximately 200 trees per acre (16-foot by 16-foot spacing). Favor healthy ponderosa pine, sugar pine, incense cedar, and Douglas-fir over white fir. Uniform grid spacing is not necessary; consider the crown class, species, and vigor of leave trees.
- Leave snags 12 inches and greater, stages 1–5 (Table C-26), if they are not considered a hazard to operations and unit access. When available, leave green trees (any diameter) immediately adjacent to snags greater than 16 inches DBH. These trees will provide additional structural and habitat diversity.
- Leave coarse woody debris 12 inches and greater, decay classes 1–5 (Table C-24). When available, leave green trees (any diameter) immediately surrounding large (greater than 20 inches DBH and 8 feet long) pieces of coarse woody debris. Retention of green trees would minimize coarse woody debris disturbance and maintain the functional integrity of the coarse woody debris.
- Do not remove riparian species such as willow, ash, yew, maple, and California black oak.

Table C-16. Double Bowen Proposed Small Diameter Thinning Units

OI Unit	Acres	Stand Type	RMP Land Allocation
T35S, R2E, section 15			
002*	39	Ponderosa Pine/Mixed Conifer	Matrix
005N	13	Ponderosa Pine	Matrix
005S	10	Mixed Conifer	Matrix
T35S, R2E, section 23			
900	11	Douglas-fir Progeny	Matrix
901*	4	Douglas-fir Progeny	Matrix
Total	**77**		

* Stands have an adjacent riparian reserve area to be thinned. A no-disturbance buffer of 35 feet adjacent to either side of non-fish-bearing streams and 60 feet adjacent to either side of fish-bearing streams would be maintained.

Table C-17. Double Bowen Small Diameter Thinning Target Basal and Canopy Cover

Legal Description	Unit #	Basal Area >8" DBH (sq. ft./acre)		Canopy Cover (%)	
		Current	Target	Current	Target
T35S, R2E, section 15	002*	150	120	60–70	50
T35S, R2E, section 15	005N	150	90	60–70	40
T35S, R2E, section 15	005S	170	120	70–80	50–60
T35S, R2E, section 23	900	190	110	80–90	50
T35S, R2E, section 23	901*	190	110	80–90	60

C.6 Stand Inventory Data

Table C-18. Double Bowen Timber Harvest Stand Inventory Data

Unit	OI	Trees per Acre <8" DBH			Basal Area	Canopy Cover	Aspect	Slope	Relative Density	
		Total	Conifers	Hardwoods					Conifers	Total
T35S, R2E, section 13										
13-1	013	644	44	0	148	60–70	E	10%	30%	62%
13-2	004	57	130	0	193	80–90	NW	25%	52%	60%
13-3	007	72	161	0	231	90–100	Level	5%	62%	71%
13-4	001W	544	67	0	155	60–70	N	10%	39%	62%
13-5	011	649	60	0	163	70–80	NW	24%	32%	55%
13-6	005	129	103	0	164	70–80	NE	45%	42%	54%
13-7	011	649	60	0	163	70–80	NW	24%	32%	55%
T35S, R2E, section 15										
15-1	001S	172	83	39	232	80–90	N	23%	39%	75%
15-2	001	248	56	41	193	80–90	N	30%	34%	66%
15-3	001	248	56	41	193	80–90	N	30%	34%	66%
15-4	001NW	878	72	15	204	90–100	N	34%	38%	85%
T35S, R2E, section 23										
23-1	009S	710	51	0	151	60–70	NW	20%	24%	53%

Table C-18. Double Bowen Timber Harvest Stand Inventory Data

Unit	OI	Trees per Acre <8" DBH			Basal Area	Canopy Cover	Aspect	Slope	Relative Density	
		Total	Conifers	Hardwoods					Conifers	Total
T35S, R2E, section 25										
25-1	008	181	101	15	224	80–90	W	20%	51%	73%
25-2	009N	465	84	4	135	60–70	E	22%	28%	44%
25-3	009NE	477	93	22	157	70–80	E	40%	38%	62%
25-4	002	344	78	28	155	70–80	N	35%	30%	59%
25-5	002	344	78	28	155	70–80	N	35%	30%	59%
25-6 25-7	007	57	163	0	260	90–100	W	30%	68%	77%
25-7	009SW	134	125	0	213	80–90	W	30%	56%	68%
25-7	110	420	127	21	222	90–100	W	20%	43%	69%
25-8	009S	389	73	0	113	60–70	E	20%	31%	46%
25-9	006A	172	102	7	191	70–80	E	21%	49%	63%
25-10	006	375	95	7	217	90–100	E	20%	51%	78%
25-11	006	375	95	7	217	90–100	E	20%	51%	78%
T35S, R3E, section 7										
7-1 7-2	001	643	92	2	195	80–90	Level	5%	47%	78%
7-1	002	221	150	0	244	90–100	SW	10%	65%	81%
7-3	003	248	122	0	209	80–90	N	20%	52%	66%
T35S, R3E, section 19										
19-1	002	420	143	0	213	90–100	E	10%	56%	79%
19-2	002A	311	144	0	206	90–100	NE	10%	55%	74%
19-3 19-4	003	229	164	0	174	70–80	NE	10%	53%	63%
19-5	102	329	72	23	191	90–100	N	10%	39%	69%
19-6	202	0	156	0	200	90–100	NE	10%	58%	58%
19-7	002C	138	111	7	173	70–80	E	10%	44%	57%
19-8	001	229	93	0	191	80–90	Level	5%	48%	65%
T35S, 3E, section 31										
31-1	001N	870	114	32	185	90–100	N	10%	39%	80%
	004	743	145	86	241	90–100	N	10%	47%	94%
	005	137	151	14	194	90–100	N	10%	52%	75%
31-2	001A	3,054	36	21	106	80–90	NE	20%	17%	63%
31-3 31-4	001S	72	83	0	218	90–100	E	10%	55%	63%
31-4	010W	1,225	82	2	163	90–100	N	35%	37%	75%
31-5	010E	452	131	13	251	90–100	N	20%	61%	91%
31-6	012	263	96	7	235	90–100	N	20%	56%	79%
31-7 31-8	006	735	123	45	231	90–100	NE	30%	45%	93%

Table C-19. Double Bowen Small Diameter Thinning Stand Inventory Data							
Unit #	Trees per Acre <8″ DBH	Trees per Acre >8″ DBH	Average Stand Diameter >8″ DBH	Basal Area >8″ DBH (sq. ft./acre)	Canopy Cover (%)	Aspect/ Slope	Relative Density
T35S, R2E, section 15							
002	1,284	120	14″	137	60–70	NW/20–30%	65%
005N	1,042	115	14″	136	60–70	N/15%	75%
005S	1,160	110	12″	155	70–80	N/20–30%	78%
T35S, R2E, section 23							
900	115	256	11″	160	80–90	E/20–30%	65%
901	592	227	11″	147	80–90	E/20–30%	77%

Relative density is a measure of crowding in a stand of trees. It compares the number of trees present to the number of trees that the site has resources (water, nutrients, and sunlight) to support. At relative densities from 35 to 50% in stands dominated by Douglas-fir, stand vigor and growth is maximized. At relative densities greater than 60% the following conditions begin to occur: competition-related mortality becomes significant, self-thinning starts, growth declines, volume growth per acre is offset by mortality, and susceptibility to insect and disease attack increases (Curtis 1982; Hann and Wang 1990; Forest Service 1983). Relative density uses a maximum density of 100, with relative densities ranging from 0 to 100. To calculate relative density, stand basal area is divided by the square root of the stand quadratic mean diameter. For example, a stand with 100 square feet basal area and a quadratic mean diameter of 16 inches would have a relative density of 25 (100 divided by 4). Quadratic mean diameter (QMD) is the diameter of the tree of average basal area in the stand.

Basal area is the proportion of ground covered by the cross-sectional area of trees present. Basal area is expressed as square feet per acre.

C.7 Characteristics of Low Vigor Trees

C.7.1 Low vigor trees

C.7.1.1 Low Vigor Ponderosa Pine

Trees meeting the following criteria:

- Crowns are ragged and thin.
- Foliage in parts of crown is thin, bunchy, or unhealthy; needles are average to shorter than average in length.
- Needle color is poor to fair.
- Some twigs or branches lack foliage and some twigs or branches are fading or dead.
- Localized weakened parts of crowns are present.
- Crown top is rounded, and the crown width is narrow or flat on one or more sides.

C.7.1.2 Low Vigor Douglas-fir and White Fir

Trees meeting the following criteria:

- Crown has thin appearance when viewed against the sky.
- Needle length is short.

- Needle color is very poor, yellowish.
- Dead or dying twigs or branches in the crown form holes; sparse and ragged crown appearance.
- Crown ratio is poor.
- Mistletoe infected, with a rating of 4, 5, or 6.

C.7.1.3 Trees Affected by Root Disease

Trees have the following visual characteristics:

- Groups of trees are affected with trees showing variable levels of decline.
- Trees have reduced height growth; look at the tops of trees for reduced increment growth.
- Foliage is yellow; decline of the crown is from the top to the bottom.
- Trees are producing distress cone crop.
- Bark beetles are sometimes present because of the stressed trees.
- Wind thrown trees are common; wood at the base of the downed trees is soft and stringy or has begun to delaminate.

Table C-20. Root Diseases in the Project Area

Root Disease	Severely Affected	Moderately Affected	Resistant
Annosus S-group *Heterobasidion sp.*	White fir	None	Douglas-fir, sugar pine, incense cedar, ponderosa pine
Armillaria	White fir	Douglas-fir, ponderosa pine, sugar pine	Incense cedar
Laminated root rot *Phellinus weirii*	Douglas fir/ White fir	None	Incense cedar, ponderosa pine, sugar pine

C.7.2 Insect-Infested Trees

Douglas-fir and white fir trees undergoing attack from bark beetles, as identified by red boring dust present in bark crevices or on the ground near the base of the tree. Borers typically begin their attack in the top of the tree, and then may spread to the lower bole. Foliage is thinning and yellowish in appearance. Pitch streamers on Douglas-fir may also be present on the mid- to upper bole.

Ponderosa pine trees undergoing current attack from western pine beetle or red turpentine beetle. Pitch tubes should contain reddish/brown granular frass. Pitch tubes clear in color indicate the tree has been successful in expelling the beetle; these trees should not be marked if otherwise healthy.

C.7.3 Douglas-fir Mistletoe Infested Trees

Target the removal of Douglas-fir trees with a mistletoe rating of 4, 5, or 6.

To determine the mistletoe rating for individual trees use the 6 class rating system.

Step 1: Divide the live crown into thirds

Step 2: Rate each third separately. Each third should be given a rating of 0, 1, or 2.

0—no visible infections.

1—light infection (one-half or less of total number of branches are infected).

2—heavy infection (more than one-half of the total number of branches is infected).

Step 3: Add ratings of each third together to obtain a rating for the tree.

NOTE: All snags and coarse woody debris would be maintained as they presently occur; snags that are a safety hazard may be felled but would be left on-site.

C.8 Leave Tree Spacing Guidelines

C.8.1 Timber Harvest—Relative Density (35%)

Estimate the average diameter of potential leave trees and determine the desired spacing in feet by referring to Table C-21. Follow the basal area and spacing table as closely as possible. Once the area has been marked verify the leave basal area using a relaskop or prism; adjust basal as necessary. As the average diameter changes, spacing will also change and stand density will remain constant.

Table C-21. Average Leave Tree Spacing by Basal Area and Average Diameter to obtain a Relative Density of 35%

Average Leave Tree DBH (inches)	Leave Tree Basal Area (square feet)	Average Leave Tree Spacing (feet)
8	99	12 x 12
10	111	15 x 15
12	121	17 x 17
14	131	19 x 19
16	140	21 x 21
18	148	23 x 23
20	157	25 x 25
22	164	26 x 26
24	171	28 x 28
26	178	30 x 30
28	185	32 x 32
30	191	33 x 33

C.8.2 Small Diameter Thinning

C.8.2.1 Ponderosa Pine Guidelines—Relative Density 25%

Estimate the average diameter of potential leave trees and determine the desired spacing in feet by referring to Table C-22. Follow the basal area and spacing table as closely as possible. Once the area has been marked verify the leave basal area using a relaskop or prism; adjust basal as necessary. As the average diameter changes, spacing will also change, holding stand density constant.

Table C-22. Average Leave Tree Spacing by Basal Area and Average Diameter to obtain a Relative Density of 25% in Ponderosa Pine Stands

Average Leave Tree DBH (inches)	Leave Tree Basal Area (square feet)	Average Leave Tree Spacing (feet)
8	71	15
10	79	17
12	87	20
14	94	22
16	100	25
18	106	27
20	112	29
22	117	31
24	122	33

C.8.2.2 Mixed Conifer Guidelines—Relative Density 35%

Estimate the average diameter of potential leave trees and determine the desired spacing in feet by referring to Table C-23. Follow the basal area and spacing table as closely as possible. Once the area has been marked verify the leave basal area using a relaskop or prism; adjust basal as necessary. As the average diameter changes, spacing will also change, holding stand density constant.

Table C-23. Average Leave Tree Spacing by Basal Area and Average Diameter to obtain a Relative Density of 35% in Mixed Conifer Stands

Average Leave Tree DBH (inches)	Leave Tree Basal Area (square feet)	Average Leave Tree Spacing (feet)
8	99	12 x 12
10	111	15 x 15
12	121	17 x 17
14	131	19 x 19
16	140	21 x 21
18	148	23 x 23
20	157	25 x 25
22	164	26 x 26
24	171	28 x 28

C.9 Coarse Woody Debris and Snags

Table C-24. Coarse Woody Debris Decay Classes

Log Characteristics	Decay Class				
	1	2	3	4	5
Bark	Intact	Intact	Trace	Absent	Absent
Twigs <3 cm.	Present	Absent	Absent	Absent	Absent
Texture	Intact	Intact to partly soft	Hard, large pieces	Small, soft blocky pieces	Soft and powdery
Shape	Round	Round	Round	Round to oval	Oval

Table C-24. Coarse Woody Debris Decay Classes

Log Characteristics	Decay Class				
	1	2	3	4	5
Color of wood	Original color	Original color	Original color to faded	Light brown to reddish brown	Red brown to dark brown
Portion of log on ground	Tree elevated on support points	Tree elevated on support points but sagging slightly	Tree is sagging near ground	All of tree on ground	All of tree on ground
Invading roots	None	None	In sapwood	In heartwood	In heartwood

Trees designated for coarse woody debris should have characteristics of decay class 1 and 2 (e.g., bark intact, limbs intact, texture mostly sound, round shape) (Table C-24). To meet the ROD/RMP guidelines, leave a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long (120 linear feet is equivalent to 7.5, 16-foot logs) (Information Bulletin OR-97-064 and Instruction Memorandum OR-95-028).

Table C-25. Number of 16-foot Logs Produced by Tree Diameter Class

Tree DBH	Number of logs per tree 16″ by 16′
16″	1
20″	1
22″	2
24″	3
26″	4
28″	4
30″	5
32″	5
34″	6
36″	6
38″	6
40″	6
42″	7
44″	7
46″	7

To meet RMP requirements for snags, leave a minimum of 1.8 snags per acre in regeneration harvest units. A snag is any standing dead (stages 1 and 2), partially dead, or defective tree (Table C-26). In all other harvest prescriptions, existing snags (stages 1–5) would be retained.

Table C-26. Physical Characteristics of Snags by Deterioration Stage

Stage	Characteristics
1	• Limbs and branches all present • Pointed tree top • Tight bark • Recently dead
2	• Few limbs • No fine branches • Pointed or broken tree top • Variable level of bark remaining
3	• Limb stubs only • Decay in upper bole • Some decay at base of bole • Variable level of bark remaining
4	• Few or no stubs • No fine branches • Broken top • Loose or no bark
5	• No limbs or branches • No sapwood present • Broken top • 20% or less of bark remaining

Appendix D: Soil

The Project Area is within the High Cascades Physiographic Province, which is characterized by a broad upland plateau that has scattered volcanic cones. Soils are weathered in place from Basalt flows.

The soils present in the proposed project units are the Hukill, McMullin-Rock outcrop, Pinehurst, Farva, Freezener, and Geppert. Other soils in the Project Area are in small amounts and proposed projects are not within those soils so they will not be discussed.

The Double Bowen Forest Management Project would affect soils in the Project Area; however, the project design features applicable to both action alternatives would minimize soil impacts to within acceptable limits.

Both action alternatives would have 819 acres of ground-based yarding and 53 acres if skyline-cable yarding. Road work and temporary route construction, reconstruction, and renovation are also the same in both action alternatives. Therefore, the effects to soils are expected to be the same in both action alternatives.

D.1 Soil Compaction

D.1.1 Ground-Based Yarding

Most of the Project Area is on stable ground with less than 35% slopes, which warrants ground-based yarding. Ground-based yarding has the potential to result in a high amount of area of soil compaction. Project design features that focus on limiting soil compaction in ground-based units would keep the effects on soil productivity (compaction) within the acceptable limit (12% of the area), as identified in the Medford ROD/RMP (p. 166).

The following project design features would limit compaction in ground-based yarding units:

- Restrict all ground-based yarding and soil ripping operations from October 15 to May 15, or when soil moisture exceeds 25%.
- Limit landings to 0.5 acre or less in size.
- In order to restrict the amount of compacted soil to less than 12% in a timber harvest unit,
  - allow mechanized equipment capable of creating and walking on slash (such as a cut-to-length system) to work off designated skid trails for one or two passes on at least 8 inches of slash and under dry soil conditions (less than 25% soil moisture content),
  - allow mechanized equipment (feller buncher systems) to work off designated skid trails during the dry season (soil moisture content less than 15%) for 1 or 2 passes only (one round-trip),
  - space the 1- to 2-pass harvest trails a minimum of 50 feet apart off of designated skid trails.
  - use low, ground-pressure equipment (8 psi or less), and
  - restrict all other use of ground-based equipment to designated skid trails.

D.1.2 Temporary Routes

In both action alternatives, 0.4 mile of temporary route construction would occur. In general, for every 1 mile of route constructed, 4 acres of land would be cleared and compacted. Therefore, a total of 1.6 acres would be compacted. Project design features would require mechanical decompaction after use. This would not fully return soil to its natural state and productivity levels but it would expedite the natural recovery time frame.

