Twin Ranch
Forest Management Project
Environmental Assessment

DOI-BLM-OR-M050-2010-0002-EA

BLM

Butte Falls Resource Area

June 2010

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering economic use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

BLM/OR/WA/AE-10/069+1792

United States Department of the Interior

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Medford District Office
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IN REPLY REFER TO:

JUN 15 2010

1792 (ORM050)

Dear Reader:

Enclosed is the recently completed *Twin Ranch Forest Management Environmental Assessment* (EA) (DOI-BLM-OR-M050-2010-0002-EA). This EA evaluates forest management activities on up to 736 acres of matrix lands and up to 16 acres of riparian reserves. Forest management activities could include regeneration harvest, shelterwood harvest, selection harvest, commercial thinning, density management, riparian thinning, tree planting, and slash disposal activities such as piling and burning and biomass utilization. Road projects proposed to support forest management activities are road renovation and improvement, road decommissioning, temporary spur road construction, and road realignment.

This document is available for public review and comment for a period of 30 days. The 30-day comment period will begin when the notice of the EA availability is published in the *Medford Mail Tribune*. At the end of the comment period, I will make my decision regarding this project, taking into consideration all pertinent site-specific issues or concerns I receive. Remember, the most useful comments are those that clearly communicate your issues or concerns. New information that would affect the analysis or show evidence of flawed or incomplete analysis would be most useful.

Any comments you may have regarding this project must be received by July 16, 2010 to be considered in final decisions for this proposal. Please send comments to Jean Williams, Butte Falls Resource Area Planning and Environmental Coordinator, Medford District BLM, 3040 Biddle Road, Medford, Oregon 97504, or e-mail your comments to Medford_Mail@blm.gov ("Attention: Jean Williams"). Questions on the proposed project should be directed to Jean Williams (541) 618-2385 or John Bergin (541) 618-2265.

If you wish to withhold your name, address, or both from public review or from disclosure under the Freedom of Information Act, you must state this at the beginning of your written comment. Your request will be honored to the extent allowed by law. All submissions from organizations or businesses and from individuals identifying themselves as representatives or officials of organizations or businesses will be made available for public inspection in their entirety.

I appreciate your interest in this project and look forward to your comments.

Sincerely,

Jon K. Raby
Field Manager
Butte Falls Resource Area

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1.0 Purpose and Need

This section describes why the BLM (Bureau of Land Management) is proposing an action. It also identifies the factors that will be used for making a decision and lists the legal requirements the BLM must consider. The following definitions are for terms used in this section:

biomass. Unmerchantable and waste plant materials used as a source of renewable combustible fuel. Also includes non-sawlog material ground into fiber and used in secondary wood products.

interdisciplinary team. A group of individuals with different training, representing the physical sciences, social sciences, and environmental design arts, assembled to solve a problem or perform a task.

skid trail. Route along which logs are taken to a landing.

1.1 Introduction

The BLM's Butte Falls Resource Area is proposing a forest management project that includes timber harvest and the associated road work and activity slash fuels treatment. This EA (environmental assessment) documents the environmental analysis the BLM conducted to estimate the site-specific effects on the human environment that may result from implementation of this project. The EA will provide the BLM Authorized Officer (Butte Falls 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 Environmental Impact Statement for the Medford District's Resource Management Plan and whether a supplement to that Environmental Impact Statement is needed or if a Finding of No Significant Impact is appropriate.

1.1.1 Proposed Action

The BLM is proposing forest management activities on up to 736 acres of matrix lands and up to 16 acres of riparian reserves. Forest management activities could include regeneration harvest, shelterwood harvest, selection harvest, commercial thinning, density management, riparian thinning, tree planting, and slash disposal activities such as piling and burning and biomass utilization. Road projects proposed to support forest management activities are road renovation, road decommissioning, temporary spur road construction, and road realignment.

1.1.2 Project Area

The Twin Ranch Project Area is located 3 to 7 miles east of the town of Butte Falls, Oregon. Proposed forest management activities would occur in 3 sixth field watersheds within the Big Butte Creek fifth field watershed: Upper South Fork Big Butte Creek, Lower South Fork Big Butte Creek, and North Fork Big Butte Creek (figure 1). The majority of the proposed forest management activities (86 percent) are focused in the Upper South Fork Big Butte Creek sixth field watershed.