Temporary route reconstruction occurs on routes that have been previously used but have since grown over or have been "put to bed" in the past. The route proposed for reconstruction (0.2 mile) was previously mechanically decompacted. By using the route, impacts would be localized to an already disturbed area. The route would be decompacted after use. Recovery would be expected to be the same as the new temporary route construction.

The temporary route renovation would use 0.3 mile of an existing, overgrown jeep road. The compaction is already present; although, it is in the process of naturally recovering and vegetation is growing in the road bed. Route construction could be slightly wider than the current tread in a few places. The end of this route would be new construction.

The following project design feature would minimize the impacts of the temporary routes:

- Rip, mulch, water bar, block, and seed (where needed as determined by the BLM) new temporary routes and associated landings in the same season of use. If hauling on a temporary route is not completed in the same year the route is constructed, the route will be storm-proofed and blocked by October 15 or when soil moisture exceeds 25%.

D.2 Soil Erosion

D.2.1 Ground-Based Yarding

Soil erosion from ground-based yarding is not expected to be a concern in the Project Area because yarding would mainly occur on gentle slopes. Where soil erosion is present, it would be localized to skid trails and would not be displaced any distance because of the gentle slopes, soil erodibility and condition of the undisturbed soils around. The duff organic horizon and vegetation are likely to catch displaced soil particles. Project design features would limit the amount of soil erosion and, if it is occurring, limit the distance the soil particles would be displaced.

The following project design feature would minimize soil erosion:

- Restrict tractor and mechanical operations to slopes generally less than 35%. In areas where it is necessary to exceed these gradients to access adjacent tractor area, use ridge tops where possible.

D.2.2 Temporary Routes

Route construction, reconstruction, and renovation have the potential to cause soil erosion. The ground would be disturbed and the soil would be compacted. The removal of topsoil exposes bare soil that may be easier to erode. The gentle topography of the area, the nature of the soil in these locations, and implementation of the following project design features would minimize the potential for soil erosion:

- Rip, mulch, water bar, block, and seed (where needed as determined by the BLM) new temporary routes and associated landings in the same season of use. If hauling on a temporary route is not completed in the same year the route is constructed, the route will be storm-proofed and blocked by October 15 or when soil moisture exceeds 25%.
- Locate temporary routes and landings on stable locations such as ridge tops, stable benches, or flats with gentle to moderate side slopes, and use existing jeep road and skid trail footprints where possible.

Appendix E: Water Resources

E.1 Methodology

The project hydrologist used the following sources for analysis:

- GIS to analyze the existing condition of the Double Bowen Project Area at the Lower South Fork Big Butte Creek sixth-field subwatershed scale.
- Central Big Butte Creek Watershed Analysis (Bureau of Land Management 1995b) for general water resources background information for the Project Area.
- Field visits to proposed harvest units and associated roads in 2013 and 2014 to determine current watershed conditions and identify potential issues related to water resources.
- Site visits to identify stream types on BLM-administered lands; aerial photo interpretation, and information on streams on BLM-administered lands were used to estimate stream types on adjacent Forest Service and non-Federal land.
- Water quality will be analyzed in detail within the Ginger Springs Recharge Area. Cumulative effects for water resources were analyzed at the seventh field drainage area scale.
- The scale for this analysis is the sixth-field subwatershed level of Lower South Fork Big Butte Creek. The sixth-field subwatershed scale is appropriate because proposed the majority of projects lie within this boundary. A small percentage of proposed projects are outside this sixth-field subwatershed and are analyzed at the seventh field drainage scale. These two seventh field drainages are Willow Creek below Ash and Ash Creek.

E.2 Assumptions

- Short-term effects are 10 years or less; long-term effects last longer than 10 years (Bureau of Land Management 1994, 4-4).
- 60-year harvest rotation for timber company lands (Bureau of Land Management 1994, 4-5).
- All proposed PDFs will be properly implemented in order to meet resource objectives.
- Roads listed as unknown in GIS were assumed to be natural surface for this analysis The Medford District RMP assessed the effects of projects of this scale and relied on Best Management Practices to comply with the Federal Clean Water Act. Best Management Practices are the primary mechanisms to achieve Oregon water quality standards (Bureau of Land Management 1995a, 151).
- Historic crown closure is assumed to be approximately 40 percent for forested lands in the Southern Cascades ecoregion (Watershed Professionals Network 2001).

E.3 Introduction

The climate of the Project Area is generally warm and dry with typically cool, wet winters and hot, dry summers. Summer temperatures range from the high 70s to the low 90s. Occasional daytime temperatures in the summer may reach 100° F. Winter lows drop regularly to 10° to 20° F. Annual precipitation averages 35 inches. Most of the precipitation occurs between mid-October to mid-April as rain or snow.

The majority of the Double Bowen Project Area lies within 1, sixth-field subwatershed—Lower South Fork Big Butte Creek, which will be used to define the analysis area for cumulative effects on water resources. This subwatershed lies within the in the Big Butte Creek fifth-field watershed which is within the larger Upper

Rogue fourth-field subbasin. The Water Resources analysis will consider three analysis areas: Lower South Fork Big Butte Creek sixth-field subwatershed and Willow Creek below Ash Creek and Ash Creek seventh-field drainages (Map E-1).

The BLM manages 4,090 acres of the 18,354 acres within the three analysis areas (Table E-1).

Table E-1. Land Ownership Acres by Water Resources Analysis Areas containing the Double Bowen Project Area

Analysis Area	BLM	Local Government	Private	Forest Service	Total
Lower South Fork Big Butte Creek	4,059	150	11,252	326	**15,787**
Willow Creek below Ash	0	551	332	132	**1,015**
Ash Creek	31	21	655	845	**1,552**
Total	**4,090**	**722**	**12,239**	**1,303**	**18,354**

Elevations in the Double Bowen analysis area range from 1,560 feet to 4,880 feet. Within the analysis area, rain predominates in the lower elevations (generally below 3,500 feet). The majority (80%) of BLM-administered lands in the analysis area are located within the rain zone (Table E-2). A mixture of snow and rain occurs between approximately 3,500 and 5,000 feet elevation; this area is referred to as the TSZ (transient snow zone). The snow level in this zone fluctuates throughout the winter in response to alternating warm and cold fronts. Snow packs in this elevation range are often shallow and are quickly melted by rain (rain-on-snow event) and warm winds. The Double Bowen analysis area contains no lands in the snow zone (above 5,000 feet elevation).

Table E-2. Precipitation Zones by Water Resources Analysis Areas containing the Double Bowen Project Area

Analysis Area	Precipitation Zone (acres)		Total	Percent in Transient Snow Zone
	Rain Zone	Transient Snow Zone		
Lower South Fork Big Butte Creek	12,370	3,412	15,790	22
Willow Creek below Ash	1,015	0	1,015	0
Ash Creek	1,227	325	1,552	21
Total	**14,612**	**3,737**	**18,357**	**20**

Peak flows occur during the winter when periodic snowfall totally or partially melts during warm, mid-winter rain-on-snow events. Low flows normally coincide with the period of low precipitation from July through October. Significant flows can also be produced by local, high-intensity summer storms, although these events are relatively rare and their effect is limited to the local area.

The risk of peak-flow enhancement is estimated from the OWAM (Oregon Watershed Assessment Manual) risk-assessment graph (Figure E-1) that uses the percent of the analysis area within the transient snow zone (see Table E-2) and the percent of the transient snow zone with less than 30% crown closure.

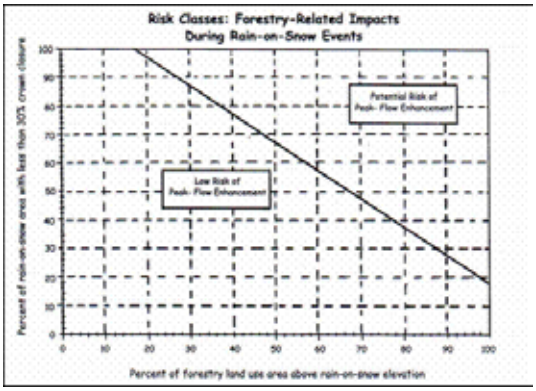
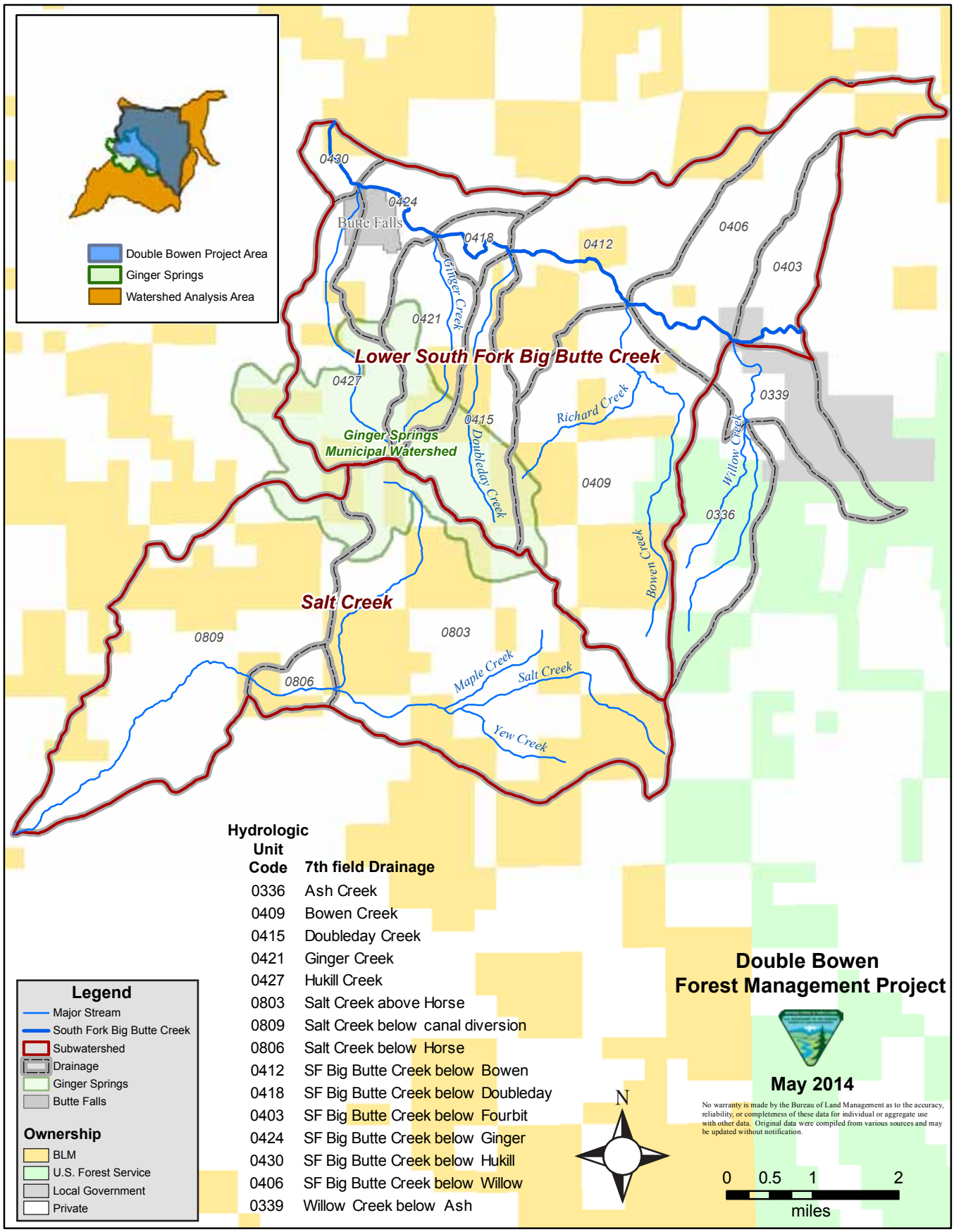


Figure E-1. Estimating the risk of peak-flow enhancement from forestry-related impacts during rain-on-snow events (WPN 1999:IV-11).

Map E1. Double Bowen Project Water Resources Analysis Areas



The historic crown closure for the planning area varies by ecoregion. The analysis areas associated with the proposed project are in the Southern Cascades ecoregion (Watershed Professionals Network 2001, A-80, A-204). Forest types within the Southern Cascades ecoregion historically had 40–45% canopy crown closure (ibid., A-83). For analysis purposes, historic crown closure is assumed to be approximately 40% for forested lands in the Southern Cascades ecoregion.

Surface water in the Double Bowen Project Area includes streams, irrigation ditches, springs, wetlands, and reservoirs. Streams in the Project Area are classified as perennial, intermittent with seasonal flow (long-duration intermittent), intermittent with ephemeral flow (short-duration intermittent), and dry draws with ephemeral flow. The Lower South Fork Big Butte Creek subwatershed contains 62 miles of stream: 18 miles of short-duration intermittent, 14 miles of long-duration intermittent, and 30 miles of perennial.

Streams categorized as perennial or intermittent on Federal lands are required to have riparian reserves as defined in the Northwest Forest Plan. Dry draws do not meet requirements for streams needing riparian reserves because they lack the combination of a defined channel and annual scour and deposition (Bureau of Land Management 1995a, p. 27). Streams on private forest lands are managed according to the Oregon Forest Practices Act, which classifies and protects streams based on three beneficial use categories—fish use, domestic water use without fish use, and all other streams. About 27% of the stream miles flow through Federal ownership and have riparian reserve buffers of 190 feet in the Lower South Fork Big Butte Creek sixth-field watershed. The relatively gentle topography of the Double Bowen Project Area and stable soils results in few unstable areas that would be identified as riparian reserves. If unstable areas are found during project layout, they would be identified as riparian reserves and excluded from harvest.

The topography of the Double Bowen Project Area is flat to gently sloping terrain with broad, low-gradient drainage ways and side slopes less than 35% (Bureau of Land Management 1995b). The generally flat terrain with low-gradient streams results in a low, stream density. Stream densities in the Project Area range from 2.5 stream miles per square mile to 3.4 stream miles per square mile (Table E-3). The overall stream density in the Project Area is 2.6 stream miles per square mile. Flat ground, low-energy streams, and low stream density result in less hydrologic connectivity from roads and skid trails to streams than in steeper watersheds with higher stream densities.

Table E-3. Stream Density by Analysis Area

Analysis Area	Square Miles	Stream Miles	Density (miles/square mile)
Lower South Fork Big Butte Creek	24.7	62.1	2.5
Willow Creek below Ash	1.6	3.9	2.5
Ash Creek	2.4	8.2	3.4
Total	**28.7**	**74.2**	**2.6**

Of all forest management activities, roads typically have the greatest potential to influence aquatic habitat in forested watersheds. Roads have three primary effects on hydrologic processes: (1) they intercept rainfall directly on the road surface and road cutbanks and affect subsurface water moving down the hill slope; (2) they concentrate flow, either on the surface or in an adjacent ditch or channel; and (3) they divert or reroute water from paths it otherwise would take were the road not present (Gucinski, et al. 2001).

Impacts include both near-term and ongoing (chronic) impacts. Near-term impacts stem from activities that include new ground disturbance, such as construction or maintenance of road segments. These activities lead to increased potential for erosion and transport of sediment to channels. Sediment

contribution to channels stemming from these activities generally diminishes after 1 to 3 years (Luce and Black 2001; Megahan 1974).

Weathering of road surfaces can lead to chronic sediment and turbidity contributions to aquatic habitats, and maintenance and use of roads (such as for timber hauling) can accelerate rates of erosion, particularly during the wet season (Luce and Black 2001; Reid and Dunne 1984). Intercepted runoff that becomes concentrated over erodible road surfaces mobilizes and transports sediment with it. Surfaces armored by pavement do not experience this type of chronic weathering, while rocked roads are more resistant than natural-surface roads. For these reasons, natural-surface (or depleted rocked surface) roads with a high degree of hydrological connectivity are generally more likely than surfaced roads (rocked or paved) to contribute sediment to streams. Around 52% (158 miles) of BLM roads and BLM-controlled roads in the Project Area are natural surface roads (Table E-4).

Table E-4. Road Surface Types by Water Resources Analysis Areas containing the Double Bowen Project Area

Analysis Area	Road Surface (miles)			Total Miles	Percent Natural Surface
	Aggregate	Bituminous	Natural		
Lower South Fork Big Butte Creek	54.6	10.4	72.6	138.2	53%
Willow Creek below Ash	0.5	1.2	6.6	8.3	79%
Ash Creek	8.2	1.0	2.2	11.4	19%
Total	**63.3**	**12.6**	**81.4**	**157.9**	**52%**

Roads that cross dry draws have the potential to route storm flow into the dry draw. Subsurface flow through the colluvium (i.e., loose rock and soil at the base of the slope) can also be intercepted by a road cut or compaction from a road that crosses the bottom of a dry draw, initiating surface flow with scour and deposition in the draw. This has the potential to change the downstream flow characteristics of the draw to a short-duration intermittent stream, affecting the size of downstream peak flows due to the more rapid delivery of storm flow to downstream reaches (water flows much faster through the defined surface channel of a short-duration intermittent stream than it does subsurface through the colluvium of a dry draw).

In addition to channel crossings, the design of the road also plays into the degree of hydrological connectivity. Well-designed roads with a properly functioning drainage system attempt to mimic the local natural drainage pattern by keeping the local downslope movement of water similar to the preroad condition. However, during extreme events (drought or peak flow) any hydrologic differences between the artificial drainage associated with the road system and the natural system become more critical and can cause noticeable effects, such as stream sedimentation, to the local environment.

Roads that are designed to shed intercepted water quickly off their surface and back to the forest floor have connectivity only from the point of the last turn-out device to where the road crosses the stream. Examples of such designs include outsloped road surfaces, rolling dips, and water bars, which are effective and common designs used to reduce connectivity between roads and the aquatic system when constructed and maintained properly (Luce and Black 2001; Macdonald and Coe 2008). Contrast this with an insloped road drained by an inboard ditch with few cross drains; such a road would have a greater portion of its length directly connected to the stream and would have a greater potential to impact aquatic habitat. Connectivity also changes in response to climactic conditions, with the greatest road-stream hydrological connectivity occurring during the wettest period of the year when soil moisture contents are high, ground water tables are elevated, and runoff is more likely (Furniss, Flanagan, and McFadin 2000). For this reason,

wet season use of a given road system would have a higher potential to contribute impacts to aquatic habitat than dry season use.

Road density provides a general index of the relative amount of road in the analysis areas. Areas with higher road densities will generally experience more road-related effects such as stream sedimentation; however, many other factors such as design, location, maintenance, use, surface type, gradient, and geology can influence the effect of any particular road. Road density in the Project Area is relatively high with Lower South Fork Big Butte Creek having a road density at 5.6 miles per square mile. The average road density for the analysis area is 5.5 miles per square mile (Table E-5).

Table E-5. Road Density by Water Resources Analysis Areas containing the Double Bowen Project Area

Analysis Area	Road Miles	Square Miles	Density (miles/square mile)
Lower South Fork Big Butte Creek	138.2	24.7	5.6
Willow Creek below Ash	8.3	1.6	5.2
Ash Creek	11.4	2.4	4.7
Total	**157.9**	**28.7**	**5.5**

Road-stream crossings are used as an indication of connectivity between roads and streams. Concentration of runoff by road drainage systems may contribute to more rapid delivery of storm runoff directly to streams, resulting in increased peak flows. Road segments linked to the channel network increase flow routing efficiency and offer a plausible mechanism for peak flow increases (Wemple, Jones, and Grant 1996). Drainages with a larger number of road-stream crossings are more likely to experience an increased magnitude and frequency of peak flows and subsequently increase localized stream sedimentation from roads. The Lower South Fork Big Butte Creek Subwatershed has a relatively high density of road-stream crossings at 6.2 crossings per mile (Table E-6). Part of the reason for this high road density is because the subwatershed contains roads within the city of Butte Falls along with a high amount of private lands.

Table E-6. Road-Stream Crossing Density in the Water Resources Analysis Areas containing the Double Bowen Project Area

Analysis Area	Stream Crossings	Stream Miles	Stream Crossings per Mile
Lower South Fork Big Butte Creek	153	24.7	6.2
Willow Creek below Ash	6	1.6	3.8
Ash Creek	20	2.4	8.2
Total	**179**	**28.7**	**6.2**

Other potential sediment delivery locations include roads that parallel stream channels closely where road ditches can transport sediment through cross drains. Approximately 28 miles of natural surface roads are within 190 feet (riparian reserve width) of streams throughout the Double Bowen Project Area (Table E-7). This includes approximately 20 miles that are listed as unknown road surfacing in the BLM GIS database; these were assumed to be natural surface for this analysis. On BLM-administered roads in the Project Area, 6.3 miles of the 28 miles of natural surface roads are within 190 feet of stream channels.

Table E-7. Miles of Natural Surface Roads in the Water Resource Analysis Areas within 190 Feet of Streams

Analysis Area	Natural Surface	Unknown Surface	Total
Lower South Fork Big Butte	6.9	17.6	**24.5**
Willow Creek below Ash	0.1	2.6	**2.7**
Ash Creek	0.9	0.0	**0.9**
Total	**7.9**	**20.2**	**28.1**

The BLM completed TMOs (transportation management objectives) for the entire Double Bowen Project Area in order to determine the long-term objectives for roads within the watershed. Recommendations for the management of each road would be addressed by this project or future projects.

Since 2000, road construction has declined and road decommissioning and upgrading has increased. Implementation of BMPs during road and timber harvest operations has reduced impacts on water quality. A review of forest management impacts on water quality concluded that the use of BMPs in forest operations was generally effective in avoiding significant water quality problems; however, the report noted that proper implementation of BMPs was essential to minimizing nonpoint source pollution (Kattelmann 1996). Water quality on Federal lands is on an upward trend with reductions in sediment input.

The Oregon Environmental Quality Commission has adopted water quality standards to protect designated beneficial uses. In practice, water quality standards have been set at a level to protect the most sensitive uses. Cold-water aquatic life such as salmon and trout are the most sensitive beneficial uses in the Rogue River and its tributaries (Oregon Department of Environmental Quality 2004). The DEQ (Department of Environmental Quality) is required by the CWA (Clean Water Act) to maintain a list of stream segments that do not meet water quality standards for one or more beneficial uses. This list is called the 303(d) list because of the section of the CWA that makes the requirement. DEQ's 2010 303(d) list is the most recent listing of these streams (Oregon Department of Environmental Quality 2010).

The analysis area contains 8.3 miles of streams on the 303(d) list for elevated stream temperatures (Table E-8). In 2008, the Rogue Basin TMDL (Total Maximum Daily Load) analysis was completed and established a limit for each pollutant for listed water bodies and effectively removed these previously listed streams from the 303(d) list; although, these streams are still considered water quality limited. No streams in the Project Area were listed as water quality limited for sedimentation. However, DEQ does not currently have a methodology for assessing sedimentation; the agency is in the process of developing such a methodology.

Table E-8. Water Quality Limited Streams in the Water Resources Analysis Areas

Analysis Area	Stream Miles
Lower South Fork Big Butte Creek	
Doubleday Creek—Temperature	3.4
Hukill Creek—Temperature	3.3
South Fork Big Butte Creek below Ginger—Temperature	0.2
Willow Creek below Ash—Temperature	1.4
Ash Creek	0
Total	**8.3**

E.4 Effects of the Double Bowen Project on Water Resources

Because no new management is proposed under Alternative 1, the effects described reflect current conditions and trends that are shaped by ongoing management, reasonably foreseeable future actions, and events unrelated to the Double Bowen project. Discussion for Alternatives 2 and 3 reflect the direct and indirect impacts of the proposed action. Effects discussion also includes cumulative impacts of those direct and indirect actions when added incrementally to past, present, and reasonably foreseeable actions. Short-term effects are defined as those lasting 10 years or less and long-term effects last more than 10 years (Bureau of Land Management 1994).

E.4.1 Effects of Alternative 1 (No Action) on Water Resources

Direct and Indirect Effects

No actions are proposed under Alternative 1. The current conditions in the Project Area are the result of past actions not related to the Double Bowen project. Alternative 1 describes anticipated effects of not implementing the proposed project and continuing with current management.

Under Alternative 1, there would be no change in existing water quality on BLM-administered lands. Surface erosion from roads would continue and the risk of sediment inputs to streams would remain relatively constant. A minimum level of BLM road maintenance would occur to repair drainage failures or prevent major sediment input. There would be no action to decrease overall road densities or decrease road interactions with streams.

There would be no reduction in total road miles and no improvement to infiltration or reduction in sediment delivery under this alternative. Alternative 1 would not implement any road-related projects and, therefore, would not reduce localized sediment coming from natural surface roads or from roads that are paralleling streams.

Cumulative Effects

Past actions have resulted in increased fine sediment levels above background level. The main actions resulting in these conditions are timber harvest and road building. Other contributors to these conditions include agriculture and grazing.

Off-highway vehicle use has increased in the past 10 years and also contributes to watershed cumulative effects by increasing erosion and subsequent sedimentation in the Double Bowen analysis area, although the extent of this effect is not known.

Timber sales completed under the 1995 Medford District ROD/RMP on BLM-administered lands in the Double Bowen analysis area implemented riparian reserve buffers and likely did not contribute to increased stream sedimentation.

Road renovation and road improvement occurred as part of these projects to reduce the overall amount of sediment coming from roads.

Road work that helps reduce sedimentation has included adding cross drains to improve road drainage by reducing distances between cross drains. Both road closures and road decommissioning have also been completed in the watershed during the last decade. However, some of the closed roads were not effective at limiting off-highway vehicles access and the subsequent erosion and sedimentation to streams.

E.4.2 Effects on Water Resources from Actions Common to All Action Alternatives

Direct and Indirect Effects

Small Diameter Thinning

Small diameter thinning would occur on 76 acres of overstocked, even-even aged ponderosa pine and mixed conifer stands in the Lower South Fork Big Butte Creek subwatershed. Water quality would be maintained during small diameter thinning by implementing project design features and no-treatment stream buffers.

Temporary Routes

In the Double Bowen Project Area, 0.9 mile of temporary route construction, reconstruction, and renovation are proposed in Alternatives 2 and 3 to facilitate access to timber harvest units (Table E-9). These temporary routes are either existing routes, previously decommissioned roads, extensions of existing roads, or short spur routes off existing roads; they are located outside riparian reserves. Temporary routes would be constructed on stable locations, used, and decommissioned within the same operating season. Temporary route construction and reconstruction would occur during the dry season. Additionally, 1.2 miles of designated skid trails are proposed, all within the Lower South Fork Big Butte Creek subwatershed. These activities would not contribute to increased road density in the Project Area because these routes and skid trails are temporary and the effects would be mitigated by ripping and water barring to minimize the potential for sedimentation. This is not expected to affect aquatic resources because they would not be connected to the stream network.

Table E-9. Temporary Routes by Water Resource Analysis Area in Alternatives 2 and 3

Analysis Area	Construction	Reconstruction	Renovation	Total
Lower South Fork Big Butte Creek	0.4	0.2	0.1	0.7
Willow Creek below Ash	0	0	0	0
Ash Creek	0	0	0.2	0.2
Total	**0.4**	**0.2**	**0.3**	**0.9**

Road Work

Proposed activities that would be hydrologically connected to the stream network include timber hauling, road renovation, and road decommissioning. Short term (one to five years), small inputs of sediment at stream crossings in the Project Area could result from these actions.

Given the dry season haul restriction, inputs would occur only during a precipitation event following a season of hauling and would be spatially spread over many input locations. It is extremely unlikely that sediment input from these activities would be detectable above background levels and would have an effect on aquatic habitat. Sediment increases would be minor and undetectable relative to existing sediment levels and would not contribute measurable or detectable effects above already elevated background levels. Over the long term, road renovation on 31.4 miles of timber haul routes would reduce road-related sediment inputs by adding rock to depleted areas and natural surface roads (Table E-10). Improving drainage would also reduce sediment inputs by reducing erosion to the road surface and ditches.

Table E-10. Miles of Road Renovation—Spot Rocking and Drainage Improvement—by Water Resources Analysis Area and Existing Surface Type

Analysis Area	Other	Aggregate	Bituminous	Natural	Unknown	Total
Lower South Fork Big Butte Creek	0.2	27.8	0	1.4	0.2	29.5
Willow Creek below Ash Creek	0	0	0	0	0	0
Ash Creek	1.2	0.7	0	0	0	1.9
Total	**1.4**	**28.5**	**0**	**1.4**	**0.2**	**31.4**

In Alternatives 2 and 3, 0.2 mile of natural surface roads within 190 feet of streams would be closed with either a gate or a barricade. Sediment from these roads would be reduced because the amount of traffic traveling on these roads would be limited, especially during the wet season when most sedimentation occurs.

Approximately 3 miles of would be decommissioned (Table E-11). This project would address sediment from roads by placing roadbeds in a stable, well-drained, maintenance-free condition that would produce little road-related sediment. Of the 2.9 miles proposed for decommissioning, 2.4 miles would be partially decommissioned and 0.5 mile would be fully decommissioned. Partial decommissioning would occur on 0.8 miles of natural surface roads within 190 feet of streams. Full decommissioning would occur on 0.6 miles of natural surface roads within 190 feet of streams. Decommissioning roads near streams would reduce the amount of sediment coming from roads in the long term.

Table E-11. Miles of Road Decommissioning by Water Resource Analysis Area for Alternatives 2 and 3

Analysis Area	Full	Partial	Total
Lower South Fork Big Butte Creek	0.5	2.3	2.8
Willow Creek below Ash Creek	0	0	0
Ash Creek	0	0.1	0.1
Total	**0.5**	**2.4**	**2.9**

Partial decommissioning includes pulling culverts, water barring, seeding, mulching, and blocking the access. Full decommissioning would additionally include ripping the road surface. Ripping the road prism breaks up the existing compacted soil and allows for better water infiltration into the soil, reduces runoff, and improves vegetative recovery. This would reduce the introduction of sediments into nearby streams from these roads. While both methods would reduce the overall amount of sediment coming from roads, fully decommissioned roads would also increase infiltration allowing for quicker and more long-lasting recovery of the site. Where stream crossings and culverts are removed, sediment could enter the stream system at the site. The amount of sediment would be minimized by following the project design features and by working during the instream work period when flows are lowest.

Water Source Restoration

Water source restoration is proposed at 2 sites; both sites are within the Lower South Fork Big Butte Creek subwatershed. Because each site is unique, the amount and type of work needed to restore the water sources to their original design varies. The following project design features would be implemented:

- Dispose of end-haul material in stable sites outside of floodplains, as identified by the BLM Authorized Officer. Apply erosion control measures at disposal sites to minimize sediment delivery to water bodies.

- Minimize disturbance to existing riparian vegetation in order to maintain slope stability.
- Use sediment-control measures such as straw bales, filter cloth, or sediment fences.
- Limit instream work to the period from June 15 to September 15.

Implementing these project design features would keep the disturbance localized and minimize or eliminate any downstream sedimentation.

Meadow Restoration

Meadow restoration would occur on 21 acres; 9.5 of those acres are located in a Riparian Reserve. The meadow would be underburned in the fall or winter when soil moisture is high so grass roots would not be consumed. This would allow the rapid regrowth of the grasses to further minimize potential erosion by stabilizing exposed soils from the burn. Burning during fall conditions when vegetation and soils are moist would keep fire intensity low and therefore minimize the amount of sediment entering the low-gradient, low-flow intermittent stream that runs through the meadow.

E.4.3 Effects of Alternative 2 on Water Resources

Direct and Indirect Effects

Under Alternative 2, shelterwood, density management, selection harvest, and riparian thinning are proposed on a total of 796 acres (Table E-12). Water quantity would not be affected by the majority of harvest activities because the amount of canopy retained after harvest would be within the range of natural variability, which is assumed to be approximately 40% for forested lands in the Southern Cascade ecoregion. Approximately 95% (754 acres) of the acres proposed for harvest would be thinned to a 40% or greater canopy cover. Shelterwood harvest on 42 acres would result in a 20–40% canopy cover, which is below the range of natural variability. Because none of the treatments result in canopy cover below the range of natural variability within the transient snow zone (Table E-13) and because of the low susceptibility of the Lower South Fork Big Butte Creek subwatershed to peak flow enhancement, there would be a low risk for increased frequency and magnitude of peak flows due to rain-on-snow events.

Table E-12. Timber Harvest Proposed in Alternative 2 by Water Resources Analysis Area

Analysis Area	Density Management		Riparian Thinning 50 or 60% CC	Selection Harvest		Shelterwood	Total
	40% CC	60% CC		40% CC	60% CC		
Lower South Fork Big Butte Creek	386	121	14	202	28	42	**793**
Willow Creek below Ash	0	0	0	0	0	0	**0**
Ash Creek	0	0	0	0	3	0	**3**
Total	**386**	**121**	**14**	**202**	**31**	**42**	**796**

CC = Minimum canopy cover remaining after harvest.

Table E-13. Timber Harvest Proposed in Alternative 2 by Precipitation Zone in Water Resources Analysis Area

Analysis Area	Rain Zone	Transient Snow Zone	Total
Lower South Fork Big Butte Creek			
Density Management—40%	199	187	386
Density Management—60%	46	75	121
Riparian Thinning	2	12	14
Selection Harvest—40%	80	122	202
Selection Harvest—60%	18	10	28
Shelterwood	42	0	42
Subtotal	**387**	**406**	**793**
Ash Creek			
Selection Harvest—60%	0	3	3
Grand Total	**387**	**409**	**796**

Note: No timber harvest is proposed in the Willow Creek below Ash seventh field drainage.

Riparian thinning would occur on up to 14 acres—but would likely be less after layout occurs—with the majority (12 acres) proposed in the Bowen Creek drainage. This stand needs silviculture treatment to minimize the spread of root rot and mistletoe that is infecting the stand. Projects proposed under Alternative 2 would not affect steam temperatures because no shade would be removed in the primary shade zone on perennial streams as a result of timber harvest; therefore, this alternative would not affect temperature on water quality limited streams.

For both Alternatives 2 and 3, upland timber harvest would occur on approximately 743 acres (the majority of total acres) using ground-based skidders or tractors (Table E-14). Ground-based machinery would use existing and designated skid trails and operate on slopes less than 35% to minimize the area of soil disturbance. Water quality would be maintained while using ground-based equipment through implementation of project design features, distance from stream channels through riparian reserves, and the relative gentle topography of these units.

Table E-14. Yarding Systems by Water Resources Analysis Area for Alternatives 2 and 3

Analysis Area	Skyline-cable	Ground-based	Total
Lower South Fork Big Butte Creek	53	740	793
Willow Creek below Ash	0	0	0
Ash Creek	0	3	3
Total	**53**	**743**	**796**

Cumulative Effects

See cumulative effects under Effects of Alternative 1 on Water Resources for previous, ongoing, and future projects in the Project Area.

Upland work, including timber harvest and follow-up fuels treatments, would have no effect on fine sediment levels due to the filtering action of riparian reserve buffers, project design features designed to prevent overland sediment movement, and best management practices.

The proposed 2.9 miles of road decommissioning would reduce the total miles of road in the Lower South Fork Big Butte Creek subwatershed from approximately 138.2 miles to 135.3 miles. Road density would be reduced from 5.6 to 5.5 miles per square mile. While this amount of road decommissioning does not greatly affect road density or sediment from roads in the Project Area, the trend on BLM lands is to reduce the amount of roads and related effects while minimizing new construction.

Timber harvest and development on private land is expected to continue existing trends in fine sediment potential currently present in the Project Area. The Double Bowen project would, in the short term, contribute a small amount of sediment to streams within the Project Area, in addition to the amounts contributed annually from all other sources. Direct inputs of fine sediment resulting from timber hauling would not be detectable above background levels.

E.4.4 Effects of Alternative 3 on Water Resources

Direct and Indirect Effects

Timber Harvest

Under Alternative 3, restoration thinning, selection harvest, and riparian thinning are proposed on 796 acres with the majority of the harvest proposed in Lower South Fork Big Butte Creek subwatershed (Table E-15). Water quantity is not expected to be affected by harvest activities because all of the proposed harvest acres would be thinned to a minimum 40% or greater canopy cover, which is within the range of natural variability.

Table E-15. Timber Harvest Proposed in Alternative 3 by Water Resources Analysis Areas

Analysis Area	Restoration Thinning		Riparian Thinning	Selection Harvest		Total
	40% CC	60% CC		40% CC	60% CC	
Lower South Fork Big Butte Creek	469	165	14	119	25	**793**
Willow Creek below Ash	0	0	0	0	0	**0**
Ash Creek	0	3	0	0	0	**3**
Total	**469**	**168**	**14**	**119**	**25**	**796**

CC = Minimum canopy cover remaining after harvest.

A total of 409 acres of timber harvest is proposed in the transient snow zone (Table E-16). No treatments would result in canopy cover below the range of natural variability (40%) within the transient snow zone; therefore, there would not be a risk for increased frequency and magnitude of peak flows.

Table E-16. Timber Harvest Proposed in Alternative 3 by Precipitation Zone in Water Resources Analysis Areas

Analysis Area	Rain Zone	Transient Snow Zone	Total
Lower South Fork Big Butte Creek			
Restoration Thinning—40%	219	250	469
Restoration Thinning—60%	87	77	164
Riparian Thinning	2	12	14
Selection Harvest—40%	60	59	119
Selection Harvest—60%	18	8	26
Subtotal	**386**	**406**	**792**
Ash Creek			
Restoration Thinning—60%	0	3	3
Grand Total	**386**	**409**	**795**

Note: No timber harvest is proposed in the Willow Creek below Ash seventh field drainage.

Cumulative Effects

See cumulative effects under Effects of Alternative 1 on Water Resources for previous, ongoing, and future projects in the Project Area.

Upland work, including timber harvest and follow-up fuels treatments, would have no effect on fine sediment levels due to the filtering action of riparian reserve buffers, project design features designed to prevent overland sediment movement, and best management practices.

The proposed 2.9 miles of road decommissioning would reduce the total miles of road in the Lower South Fork Big Butte Creek subwatershed from approximately 138.2 miles to 135.3 miles. Road density would be reduced from 5.6 to 5.5 miles per square mile. While this amount of road decommissioning does not greatly affect road density or sediment from roads in the Project Area, the trend on BLM lands is to reduce the amount of roads and related effects while minimizing new construction.

Timber harvest and development on private land is expected to continue existing trends in fine sediment potential currently present in the Project Area. The Double Bowen project would, in the short term, contribute a small amount of sediment to streams within the Project Area, in addition to the amounts contributed annually from all other sources. Direct inputs of fine sediment resulting from timber hauling would not be detectable above background levels.

Appendix F: Aquatic Conservation Strategy

The Record of Decision for the Northwest Forest Plan contains Standards and Guidelines for the management of the land use allocations designated in the Northwest Forest Plan and incorporated into the 1995 Medford District ROD/RMP. The ACS (Aquatic Conservation Strategy) provides clarification of the intent of the Standards and Guidelines "in order to provide guidance for situations not specifically covered by the standards and guidelines" (USDI and USDI 1994, B-1).

F.1. Components of the Aquatic Conservation Strategy

The following are four main components of the ACS: Riparian Reserves, Key Watersheds, Watershed Analysis (WA), and Watershed Restoration.

F.1.1 Riparian Reserves

The 1995 Medford District ROD/RMP (p. 27) states, "As a general rule, management actions/direction for riparian reserves prohibits or regulates activities that retard or prevent attainment of Aquatic Conservation Strategy and riparian reserve objectives."

ROD/RMP Management direction for timber management within riparian reserves (p. 27) states, "Apply silvicultural practices for riparian reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy and riparian reserve objectives."

F.1.2 Key Watersheds

Key watersheds serve as refugia for "maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species" (ROD/RMP, p. 22). Key watersheds were designated in the 1995 ROD/RMP (p. 23). The Big Butte Creek fifth-field watershed is not a key watershed. The Lower South Fork Big Butte Creek sixth-field watershed where the majority of the Project Area lies within also is not a key watershed.

F.1.3 Watershed Analysis

The relevant watershed analysis for this project is the 1995 Central Big Butte Creek Watershed Analysis (Bureau of Land Management 1995b). Watershed analysis is intended to enable the planning of watershed- or landscape-scale projects that achieve ACS objectives. Watershed analysis will serve as the basis for the design of Best Management Practices during project-specific planning (ROD/RMP, p. 152).

In 2011, the BLM conducted a review and updated the Best Management Practices to provide direction regarding road maintenance practices and road-related actions (IM-OR-2011-018). The update was intended to minimize or prevent sediment delivery to waters of the United States in compliance with the Clean Water Act. Those Best Management Practices were incorporated into the Medford District RMP.

F.1.4 Watershed Restoration

The ROD/RMP (p. 23) states, "Watershed restoration will be an integral part of a program to aid recovery of fish habitat, riparian habitat, and water quality. The most important components of a watershed restoration program are control and prevention of road-related runoff and sediment production, restoration of the condition of riparian vegetation, and restoration of instream habitat complexity."

F.2 Project Summary

The BLM is proposing forest management activities on 858 acres of matrix lands and up to 33 acres of riparian reserves. Forest management activities could include regeneration harvest (shelterwood retention), density management, selection harvest, restoration thinning, small diameter thinning, riparian thinning, and slash disposal activities such as piling and burning and biomass utilization. Proposed road projects include temporary route construction, reconstruction and renovation; road renovation; road closure and decommissioning; and water source restoration.

F.2.1 Project Design Features (PDFs) that would Maintain or Restore ACS Objectives

In timber harvest and small diameter thinning units,

- Stack slash piles more than 60 feet from fish-bearing, perennial streams and more than 35 feet from non-fish-bearing, intermittent streams. Piles will not be placed in channel bottoms.
- Prohibit the use of foam agents within two site-potential trees of fish-bearing, perennial streams and within one site-potential tree of non-fish-bearing, intermittent streams during prescribed burning and mop-up activities.
- Do not treat vegetation within 60 feet of fish-bearing, perennial streams and within 35 feet of non-fish-bearing, intermittent streams.

In timber harvest units,

- Do not cut vegetation within two site potential trees of fish-bearing streams, and within one site potential tree of non-fish-bearing perennial and intermittent streams.
- Designate skid trails with an average of 150-foot spacing. In order to minimize ground disturbance, use existing trails and avoid creating new skid trails where feasible.
- Rip skid trails in all tractor-yarded regeneration harvest units.

In small diameter thinning units,

- Restrict ground-based equipment to slopes 20% or less within 100 feet of a stream. Equipment within the 100 feet will generally be limited to one skid trail parallel to the stream. These trails may be ripped if it would not affect the remaining vegetation. On slopes greater than 20%, no equipment is allowed within 100 feet of the stream; however, trees may be bull-lined to outside of the 100 feet.
- Do not cut vegetation within 60 feet of fish-bearing, perennial streams and within 35 feet of non-fish-bearing, intermittent streams.
- Use existing skid trails in harvest units, where feasible. All other skid trails must be designated prior to falling timber at an average spacing of 100 feet.

In riparian thinning units,

- Riparian thinning within timber harvest units will have a 90-foot, no-treatment buffer on intermittent and perennial streams.
- Do not remove riparian hardwood species such as willow, ash, yew, maple, and California black oak.

For road and quarry work,

- Restrict culvert removal and placement, and road renovation, closure, and decommissioning work from October 15 to May 15, or when soil moisture exceeds 25%.
- Block or barricade identified roads after use and before beginning of the rainy season (generally by October 15).
- Rip and water bar all temporary routes and associated landings (new construction or reconstruction) to a depth of 18 inches or bedrock (whichever is shallower), apply mulch, and block upon completion of use. If hauling is not completed in the same year the route is constructed, the route will be storm proofed and blocked by October 15 or when soil moisture exceeds 25%.
- Rip roads identified for decommissioning to a depth of 18 inches using a subsoiler or winged-toothed ripper, apply native seed and weed-free mulch, and block.
- Apply native seed and mulch to fill slopes and disturbed areas of roads to be fully decommissioned. Seeding and mulching will occur in the same operational season that construction activities occur.
- Apply native seed and mulch to soils that are disturbed or exposed during stream culvert removal, replacement, and installation in the same operational season the work is completed.
- Restrict the application of dust abatement materials, such as lignin, Mag-Chloride, or approved petroleum-based dust abatement products, during or just before wet weather, and at stream crossings or other locations that could result in direct delivery to a water body (typically not within 25 feet of a water body or stream channel).
- Place waste stockpile and borrow sites resulting from road construction or reconstruction in a location where sediment-laden runoff can be confined, on stable slopes at least one site-potential tree height from a stream.
- When removing culverts, pull slopes back to the natural slope, or at least 1:1, to minimize sloughing and erosion, and to minimize the potential for the stream to undercut stream banks during periods of high stream flows. Apply weed-free mulch and native plant seed on all side slopes of the stream where the culvert was removed in the same season the culvert was removed.
- Dewater streams during culvert placement and replacement to maintain optimum bedding material moisture content and to minimize the movement of sediment downstream.
- Remove all possible excess sediment from stream channels during culvert removal, replacement, and installation in the same operational season the work is completed.
- Use approved rip rap, aggregate, and borrow material for road renovation and surfacing. BLM material sources will be surveyed prior to use and will be free of noxious weeds. If noxious weeds are found, they will be treated prior to material extraction and use.
- Restrict all quarry development and rock crushing operations whenever soil moisture conditions or rainstorms could cause the transport of sediment resulting from quarry operations to nearby stream channels (generally October 15 to May 15).
- Construct silt fences or other preventative structures (diversion ditches, settling ponds) as needed to prevent the potential for runoff from quarry operations into nearby stream channels.
- Plant grass seed, native vegetation, or both within the same operating season to stabilize exposed soil in overburden areas from quarry operations.

During water source restoration:

- Dispose of end-haul material in stable sites outside of floodplains, as identified by the BLM Authorized Officer. Apply erosion control measures at disposal sites to minimize sediment delivery to waterbodies.
- Meet Medford District ROD/RMP and Oregon Department of Fish and Wildlife standards for replacement culvert design and installation.
- Minimize disturbance to existing riparian vegetation in order to maintain slope stability and shade.
- Use sediment-control measures such as straw bales, filter cloth, or sediment fences.
- Limit instream work to the period from June 15 to September 15.
- Maximize maintenance activities during late summer and early fall to best avoid wet conditions.
- Temporarily suspend work if monitoring indicates rain storms have saturated soils to the extent there is potential for causing excessive stream sedimentation.
- Apply native plant seed and weed-free mulch as soon as possible after excavation or ripping to reduce erosion.
- Install, operate, and maintain fish screens on water withdrawal equipment in accordance with NOAA Fisheries.

F.3 ACS Consistency Analysis

The following discussion is based on the proposed project activities combined with specific PDFs that will maintain or restore each ACS objective. ACS objectives are analyzed based on short- (10 years or less) and long- (over 10 years) term effects of the project, and are analyzed at a project scale and watershed scale.

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.

Project Scale

Short-Term: The Double Bowen project would maintain and, in some cases, enhance the distribution, diversity, and complexity of the watershed and landscape-scale features. Project design features will ensure protection of the aquatic systems to which species, populations, and communities are uniquely adapted. Project design features include no-treatment buffers on all streams, lakes, wetlands, ponds, springs, and meadows; no new landing construction in riparian reserves; wet season restrictions on hauling and road construction; special yarding requirements for mechanized equipment in riparian reserves; and blocking and decommissioning temporary routes in the same season the route is used.

Long-Term: The Double Bowen project is expected to maintain watershed features in the long term. A total of 2.9 miles of road would be fully and partially decommissioned. The road segments to be abandoned would be fully decommissioned by ripping, water barring, and planting. A total of 0.9 mile of temporary route construction, reconstruction, and renovation would provide temporary access to timber harvest units and would be decommissioned after use. No new permanent road construction is proposed in this project.

Riparian reserves would continue to function because no-treatment buffers would be implemented on all streams, wetlands, ponds, lakes, springs, and meadows; the 14 acres of proposed riparian reserve thinning would increase long-term large wood recruitment.

Watershed Scale

Short-Term: Riparian reserves are expected to maintain the distribution, diversity, and complexity of watershed- and landscape-scale features primarily because restoration through riparian thinning would occur on 14 acres of riparian reserves; no-treatment buffers would be implemented on all streams, lakes, ponds, wetlands, springs, and meadows.

Long-Term: There would be no long-term impacts from this project at the watershed scale because of the implementation of no-treatment riparian buffers, road decommissioning, and special yarding requirements for mechanized equipment during riparian thinning.

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.

Project Scale and Watershed Scale

Short-Term/Long-Term: No physical or chemical barriers associated with the proposed forest management activities and associated projects are expected to occur either in the short-term or long-term.

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

Project Scale and Watershed Scale

Short-Term/Long-Term: No-treatment buffers would be in place on all streams, wetlands, ponds, lakes, and springs; therefore, all banks and stream configurations would remain unchanged. The Double Bowen project would not affect the physical integrity of the aquatic system in the short- or long-term at either the project or watershed scale.

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

Project Scale

Short-Term/Long-Term: Water quality would be maintained through the use of riparian reserves and no-treatment buffers in the Project Area. Water quality would be improved in the short-term as a result of road renovation, although small amounts of sediment could be mobilized and transported to streams when the work begins. There are no point sources of pollution associated with this project. Project design features to maintain water quality include storing hazardous materials and petroleum products and fueling equipment outside of riparian reserves.

Water quality would be maintained in the long-term. Road renovation and decommissioning would reduce sediment input from roads. There would be a slight improvement in water quality at the project scale as a result of the adding crushed rock to approximately 1 mile of road and decommissioning a total of 2.9 miles of road.

Watershed Scale

Short Term/Long Term: Water quality would be maintained at the watershed scale because riparian reserves would continue to function and protect riparian, aquatic, and wetland ecosystems. Road renovation would reduce sediment input to local stream channels but would have little effect at the watershed scale.

Water quality would be maintained as riparian reserves continue to grow large conifers. Road work would help maintain or improve water quality; although, the effect at the watershed scale would be small because of the large number of road miles in the watershed.

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.

Project Scale

Short-Term/Long-Term: The current sediment regime would be maintained because riparian reserves would continue to filter sediment and protect aquatic systems from additional sediment loads that may result from management actions.

The current sediment regime would be maintained and slightly improved as a result of 31 miles of proposed road renovation and 2.9 miles of road decommissioning. The volume of sediment would be reduced locally as a result of adding crushed rock to approximately 1 mile of road.

Watershed Scale

Short-Term/Long-Term: The current sediment regime would be maintained during implementation of the Double Bowen project because timber harvest would occur outside of riparian reserves, with the exception of riparian reserve thinning. Riparian reserve thinning would maintain the sediment regime through the use of no-treatment buffers along the streams. The sediment regime would be maintained or improved through 31 miles of road renovation and 2.9 miles of road decommissioning.

The sediment regime would be maintained at the watershed scale. Although the road work would reduce the volume of sediment at the site scale, this would be immeasurable at the watershed scale when compared to the volume of sediment generated from roads throughout the watershed.

6. Maintain and restore instream 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.

Project Scale

Short-Term: Riparian reserves throughout the Project Area would continue to function. Patterns of sediment, nutrient, and wood routing would be unchanged. The project would not diminish large wood recruitment, alter the flow regime, reduce flood-prone areas, or impinge on watershed function. Vegetation canopy removal, soil compaction, roads, and stream crossings (four risk assessment factors) would not approach risk thresholds of peak or base flows because full riparian reserves will be retained on all but 14 acres of riparian thinning, mechanized equipment would follow special yarding requirements inside riparian reserves, and a total of 2.9 miles of road would be decommissioned.

Long-Term: In the long-term, it is expected that large wood recruitment would increase within the 14 acres of riparian reserves proposed for thinning due to reducing stand densities and promoting large diameter

conifer trees. In the riparian reserves within the Project Area that would not be thinned, large wood recruitment and patterns of sediment and nutrient routing would remain unchanged.

Watershed Scale

Short-Term/Long-Term: Riparian reserves throughout the Double Bowen Project Area would continue to recover and maintain patterns of sediment, nutrient, and wood routing. Peak high and low flows would remain unchanged at the watershed scale. At the watershed scale, there would be no effects detectable from the background levels because project design features would be implemented to ensure instream flows are maintained. Project design features include no-treatment riparian buffers, no new landings in riparian reserves, special yarding requirements for mechanized equipment within riparian reserves, restrictions on wet season hauling and road construction, and decommissioning temporary routes in the same season of use.

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

Project Scale

Short-Term/Long-Term: The Double Bowen project would maintain the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands because canopy removal, soil compaction, roads, and stream crossings (four risk assessment factors) will not exceed risk thresholds for altering hydrology. No-treatment buffers would be applied to all streams, wetlands, ponds, and springs. Except for meadow restoration, project activities would be restricted within 300 feet of meadows 10 acres or larger. There would be no mechanical disturbance within meadows or wetlands.

Watershed Scale

Short-Term/Long-Term: The Double Bowen project would maintain the timing, variability, and duration of floodplain inundation and the water table elevation in meadows and wetlands because project activities would not increase the risk of peak flows or water accumulations. Project activities would not occur in meadows and no-treatment buffers would be implemented on all streams, lakes, ponds, springs, and wetlands.

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.

Project Scale

Short-Term: The Double Bowen project would maintain species composition and structural diversity of plant communities in riparian areas and wetlands because no-treatment buffers would be in place on all streams, wetlands, ponds, and springs. Restoration activities in riparian reserves include riparian thinning on 14 acres of riparian reserves. Temporary route reconstruction would use the existing footprint of old skid trails or roads. Riparian reserves would continue to ensure nutrient filtering and appropriate rates of surface erosion, bank erosion, and channel migration. Riparian reserves would supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Long-Term: The Double Bowen project would restore species composition and structural diversity of plant communities in treated riparian reserves because this project would encourage healthy riparian forests by reducing stand densities to levels the sites have the resources to support. In untreated riparian areas, species

composition and structural diversity would be maintained through full riparian reserves on all streams, ponds, lakes, springs, and wetlands.

Watershed Scale

Short-Term/Long-Term: The Double Bowen project is not expected to affect species composition and structural diversity in riparian areas or wetlands at the watershed scale because thinning would occur on only 14 of the 860 acres of riparian reserves in the Project Area.

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

Project Scale

Short-Term/Long-Term: The Double Bowen project would maintain populations of native plant, invertebrate, and vertebrate riparian-dependent species because no riparian hardwood species will be removed and no-treatment buffers will be implemented on all streams, wetlands, ponds, lakes, and springs. Project design features such as restrictions on wet season hauling and road construction, special yarding requirements for mechanized equipment during riparian thinning, no new landings in riparian reserves, decommissioning temporary routes in same season of use, and ripping and planting new landings and skid trails associated with regeneration harvest will be implemented. Project design features will minimize disturbance to plants, soil, and water; keep project activities from causing large disturbances at the project scale; and limit the risk of spreading noxious weeds.

Watershed Scale

Short-Term/Long-Term: The Double Bowen project is not expected to affect populations of native plant, invertebrate, and vertebrate riparian-dependent species at the watershed scale because no-treatment buffers would be implemented on all stream, wetlands, ponds, and springs. Riparian reserve thinning would be limited to 14 acres and mechanized equipment would follow special yarding requirements within riparian reserves during riparian thinning.

F.4 ACS Summary

The Double Bowen project will maintain all ACS objectives in the short-term and long-term at both the site and watershed scales because of no permanent road construction; no-treatment buffers on all stream channels, lakes, ponds, springs, wetlands, and meadows; special yarding requirements for mechanized equipment within the 14 acres proposed for riparian thinning; and additional project design features to limit effects to soil, water, and plants. This project is not expected to affect the aquatic environment. It would promote the development of large diameter conifer trees in the riparian reserve thinning areas, allow riparian reserves to continue to function, and protect streams within the Double Bowen Project Area.

Full riparian reserves would continue to provide shade to streams. Proposed actions would maintain an adequate distance from streams to avoid sediment deposition harmful to fish habitat. Any effects from all proposed actions are expected to be negligible and within the range of natural variability for maintenance of fish populations and habitat.

Appendix G: Botanical Resources

Special Status plant species are rare plants that are listed under the Endangered Species Act (ESA) as Threatened, Endangered, Proposed, or Candidate; listed by a state as Threatened, Endangered, or Candidate; or listed by the BLM as Sensitive. The BLM's policy for Special Status plants is to (1) conserve, protect, and manage Threatened and Endangered (T&E) and Special Status plants and the ecosystems on which they depend, and (2) ensure that actions authorized on BLM lands do not contribute to the need to list Special Status species under the provisions of the ESA, approved recovery plans, and Bureau Special Status species policies (Bureau of Land Management 1994, 50–53).

Survey and Manage (S&M) species are another category of rare and little known species thought to be associated with late-successional and old growth forests in the Northwest Forest Plan area. They were identified as species that would not be sufficiently protected through the establishment of reserves across the landscape and so required additional efforts to locate and manage their populations to ensure their persistence.

The project botanist has evaluated the effects of the proposed Double Bowen Forest Management Project on Special Status plant species and has determined the following:

- Proposed projects would have no effect on T&E plants.
- Projects would not trend Bureau Sensitive vascular or nonvascular plant and fungi species toward listing.
- Projects would not prevent the persistence of S&M vascular or nonvascular plant and fungi species.

Affects to Special Status Plant and Fungi Species Known or Suspected in the Double Bowen Project Area

Vascular Plants

Clustered lady-slipper *(Cypripedium fasciculatum)*—Bureau Sensitive; S&M Category C

Description: Long-lived perennial orchid with shallow, rhizomatous roots that requires a fungal partner for seed germination and development and probably long-term maintenance. Blooms in April and May. Reproduction occurs asexually by rhizome fragmentation and less frequently through pollination and seed production. Clustered lady-slipper's range is the western United States. Populations are scattered with generally few plants per population.

General Habitat Requirements: Forest communities with an average 60–100% canopy cover. Canopy cover influences temperature and moisture, which are the most essential factors that control distribution and survival of all orchids. One population is located in the Project Area within a proposed timber harvest unit.

Alternative 2: The clustered lady-slipper population is located in a proposed density management unit that would reduce the canopy cover to a minimum of 60%. The unit would be tractor yarded and underburned. The population would be protected from direct and indirect impacts with a 50-foot-radius no-treatment buffer from September 1 to March 1. Retaining the existing canopy cover at the site within the buffer would prevent changes in environmental conditions that would negatively impact plants, including increased air and soil temperatures and reduced relative humidity. Retaining conifers within and outside the buffer would prevent negative effects to the plants as a result of disruption of mycorrhizal connections between the tree roots and the lady-slipper rhizomes. Restricting underburning to when plants are dormant would prevent damage or destruction of plants from fire.

Alternative 3: The clustered lady-slipper population is located in a proposed restoration thin unit. While the overall canopy cover remaining in the unit after harvest would be 60%, there would also be small gaps, 0.1 to 0.25 acres in size, where no large trees would remain. The lady-slipper plants would be buffered with a 50-foot-radius buffer if not located next to a gap, and with a 75-foot-radius buffer if gaps are created within 75 feet of the site. The buffer would prevent impacts to plants from harvest equipment, maintain environmental conditions at the site, and maintain conifers that may have mycorrhizal connections with the plants.

Bellinger's meadowfoam *(Limnanthes floccosa* ssp *bellingeriana)*—Bureau Sensitive

Description: Spring-blooming annual. Believed to be self-fertilizing. It is closely related to large-flowered meadowfoam (*Limnanthes floccosa* ssp. *grandiflora),* a Federal endangered species that grows in the Agate Desert, and dwarf woolly meadowfoam (*Limnanthes pumila* ssp. *pumila)*, a state threatened species that grows on the tops of Upper and Lower Table Rocks.

General Habitat Requirements: Grows in heavy clay soils in seasonally wet, rocky meadows and vernal pools. It is native to southwestern Oregon and Shasta County, California, where it grows in the Cascade Range and its foothills. One population is located in the Projects Area in a vernally wet meadow at 2,700 feet elevation.

Alternatives 2 and 3: To prevent impacts to the Bellinger's meadowfoam population located in the 21-acre meadow proposed for restoration, no burn piles would be placed within the population. Burning dried fuels creates high temperatures that sterilize the soil and denature seeds within the fire ring. This specie is an annual and plant germination depends on yearly seed production. Actions that prevent seed production during one year would result in a short-term negative effect to the population.

Underburning would occur from September 1 to March 1, when the plants are dormant, to prevent damage to or mortality of plants. Based on The Nature Conservancy's results of their prescribed burns in the Agate Desert Preserve, which contain the large-flowered meadowfoam, the BLM assumes the number of individual Bellinger's meadowfoam plants would initially increase at the Double Bowen site after burning and later level off (U.S. Fish and Wildlife Service 2006). This short-term benefit to the population would result in an increase in seed production for future reserves. The burn would also benefit the population by removing encroaching trees and shrubs in the meadow and preventing succession of the meadow to woodland. Trees use more water than grasses and forbs, resulting in changes to hydrology at the site, which would negatively affect germination of meadowfoam plants.

A potential risk to the population from burning is an increase in weeds. They could move into the meadow after the burn or into the burn pile rings after competing vegetation has been removed. Weeds would compete with the meadowfoam plants for space and resources and possibly change the hydrology at the site, which would also negatively affect these annual plants that depend on spring overland water flow for germination. To reduce the risk of an increase in noxious weeds in the meadow, especially around the meadowfoam population, the BLM would monitor the site and treat noxious weeds if they become established.

Nonvascular Plants

Lichen

Rust-stained pin lichen *(Chaenotheca ferruginea)*—S&M Category B

Description: Crustose pin lichen with tiny (1-3 millimeter tall) fruiting bodies that resemble straight pins. Its range in the Pacific Northwest includes British Columbia, Oregon, Washington, and California.

General Habitat Requirements: The thallus grows tightly appressed to the bark of Douglas-fir, western red cedar, and incense cedar in semi-open montane forests and foothills. It is common at low to mid-elevations

on the west side of the Cascade Mountains and less common in similar situations east of the Cascades. One occurrence of *Chaenotheca ferruginea* was documented in the Double Bowen Project Area growing on a 50+ inch DBH incense cedar in a 170-year-old conifer stand at 3,880 feet elevation.

Alternative 2: Establishing a 75-foot-radius no-cut buffer around the *Chaenotheca ferruginea* site in the unit proposed for density management (with retention of 40% canopy cover) would protect this pin lichen from direct impacts from tractors, damage from falling trees, or removal of the host tree. Other trees would be retained in the buffer and outside the buffer to provide future host trees for this specie through spore dispersal. Maintaining the existing canopy at the site would prevent the lichen from becoming desiccated as a result of increased air temperature and reduced relative humidity. Because flame lengths cannot be entirely controlled during underburning, restricting underburning to outside the buffer would prevent damage to the lichen.

Alternative 3: Restoration thinning retaining 40% canopy cover is the harvest prescription for the unit containing the *Chaenotheca ferruginea* site. The lichen would be buffered with a 75-foot-radius no-treatment buffer to prevent direct impacts from harvest equipment, damage from falling trees, removal of the host tree, or changes in environmental conditions. Other trees retained within and outside the buffer would provide future host trees for this specie through spore dispersal.

Fungi

Truncate club coral fungus *(Clavariadelphus truncatus)*—S&M Category D

Description: Like all fungi, it consists of mats of cobwebby filaments that grow through the soil and form connections with the rootlets of conifers. It reproduces via spores that are spread when the fruiting body ruptures. It fruits during cold months, generally in the fall and early winter in southern Oregon.

General Habitat Requirements: Grows singly or in patches on soil or duff, under mixed conifers. It is widespread across the Northwest Forest Plan area. Two populations were documented in the Double Bowen Project Area during the fall 2013 fungi surveys. One occurrence is in a 300-year-old moist, white fir/dwarf Oregon grape forest plant community at 3,075 feet elevation. The site has 70% canopy cover. The second site is in a 180-year-old moist, Douglas-fir/white fir stand with 70% canopy cover at 3,903 feet elevation.

Alternatives 2 and 3: Selection harvest using tractor yarding and leaving a 40% canopy cover would remove poor vigor trees across all diameter classes to reduce stand densities in overstocked stands and make site resources available for the remaining trees. This prescription would benefit S&M fungi in the long-term because it would promote development of old growth characteristics in the stand and improve resiliency to environmental disturbances such as fire and insect attacks. Establishing 50-foot, no-treatment buffers around the fruiting bodies of the fungi would prevent direct impacts to mycelia from harvest equipment and indirect impacts from changes in environmental conditions at the sites.

False truffle *(Rhizopogon truncatus)*—S&M Category D

Description: Mycorrhizal species with bright yellow mycelium in which fruiting bodies are embedded.

General Habitat Requirements: Forms symbiotic associations with the fine root systems of plants, especially conifers in the Pine Family. It is distributed throughout the Sierra, Siskiyou, and Cascade mountains of Northern California into the central Oregon Cascades in the Northwest Forest Plan area. One site was documented in spring 2014 in a Selection Harvest unit that would retain 40% canopy cover. The site is in a Douglas-fir/grand fir stand on an east-facing slope at 3,060 feet elevation with 65% canopy cover.

Alternatives 2 and 3: Selection harvest using tractor yarding and leaving a 40% canopy cover would remove poor vigor trees across all diameter classes to reduce stand densities in overstocked stands and make site

resources available for the remaining trees. This prescription would benefit S&M fungi in the long-term because it would promote development of old growth characteristics in the stand and improve resiliency to environmental disturbances such as fire and insect attacks. Establishing 50-foot, no-treatment buffers around the fruiting bodies of the fungi would prevent direct impacts to mycelia from harvest equipment and indirect impacts from changes in environmental conditions at the sites.

Appendix H: Wildlife

Special Status Wildlife Species Known or Suspected in the Double Bowen Project Area

Special status species are listed under the ESA as threatened or endangered, listed by a state as threatened, endangered, or candidate species; and listed by the BLM as sensitive species.

The project wildlife biologist has evaluated the effects of the proposed projects in Double Bowen and has determined that the No Action Alternative along with the two Action Alternatives would not rise to the level that would result in the following Bureau special status wildlife species to no longer be able to persist within the Project Area.

The following special status wildlife species are known or suspected to be in the Butte Falls Resource Area, but are not suspected to be present in the Double Bowen Project Area based on habitat types, field survey data, and literature reviews: Oregon spotted frog, bald eagle, peregrine falcon, willow flycatcher, streaked horned lark, Oregon vesper sparrow, grasshopper sparrow, Lewis' woodpecker, tricolored blackbird, white-headed woodpecker, white-tailed kite, chase sideband snail, Oregon shoulderband snail, Siskiyou hesperian snail, red tree vole, and vernal pool fairy shrimp. These species will not be evaluated any further.

Amphibians

Foothill Yellow-Legged Frog *(Rana boylii)*—Bureau Sensitive

General Habitat Requirements: Live in and near low-gradient streams with rocky, gravelly, or sandy substrate. The tadpoles live in pools with little or no silt. Adults are often found sitting at the edge of pools on the banks covered with vegetation, including grasses and sedges. They also are observed in open rocky areas at the edges of streams.

Alternatives 2 and 3: No disturbance anticipated. Timber sale units would have a 190- to 380-foot riparian buffer, small diameter thinning units would have a 35- to 60-foot riparian buffer, and riparian thinning units would have a 90-foot no-harvest buffer. No ground-based machinery would be used within riparian reserves.

Birds

Northern Spotted Owl *(Strix occidentalis caurina)*—Federal Threatened

General Habitat Requirements: Nest in multilayered coniferous forests with a well-developed overstory and with the presence of large stick nests, cavities, or mistletoe. Forage on forest-dependent mammals such as flying squirrels and wood rats.

Alternative 2: Timber harvest would likely adversely affect spotted owl habitat because 21 acres of nesting/roosting/foraging and 22 acres of roosting/foraging habitat would be downgraded and 4 acres of nesting/roosting/foraging, 38 acres of roosting/foraging, and 1 acre of dispersal would be removed. Areas of nesting/roosting/foraging and roosting/foraging downgrade or removal are outside of known owl home ranges.

Alternative 3: Timber harvest would likely adversely affect spotted owl habitat because 21 acres of nesting/roosting/foraging and 22 acres of roosting/foraging would be downgraded and 1 acre of dispersal and 0.5 acre of nesting/roosting/foraging would be removed. Areas of nesting/roosting/foraging and roosting/foraging downgrade or removal are outside of known owl home ranges.

Invertebrates

Johnson's Hairstreak Butterfly *(Callophrys johnsoni)*—Bureau Sensitive

General Habitat Requirements: The larvae feed exclusively on the aerial shoots of dwarf mistletoes (*Arceuthobium*) on true fir and mountain hemlock trees in late-successional coniferous forests. It spends much of its lifespan in and near the tops of conifer trees, although it descends to ground level for nectaring and to visit moist muddy areas. Adults sip flower nectar from a variety of shrubs and plants.

Alternatives 2 and 3: Treatments would remove fir trees hosting mistletoe within 43 acres of potential habitat for this species. Trees removed would likely be dispersed individual trees or small clumped trees with openings no greater than 0.25 acre, which could provide openings that promote growth of nectar plant sources. Treatments outside of those acres would result in some loss of canopy cover and dwarf mistletoe. Under both action alternatives, dwarf mistletoe would continue to persist within the Project Area.

Travelling Sideband Snail *(Monadenia fidelis celeuthia)*—Bureau Sensitive

General Habitat Requirements: May be found seeking refuge and hibernating under mosses in notches of trees, under large coarse woody debris, and under leaf litter at the bases of bigleaf maples. They are active during the spring when temperatures are warm and soils are moist.

Alternative 2: Treatments would retain, and ground-based equipment would avoid moving or damaging, large coarse woody material. Removal of up to 70% of the forest canopy and increased sun exposure from shelterwood harvest on 42 acres would result in drying of important subterranean refugia sites, reduction in fungi food sources, and loss of aestivating individuals.

Alternative 3: Treatments would retain, and ground-based equipment would avoid moving or damaging, large coarse woody material. Sufficient canopy cover would be retained to continue to provide moist refugia in treatment areas. Restoration thinning units will have skips within the treatment polygons, retaining unique features that may provide additional refugia for this species.

Mammals

Fisher *(Martes pennanti)*—Bureau Sensitive

General Habitat Requirements: Floristically diverse landscapes with diverse successional stages, a high proportion of mid- and late-successional forest characteristics, multiple tree canopy layers, and large trees or snags with cavities, provide for denning and resting opportunities and foraging of a wide variety of prey species.

Alternative 2: Shelterwood harvest on 42 acres would leave a residual canopy cover of less than 40%. Fishers would likely avoid these areas until the understory brush and small trees begin to grow and provide foraging habitat in 5 to 10 years. The remainder of the treatments, along with the retention of snags, coarse wood, and canopy cover of over 40%, would maintain the forests for use by fishers for foraging and dispersal.

Alternative 3: Restoration thinning treatments will have skips around unique features and strive to retain trees 150 years old and greater. The retention of fisher constituent elements (e.g., canopy, snags, and large trees) within the stands could be used for denning, resting, and foraging. The remainder of the treatments, along with the retention of snags, coarse wood, and canopy cover of over 40% would maintain the forests for use by fishers for foraging and dispersal.

Gray Wolf *(Canis lupus)*—Federal Endangered

General Habitat Requirements: Wolves use a variety of habitats, but use primarily coincides with wild ungulate ranges, including winter range, summer range and calving/fawning areas. Important wolf habitat

components for reproduction are denning sites and rendezvous sites. Den sites may be in hollow logs, clefts between rocks, deep riverbank hollows, spaces under upturned trees or rock overhangs, or abandoned dens of other animals.

Alternatives 2 and 3: One gray wolf with a tracking device has been observed near the Project Area; however, there is no evidence that wolves have become established or created den sites in the Project Area. The nearest, known, established wolf packs are in northeastern Oregon, over 300 miles away. A wolf can travel miles in a day and sustained direct effects to individuals from the proposed actions will be improbable. Although unlikely, there may be brief, chance encounters between harvest personnel and a wolf. The majority of the roads in the area are open to year-round traffic; therefore the likelihood of harvest personnel encountering a wolf is no greater than other forest visitors.

Fringed Myotis Bat *(Myotis thysanodes)*—Bureau Sensitive

General Habitat Requirements: Fringed myotis roost in caves, abandoned buildings, rock crevices, and trees. They are found in chaparral to ponderosa pine habitat, but the preferred habitat is the oak woodland from which they forage out into a variety of other habitats. They forage on moths and beetles near the vegetative canopy.

Alternatives 2 and 3: Some loss of potential roosting sites (hazard snags and mature trees) is expected from harvest activities; however, residual roosting habitat would be provided through green tree and snag retention. Riparian reserves, 100-acre northern spotted owl activity centers, and other reserves would also provide snag and large tree habitat for bats.

Townsend's Big-Eared Bat *(Corynorhinus townsendii)*—Bureau Sensitive

General Habitat Requirements: Townsend's big-eared bats hibernate and rear their young in sites such as caves, mines, and buildings. Rim rock, cliffs, bridges, boulder fields, and possibly bark of large trees have the potential to be used as day roosts. Bats forage on moths and are known to travel long distances to foraging sites. Bats visit ponds and pools in streams to drink water.

Alternatives 2 and 3: Snags would be reserved. There are no caves, mines, or structures in any proposed unit. Some loss of potential roosting sites would occur, but adequate day roost habitat would exist within and adjacent to the Project Area through green tree and snag retention and other reserves.

Reptiles

Pacific Pond Turtle *(Actinemys marmorata)*—Bureau Sensitive

General Habitat Requirements: Spend the majority of their life cycle in aquatic environments, but must leave the water to dig terrestrial nests and lay their eggs. These turtles often over-winter in upland settings as well.

Alternatives 2 and 3: Timber harvest units would have 190- to 380-foot riparian buffers, small diameter thinning units would have 35- to 60-foot riparian buffers, and riparian thinning units would have 90-foot no-harvest buffer. No ground-based machinery would be used within riparian reserves. Tree falling in small diameter and riparian thinning units has the potential to affect individual animals that have left the water to lay eggs. Although pond turtles have not been observed in the water sources (pump chances) within the Project Area, proposed water source maintenance may provide for future habitat for the species.

Survey and Manage Species Known or Suspected in the Double Bowen Project Area

Survey and Manage (S&M) species are another category of rare and little known species thought to be associated with late-successional and old growth forests in the Northwest Forest Plan area. They were identified as species that would not be sufficiently protected through the establishment of reserves across the landscape and so required additional efforts to locate and manage their populations to ensure their persistence.

Great Gray Owl *(Strix nebulosa)*

General Habitat Requirements: Nest in late successional Douglas-fir stands with high canopy cover and open understories near meadows or grassy openings. Nest on old hawk or raven stick nests, dwarf mistletoe, or on natural depressions on broken-topped snags. Tree diameters range from 20 to 40 inches in diameter. Primarily forage in open areas on voles and pocket gophers.

Alternative 2: Nest trees located during surveys have a 125-acre no-harvest buffer and seasonal restrictions would occur for any potential noise-disturbance activities near active nests. The area of shelterwood harvest was surveyed for owls with no observations, but those stands are not adjacent to natural meadows and are not expected to provide nesting habitat. Natural meadows would be buffered from harvest in order to retain future nesting opportunities for great gray owls.

Alternative 3: Nest trees located during surveys have a 125-acre no-harvest buffer and seasonal restrictions would be implemented for any potential noise-disturbance activities near active nests. Natural meadows would be buffered from harvest in order to retain future nesting opportunities for great gray owls.

Birds of Conservation Concern Known or Suspected in the Double Bowen Project Area

Birds of Conservation Concern are species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA.

Olive-sided Flycatcher *(Contopus cooperi)*

General Habitat Requirements: Associated with natural or man-made openings with tall trees or snags available for perching and singing. Breed primarily within forest burns and edges where snags and scattered tall live trees are present, near stream banks and wet areas, and at the edge between late-successional and early successional forests such as meadows and harvest units. They build their nests high in conifer trees on horizontal branches away from the trunk.

Alternative 2: Variable density thinning would create more diverse stand conditions and accelerate growth of larger trees that may become snags. Shelterwood harvest would provide up to 42 acres of new foraging and nesting habitat. Increased forest edge habitat would also enhance foraging opportunities.

Alternative 3: Variable density thinning would create more diverse stand conditions and accelerate growth of larger trees that may become snags. Forest gaps would increase understory growth, contributing to increased insect production over the next 20 years. Increased forest edge habitat would also enhance foraging opportunities. Gaps created by thinning may allow foraging until the canopy eventually closes in and these opportunities are lost.

Rufous Hummingbird *(Selasphorus rufus)*

General Habitat Requirements: Primarily associated with forest edges and openings with a diversity of flowering plants for feeding. Frequently occurs in open habitats that are shrub-dominated and late-

successional forest with a highly developed and diverse understory of herbaceous plants and shrubs, particularly within large openings. Need flowering plants and shrubs.

Alternative 2: Tree removal would create openings where flowering vegetation important for foraging would persist. Large openings created in the area of shelterwood harvest would provide for suitable habitat until the canopy cover increases and closes in 30 years.

Alternative 3: Tree removal would create openings where flowering vegetation important for foraging would persist until the canopy cover increases and closes in 10 to 20 years.

Northern Goshawk *(Accipiter gentillis)*

General Habitat Requirements: Nests in mature forests with larger trees; relatively closed canopies; and open understories.

Alternative 2: An undiscovered nest could be disturbed during project operations. Harvest will open up the overstory component of the forest, but remaining older seral habitat in the Project Area would be sufficient to maintain nesting in subsequent years. Goshawk could still nest and forage after the action. There would be a reduction in goshawk habitat of 42 acres where shelterwood harvest would occur.

Alternative 3: An undiscovered nest could be disturbed during project operations. Harvest will open up the overstory component of the forest while maintaining untreated patches throughout. In 638 acres of restoration thinning areas, trees 150 years and older would be retained, providing future nesting structure. Untreated suitable habitat would also remain dispersed throughout the Project Area.

Purple Finch *(Carpodacus purpureus)*

General Habitat Requirements: Breeds primarily in moderately moist open or semi open coniferous forests. Also frequently found in mixed coniferous-deciduous forest, edges of bogs, and riparian corridors at low to mid-elevations.

Alternative 2: Reduction in tree density, while maintaining moderate canopy cover, would be beneficial for this species. The shelterwood harvest units may degrade nesting and foraging habitat in the short term, but as new vegetation returns, there would be new opportunities for foraging.

Alternative 3: Reduction in tree density, while maintaining moderate canopy cover, would be beneficial for this species. Treatments would help restore habitats by removing encroaching, shade-tolerant species and reducing dense and decadent overstocked habitats.

Game Birds below Desired Condition Known or Suspected in the Double Bowen Project Area

Game Birds below Desired Condition are species whose populations are below long-term averages or management goals, or for which there is evidence of declining population trends.

Band-tailed Pigeon *(Columba fasciata)*

General Habitat Requirements: Nest primarily in closed Douglas-fir stands with canopy cover above 70%. Key food sources include red elder, cascara and other berry, fruit and mast producing shrubs and trees. Mineral springs/seeps are important and provide essential calcium for nesting.

Alternative 2: In more heavily thinned areas, there would be an increase in forage plant species such as berry, fruit, and mast producing shrubs and trees. While foraging habitat would not be lost, shelterwood harvest

would degrade potential nesting habitat until the mixed-conifer stands grow back. Springs and seeps would be buffered.

Alternative 3: Foraging and nesting habitat would not be lost; restoration thinning would retain potential nest trees in large, older conifers. In more heavily thinned areas, there would be an increase in forage plant species such as berry, fruit, and mast producing shrubs and trees. Springs and seeps would be buffered.

Appendix I: Fish and Aquatic Habitat

Double Bowen Forest Management Project ESA Effects Determination-Aquatic

In order to evaluate the potential aquatic effects of all activities associated with the Double Bowen Forest Management Project, the BLM Fish Biologist used the procedure described in the *Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish Within the Northwest Forest Plan Area (Forest Service, NOAA Fisheries, Bureau of Land Management, US Fish and Wildlife Service 2005)*. In this process an overall action is broken down into its core project elements and each of those elements are evaluated with regard to (1) the proximity to listed fish, critical habitat, and essential fish habitat; (2) the probability of an effect to listed fish, critical habitat, and essential fish habitat; and (3) the potential magnitude of any effect. To further refine the analysis, each project element is evaluated against a series of important habitat indicators that have been shown to be of critical importance to aquatic habitat.

Proposed Projects (Map I-1)

Timber Harvest

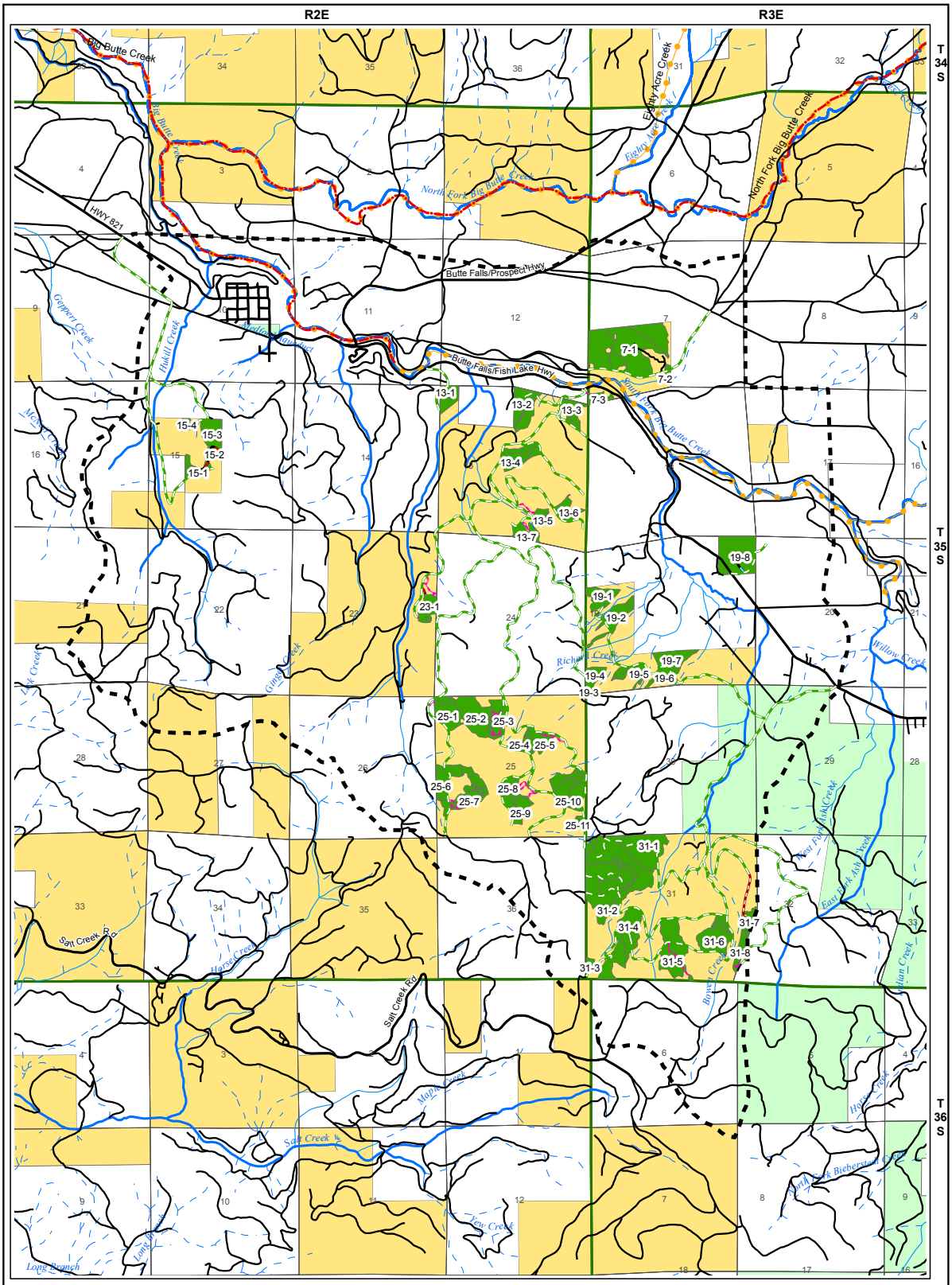
The BLM's Butte Falls Resource Area proposes forest management actions, including timber harvest, on 872 acres of forest land within 42 units. Silviculture prescriptions may vary by alternative and may include a combination of density management, shelterwood harvest, selection harvest, riparian thinning, restoration thinning, or small diameter thinning (see EA, Table 2-1). Cut trees would be removed using ground-based or skyline cable yarding systems. This project is further described in the EA, section 2.2, Proposed Projects.

Treatments would occur within 14 acres of riparian reserves. Riparian reserves are 190 feet on either side of non-fish-bearing perennial and intermittent streams and perennial springs, or 380 feet total. Fish-bearing streams would receive a 380-foot buffer on either side of the stream, or 760 feet total.

The outer 100 feet of riparian reserves located adjacent to proposed upland thinning units would be thinned. Equipment would not enter the 190-foot riparian reserve (unless on existing roads) but trees could be yarded through the outermost 100 feet. Riparian thinning within timber harvest units would have a 90-foot, no-treatment buffer on intermittent and perennial streams. In small diameter thinning units, no vegetation within 35 feet of intermittent streams and 60 feet of perennial streams would be cut.

The nearest harvest activity to Southern Oregon/Northern California Coast (SONCC) Coho Salmon critical habitat would occur in T35S, R2E, section 13, units 13-1, 13-2, and 13-3 and T35S, R3E, section 7, units 7-3 and 7-1, which are approximately 690 feet (average) from South Fork Big Butte Creek. Table I-1 has a complete list of units and their proximity to fish-bearing streams, coho critical habitat (CCH), and essential fish habitat (EFH).

Yarding—Yarding operations will use a combination of ground-based and skyline-cable systems yarding methods. Approximately 819 acres of tractor yarding is proposed. Ground-based operations will be limited to slopes less than 35% and would be limited to approved skid trails. Cable yarding will be used on all units where access to the unit from a point of higher elevation is possible, and yarding will use skyline yarding with single-end suspension. Approximately 53 acres of uphill cable yarding is proposed. All tractor and cable yarding operations will be seasonally restricted to the dry season, generally beginning mid-May and ending mid-October.



Map I-1. Coho Salmon and Coho Critical Habitat in the Double Bowen Project Area

Timber Hauling

Timber hauling would use a combination of dry season and dry condition haul. Haul from units would use existing rock-surfaced roads, which quickly connect to paved, county highways (e.g., Butte Falls-Fish Lake Highway and Butte Falls/Prospect Highway). No aggregate haul routes cross over CCH or EFH. The nearest stream crossing is located approximately 380 feet from South Fork Big Butte Creek, a Coho-bearing stream channel.

The engineering package for the final contract lists all roads needed for contract implementation. The haul routes include 29.1 miles (94.5%) rocked and 1.7 miles (5.5%) native surface for a total of 30.8 miles.

Route Construction and Road Renovation

Temporary route construction would involve 2 segments totaling approximately 0.4 mile. These two new segments are located on stable areas on or near ridge tops, and do not cross any stream channels. One temporary route is located in unit 15-1/15-2 and one temporary route is in unit 23-1(300 feet from Doubleday Creek); routes are 6,141 feet and 8,827 feet respectively from CCH. After harvest is complete, these temporary routes would be ripped, water barred, mulched, blocked, and seeded with native grass (where needed).

The proposal also includes 31 miles of road renovation activities. Renovation includes brushing, blading, watering, spot rocking, rolling and reshaping road surface, and cleaning ditches and culvert inlets and outlets. Renovation would take place on roads 35-2E-10.0, 35-2E-10.1, 35-2E-11.1, 35-2E-13.0, 35-2E-13.2, 35-2E-13.3, 35-2E-13.4, 35-2E-13.5, 35-2E-13.6, 35-2E-13.8, 35-2E-13.9, 35-2E-14.0, 35-2E-15.0, 35-2E-15.1, 35-2E-23.3, 35-2E-24.0, 35-2E-24.1, 35-2E-25.0, 35-2E-25.1, 35-2E-31.0, 35-2E-9.0, 35-3E-19.0, 35-3E-29.0, 35-3E-29.1, 35-3E-31.0, 35-3E-31.2, 35-3E-31.3, 35-3E-31.4, 35-3E-31.6, and 35-3E-7.1.

No temporary route construction or road renovations occur adjacent to CCH or EFH.

Effects of the Action

Timber Harvest

Proximity

The nearest harvest activity to SONCC Coho Salmon critical habitat would occur in T35S, R2E, section 13, units 13-1, 13-2, and 13-3 and T35S, R3E, section 7, units 7-3, and 7-1, which are approximately 740 feet, 525 feet, 539 feet, 395 feet, and 397 feet respectively from South Fork Big Butte Creek. The remaining harvest units are located at progressively further distances away from CCH, as shown in the table below. See Table I-1 for a complete list of units and their proximity to fish-bearing streams, CCH, and EFH.

Table I-1. Distance From Proposed Timber Harvest Units to Fish-Bearing Streams, CCH, and EFH

Unit #	Nearest Fish-Bearing Stream	Distance from Timber Harvest Unit (miles)		
		Fish-Bearing Stream	CCH	EFH
T35S, R2E, section 13				
13-1	Doubleday Creek	0.1	0.1	0.4
13-2	South Fork Big Butte Creek	0.1	0.1	1.6
13-3	South Fork Big Butte Creek	0.1	0.1	1.6

Table I-1. Distance From Proposed Timber Harvest Units to Fish-Bearing Streams, CCH, and EFH

Unit #	Nearest Fish-Bearing Stream	Distance from Timber Harvest Unit (miles)		
		Fish-Bearing Stream	CCH	EFH
13-4	Doubleday Creek	0.2	0.7	1.4
13-5	Doubleday Creek	0.6	1.4	2.1
13-6	Bowen Creek	0.5	0.9	2.0
13-7	Doubleday Creek	0.6	1.4	2.0
T35S, R2E, section 15				
15-1	Hukill Creek	0.2	1.6	1.6
15-2	Hukill Creek	0.4	1.8	1.1
15-3	Hukill Creek	0.3	0.9	0.9
15-4	Hukill Creek	0.2	1.4	1.0
T35S, R3E, section 19				
19-1	Bowen Creek	0.5	1.2	3.7
19-2	Bowen Creek	0.4	1.1	3.5
19-3	Bowen Creek	1.1	2.0	4.5
19-4	Bowen Creek	1.0	1.9	4.3
19-5	Bowen Creek	0.8	1.7	4.1
19-6	Bowen Creek	0.8	1.8	4.1
19-7	Bowen Creek	0.6	1.5	3.9
19-8	Bowen Creek	0.1	0.3	3.1
T35S, R2E, section 23				
23-1	Doubleday Creek	0.06	1.8	2.4
T35S, R2E, section 25				
25-1	Doubleday Creek	0.2	2.6	2.5
25-10	Bowen Creek	1.6	2.5	4.9
25-11	Bowen Creek	1.4	3.6	5.1
25-2	Doubleday Creek	0.4	2.7	3.3
25-3	Bowen Creek	1.7	2.6	4.9
25-4	Bowen Creek	1.6	2.6	4.8
25-5	Bowen Creek	1.5	2.4	4.9
25-6	Doubleday Creek	0.6	3.1	3.7
25-7	Doubleday Creek	0.7	3.1	3.7
25-8	Bowen Creek	1.9	2.8	5.3
25-9	Bowen Creek	2.1	2.9	5.3
T35S, R3E, section 31				
31-1	Bowen Creek	0.1	3.3	5.6
31-2	Bowen Creek	0.7	3.8	6.2
31-3	Bowen Creek	1.1	4.3	6.7
31-4	Bowen Creek	0.6	3.8	6.1
31-5	Bowen Creek	0.6	3.8	6.1
31-6	Bowen Creek	0.6	3.7	6.0

Table I-1. Distance From Proposed Timber Harvest Units to Fish-Bearing Streams, CCH, and EFH

Unit #	Nearest Fish-Bearing Stream	Distance from Timber Harvest Unit (miles)		
		Fish-Bearing Stream	CCH	EFH
31-7	East Fork Ash Creek	1.8	3.2	6.0
31-8	Bowen Creek	0.6	3.7	6.0
T35S, R3E, section 7				
7-1	South Fork Big Butte Creek	0.08	0.08	1.6
7-2	South Fork Big Butte Creek	0.3	0.3	2.1
7-3	South Fork Big Butte Creek	0.07	0.07	1.7

Probability

Sediment

Based on the Medford District RMP (p. 26–27), riparian reserves would be sufficient to prevent any direct or indirect effects to fish below the Project Area. Protective project design features and Best Management Practices in upslope areas would greatly reduce the likelihood of harvest-related sediment creation, and the use of riparian reserves (190 feet on intermittent and non-fish-bearing perennial streams) would completely filter any sediment that is generated from harvest actions. Therefore, these measures would eliminate the probability of harvest-related sediment entering the aquatic system.

Large Wood

A review of the literature vastly indicates most large wood comes from within 100 feet, or 30 meters, of the stream (Murphy and Koski 1989; McDade, et al. 1990; Van Sickle and Gregory 1990; May and Greswell 2003). Full riparian reserves would be 190 feet on either side of non-fish-bearing perennial and intermittent streams and perennial springs, or 380 feet total. Fish-bearing streams would receive a 380-foot buffer on either side of the stream, or 760 feet total. Full riparian reserves would be sufficient to keep large wood at current levels. As a result, there would be no probability of an effect to large woody material as a result of harvest activities.

Temperature

Use of riparian reserve buffers on all streams would retain all primary shade. Therefore, there is no probability of a decrease in stream shade that could lead to an increase in stream temperature as a result of activities further upslope.

Peak Flow

Peak flows would not increase as a result of projects proposed in this EA. A total of 409 acres of timber harvest is proposed in the transient snow zone. No treatments would result in canopy cover below the range of natural variability (40%) within the transient snow zone; therefore, there would not be a risk for increased frequency and magnitude of peak flows.

Conclusion

As indicated in the discussions above, physical habitat components, including the sediment regime, woody material, water temperature, and peak flows would remain unchanged as a result of harvest actions. Therefore, there is no probability of an impact to the aquatic system from harvest activities.

Timber Yarding

Proximity

Yarding corridors would be established outside of the riparian reserves and would not be over intermittent or perennial streams. The nearest area where yarding corridors may be needed is in T35S, R3E, section 13, located 3,835 feet above CCH and EFH within South Fork Butte Creek.

Probability

"To reduce the amount of surface fuel loadings and emissions from prescribed burning, remove slash from the site, when feasible, by using whole tree harvesting, chipping limb slash in the harvest unit, or a combination of both methods. Where whole tree harvesting is permitted, landing slash will be chipped, burned, or moved off site" (EA, section 2.4.7, Fuels Treatments Associated with Timber Harvest and Small Diameter Thinning). Trees could be processed and cut to log lengths within the treatment units. Slash remaining in units after yarding would be lopped and scattered or piled and burned. Any slash at landings would be used for biomass or piled and burned. The lop and scatter treatment would arrange slash in a discontinuous horizontal pattern at a depth not to exceed 2 feet in height. The material would decompose faster in this arrangement and minimize the amount of time the slash would be available to influence fire behavior. Retained slash would mitigate negative impacts to sensitive soils, decrease the chance of off-site erosion and increase retained nutrients on site.

Ground-based and skyline-cable yarding operations would be restricted to the dry season—generally beginning in mid-May and ending mid-October. The dry season may be extended into the fall if wetting winter rains have not occurred, the weather forecast is monitored daily, and all winterization actions can reasonably occur prior to the season-ending storm event.

Exposed soil would be covered or otherwise temporarily stabilized prior to season-ending wetting rains. This would occur on temporary routes, landings, yarding corridors, skid trails, and other areas of exposed soils.

Conclusion

Based on the riparian reserves, seasonal restrictions, and distance away from the nearest CCH and EFH, there is no risk of local impacts to temperature, wood, or sediment delivery from timber yarding activities. As a result, there is no probability that yarding actions would result in impacts to these indicators further downstream in reaches containing SONCC Coho Salmon.

Route Construction and Road Renovation

Proximity

Two temporary routes, totaling 0.4 mile, would be constructed 1.2 and 1.7 miles from the nearest CCH and EFH.

Probability

Temporary routes would be ripped, water barred, mulched, blocked, and seeded with native grass (where needed) after harvest is completed. These new route segments would be located on or near stable ridge top areas and would not cross any stream channels. Therefore, there are no direct connections from these roads to the aquatic system and they are considered hydrologically disconnected. Absent any connection to the stream network, there is no mechanism for an effect to aquatic habitat or coho salmon.

Road renovation activities would take place in the dry season and may include brushing, road surface blading, installation of additional surface rock, addition of sediment control structures (such as geo-fabric rolls, hay bales, silt fencing, etc.), and replacement or addition of some cross drains (EA, section 2.4.6, Road and Quarry Work). No culverts will be replaced on perennial stream channels or within CCH. Therefore, there is no mechanism for an aquatic impact from route construction and renovation activities.

Timber Haul

Proximity

The haul routes would use the existing road network and short segments of newly constructed temporary routes. The majority of hauling from units would use rock-surfaced roads, which quickly connect to paved county highways. Along the rock-surfaced portions of the proposed haul routes, there are no CCH stream crossings. The nearest stream crossing is located 380 feet from South Fork Big Butte Creek CCH and EFH.

Probability

Use of the haul route may occur during either the wet or dry season; however, road-use project design features and the contract administrator will only allow hauling on gravel roads during dry conditions in order to prevent sediment inputs to the aquatic system. The gravel-surfaced portions of these haul routes were inspected. The majority are located on or near ridge tops and were found to be well armored with resilient surface rock, have well vegetated ditches, and have very few stream crossings.

Protective project design features such as straw bales, silt fences, geo-fabric rolls, and water bars would be installed at any site where there is potential for haul-related road sediment to enter the aquatic system. As a result, any mechanism for transmission of sediment to stream channels would be arrested by the above project design features. Absent these delivery mechanisms, there is no anticipated sediment delivery to streams.

Effects Determination for Federally Threatened or Endangered Species and Essential Fish Habitat

Federally Threatened Species and Critical Habitat

There are no direct or indirect effects expected to fish species, including Coho Salmon, below the Project Area as a result of harvest, yarding, or road activities. Based on the summary information listed above, there are no anticipated effects to stream channels, sediment and large wood routing, or stream shade resulting from timber harvest, route construction, and roadrenovation. Any mechanism for sediment delivery at stream crossings has been arrested through the use of project design features and Best Management Practices. Therefore, this project would result in a No Effect determination with regard to SONCC Coho Salmon. In addition, this project would have no effect on designated coho critical habitat.

Magnuson-Stevens Act of 1996—Essential Fish Habitat

There would be no effect from harvest on EFH for Coho and Chinook Salmon. All of the proposed project would occur higher in the watershed. As previously discussed, the project above Coho- and Chinook-bearing streams would have no effect on large wood and sediment delivery to EFH downstream. Riparian reserves would be sufficient to prevent effects to sediment or large wood supply to EFH.

As mentioned above, potential effects from road-related activities would be arrested through use of protective project design features; therefore, there would be no impacts to EFH. Temporary route construction would occur near ridge tops and would not be hydrologically connected to the stream channel. Renovation of existing system roads would reduce the long-term potential for delivery of sediment to streams during dry

condition winter haul. Application of sediment-arresting project design features (e.g., filters, fences, straw bales) in the ditch would capture sediment transported in the ditch. Where haul does occur near or across EFH, the blacktop surface of the road and hauling project design features would prevent adverse effects from road-related activities.

Timber harvest unit 13-1 (T35S, R2E, section 13), the closest unit to EFH, is 0.4 mile upstream of EFH. The limited disturbance and application of riparian reserves would preclude a reduction of large wood recruitment and would prevent sediment delivery to EFH.

As a result, these proposed actions would have no impact on EFH for Coho or Chinook Salmon in the Big Butte Creek watershed.

Appendix J: Harvest Units Deferred from Entry

Table J-1 contains a list of the operational inventory units that were considered for harvest in the Double Bowen Project and deferred from entry at this time. These units may be considered in future projects.

Table J-1. Operational Inventory Units Deferred from Harvest Entry

Legal Description	Operational Inventory Unit	Acres	Remarks
T35S, R2E, sec. 13	006	2	Stocked at target relative density levels.
	013	3	Stocked at target relative density levels.
	008	5	Low basal area. Currently at retention level for northern GFMA prescription.
	001	3	SE corner of stand classified as RA32 habitat.
	012	2	Northern part of stand classified as RA32 habitat.
	011	4	Riparian reserve.
T35S, R2E, sec. 15	001	2	Poor access; uneconomical to harvest.
T35S, R2E, sec. 23	009N	8	Low basal area. North half of unit at northern GFMA retention levels due to 2008 windstorm.
T35S, R2E, sec. 25	004	16	2008 windstorm reduced the majority of stand to near target relative density—average 110 basal area.
	009	10	Low basal area in scattered portions near perimeter of unit.
	111	5	Average 100 basal area, with stocking levels at target prescription for designated spotted owl habitat.
T35S, R3E, sec. 31	006	17	North portion of stand classified as RA32 habitat.
	Total	**77**	

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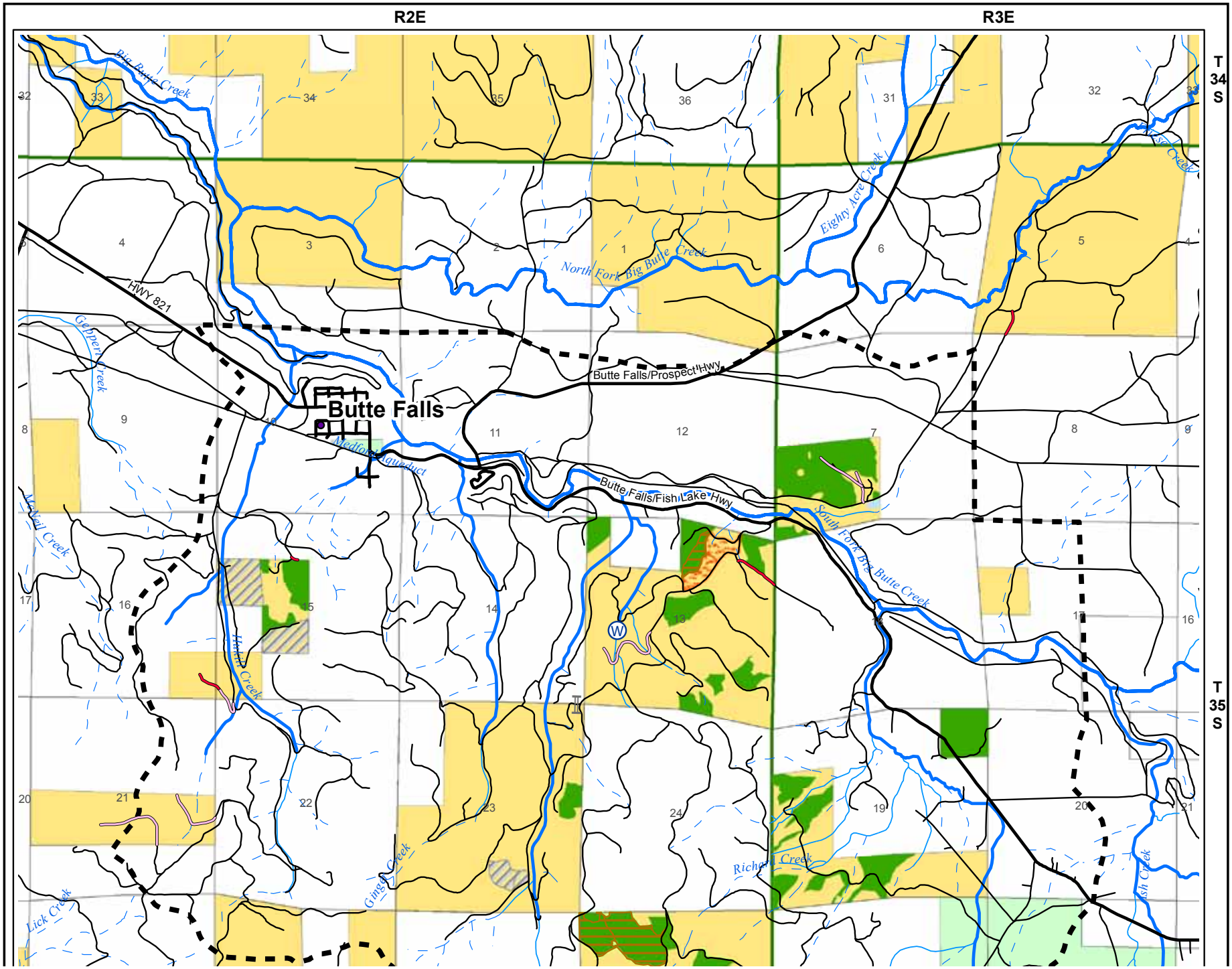
Maps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R3E
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Eighty Acre Creek
HWY 821
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Butte Falls
Medford Aqueduct
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Gebhart Creek
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Hanks Creek
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Richard Creek
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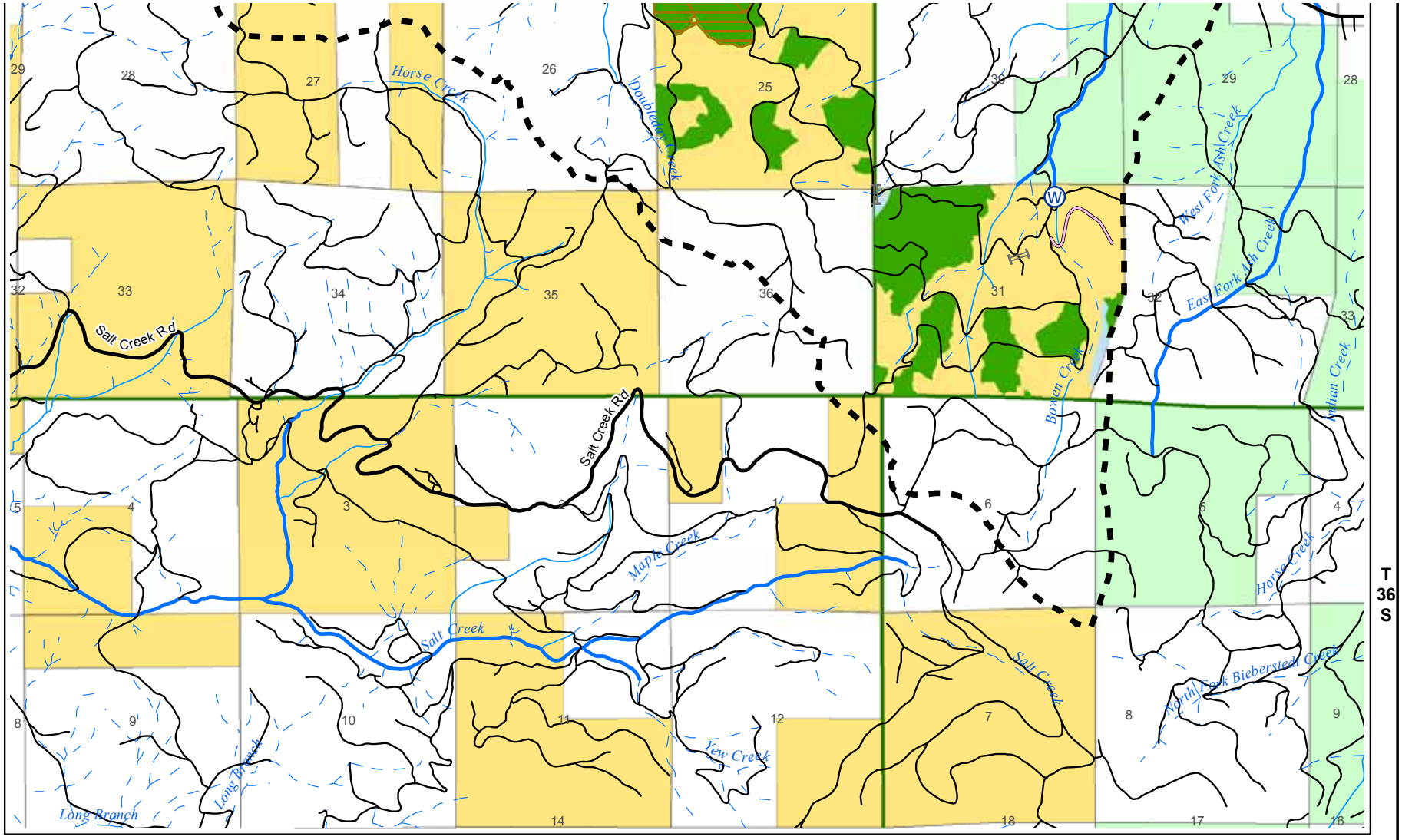
Fish Creek



Timber Harvest Units
Riparian Thinning
Small Diameter Thinning
Harvest Units to be Underburned
Meadow Restoration
Water Source Restoration
Barricade Installation

Full Road Decommission
Partial Road Decommission
Paved Road
Existing Road
Fish-bearing Stream
Perennial Stream
Intermittent Stream

Private
Forest Service
BLM
Double Bowen Project Boundary

Double Bowen Forest Management Project Environmental Assessment

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MEDFORD DISTRICT
June 2014

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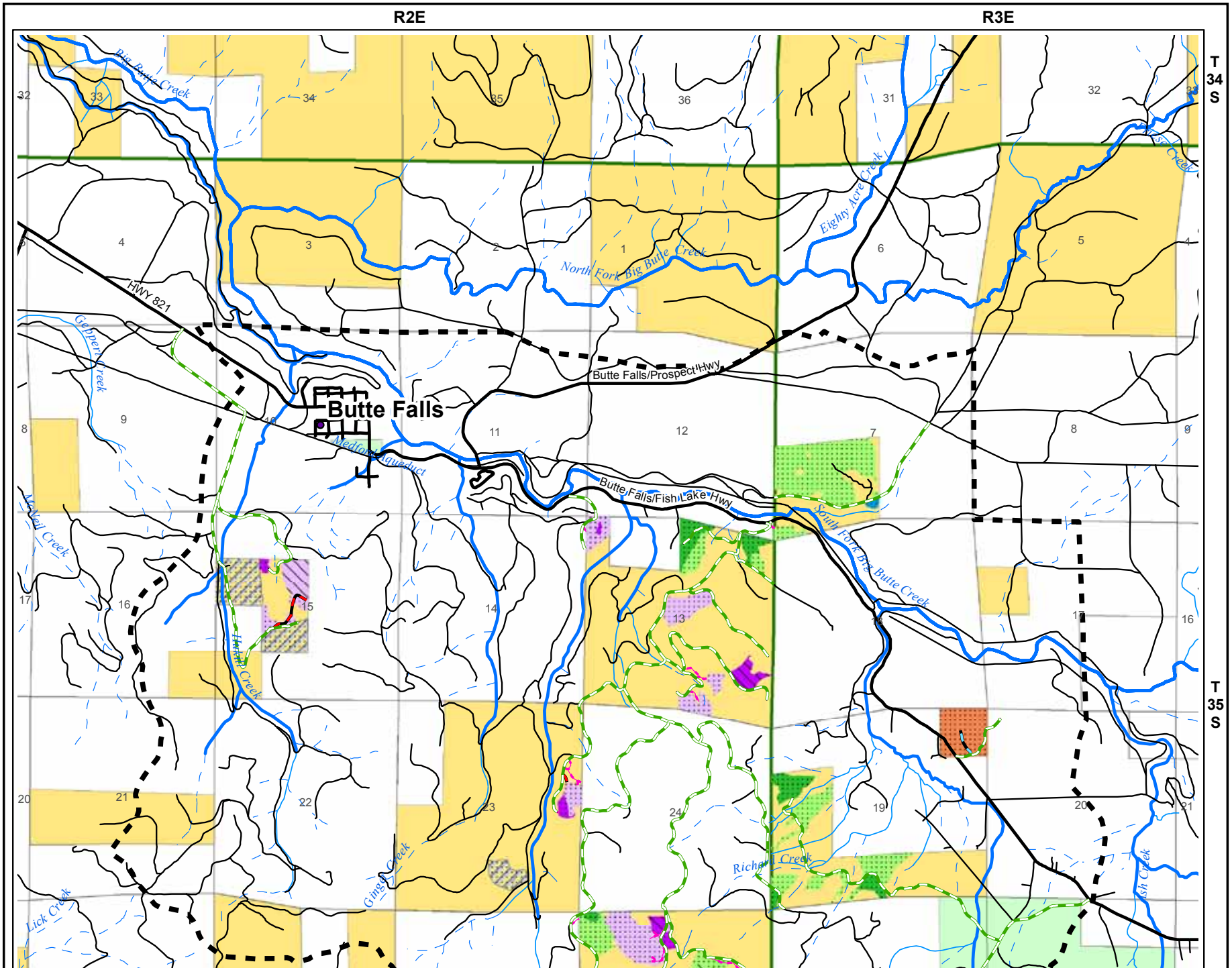
Map 2. Double Bowen Projects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R3E
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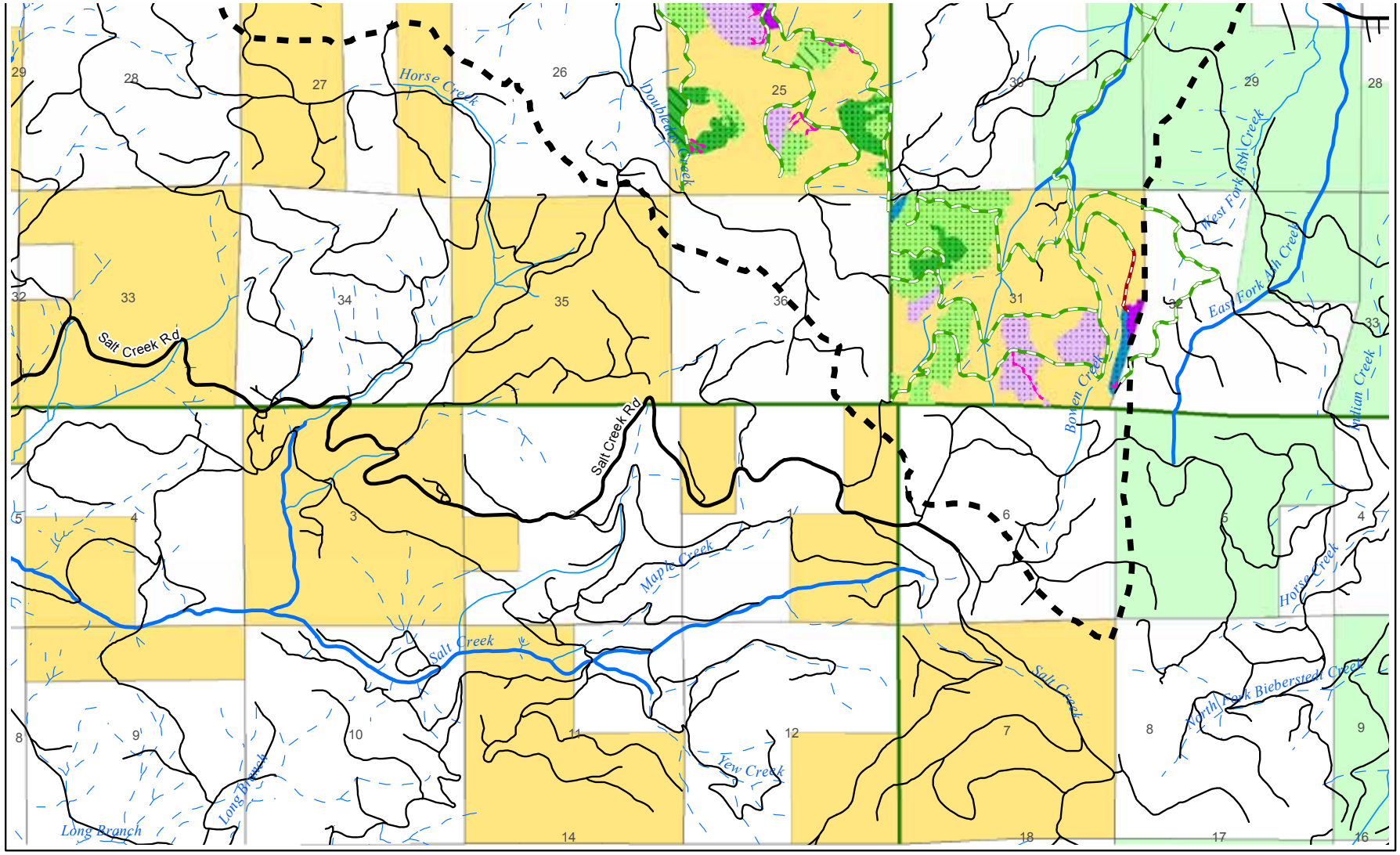
T 35 S
Big Butte Creek
North Fork Big Butte Creek
Eighty Acre Creek
HWY 821
Gepper Creek
Butte Falls/Prospect Hwy
Butte Falls
Medford Aqueduct
Butte Falls/Fish Lake Hwy
South Fork Big Butte Creek
McNeil Creek
Hatch Creek
Richard Creek
Gingle Creek
Lick Creek



Density Management 40%
Density Management 60%
Selection Harvest 40%
Selection Harvest 60%
Shelterwood
Riparian Thinning
Small Diameter Thinning

Logging System

Skyline
Tractor

Paved Road
Existing Road
Road Renovation
Temporary Route Construction
Temporary Route Reconstruction
Temporary Route Renovation
Designated Skid Trail

Fish-bearing Stream
Perennial Stream
Intermittent Stream
Private
Forest Service
BLM
Double Bowen Project Boundary

Double Bowen Forest Management Project Environmental Assessment

N

MEDFORD DISTRICT
June 2014

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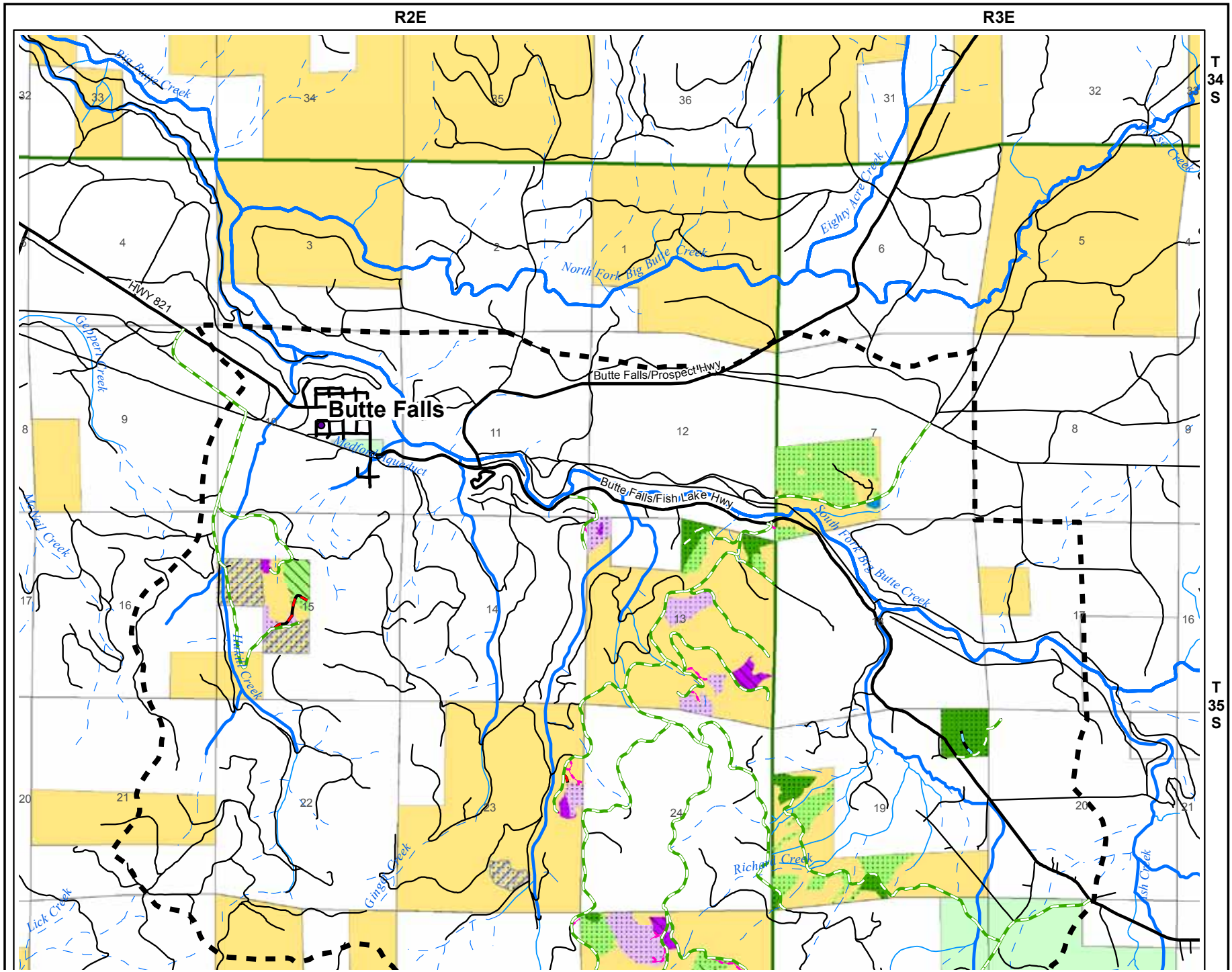
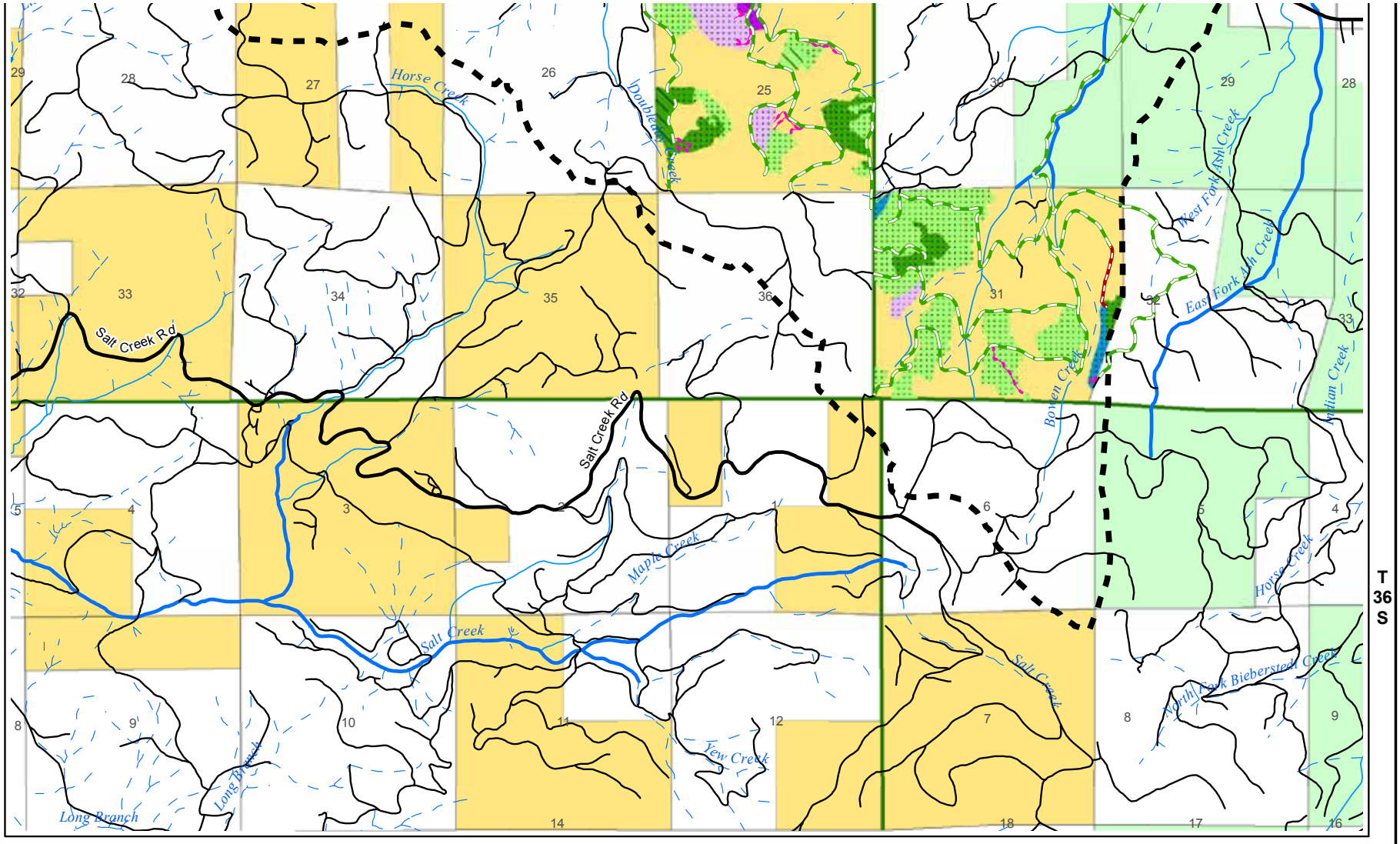
0 0.5 1 2
Miles

Map 3. Double Bowen Alternative 2


R2E
R3E
T 34 S
T 35 S
Big Butte Creek
North Fork Big Butte Creek
Eighty Acre Creek
HWY 821
Butte Falls/Prospect Hwy
Butte Falls
Medford Aqueduct
Butte Falls/Fish Lake Hwy
South Fork Big Butte Creek
Gepper Creek
McNeal Creek
Hatch Creek
Ginger Creek
Richard Creek
Lick Creek
Fish Creek



Restoration Thinning 40%
Restoration Thinning 60%
Selection Harvest 40%
Selection Harvest 60%
Riparian Thinning
Small Diameter Thinning

Logging System

Skyline
Tractor

Paved Road
Existing Road
Road Renovation
Temporary Route Construction
Temporary Route Reconstruction
Temporary Route Renovation
Designated Skid Trail

Fish-bearing Stream
Perennial Stream
Intermittent Stream
Private
Forest Service
BLM-Administered
Double Bowen Project Boundary

Double Bowen Forest Management Project Environmental Assessment

N

MEDFORD DISTRICT
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0 0.5 1 2
Miles

Map 4. Double Bowen Alternative 3

Acronyms

ACS	aquatic conservation strategy
ARPA	Archaeological Resource Protection Act
BDT	bone dry ton
BLM	Bureau of Land Management
BMP	best management practice
CAA	Clean Air Act
CHU	critical habitat unit
COR	contracting officer representative
CWA	Clean Water Act
DBH	diameter at base height
DEQ	Department of Environmental Quality
EA	environmental assessment
EIS	environmental impact statement
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FG	fragile slope gradient
FLPMA	Federal Land Policy and Management Act
FOI	forest operations inventory
FP	fragile mass movement potential
FR	Federal Register
GFMA	general forest management area
GIS	geographic information system
ID	interdisciplinary
IVMP	interagency vegetation mapping project
KLE	Klamath East
MBF	thousand board feet
MMBF	million board feet
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NRF	nesting, roosting, and foraging
O&C	Oregon and California
PCGP	Pacific Connector Gas Pipeline
PM2.5	particulate matter up to 2.5 micrometers
PM10	particulate matter up to 10 micrometers
PRMP	proposed resource management plan
RA	recovery action
RMP	Resource Management Plan
ROD	record of decision
S&M	Survey and Manage
SEIS	supplemental environmental impact statement
TMDL	total maximum daily load
TPCC	timber production capability class