The Project Area is located on BLM-administered lands in sections 27 and 35 in Township 34 South, Range 3 East; and sections 1, 2, 3, 11, 12, and 17 in Township 35 South, Range 3 East; Willamette Meridian; Jackson County, Oregon. The nearest main transportation routes are Rancheria Road (Jackson County road #998) and Butte Falls-Prospect Highway (Jackson County road #992) (map 1).

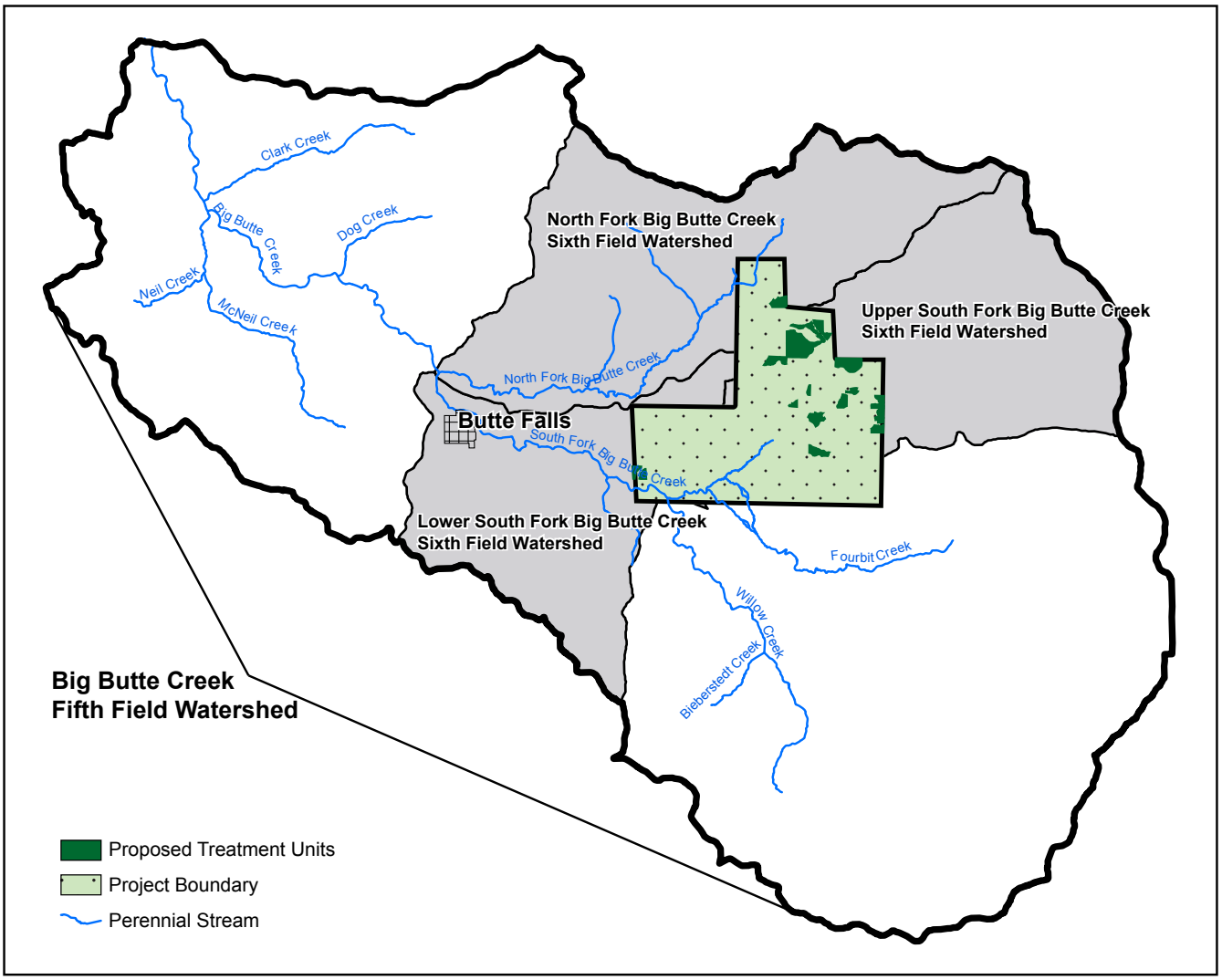
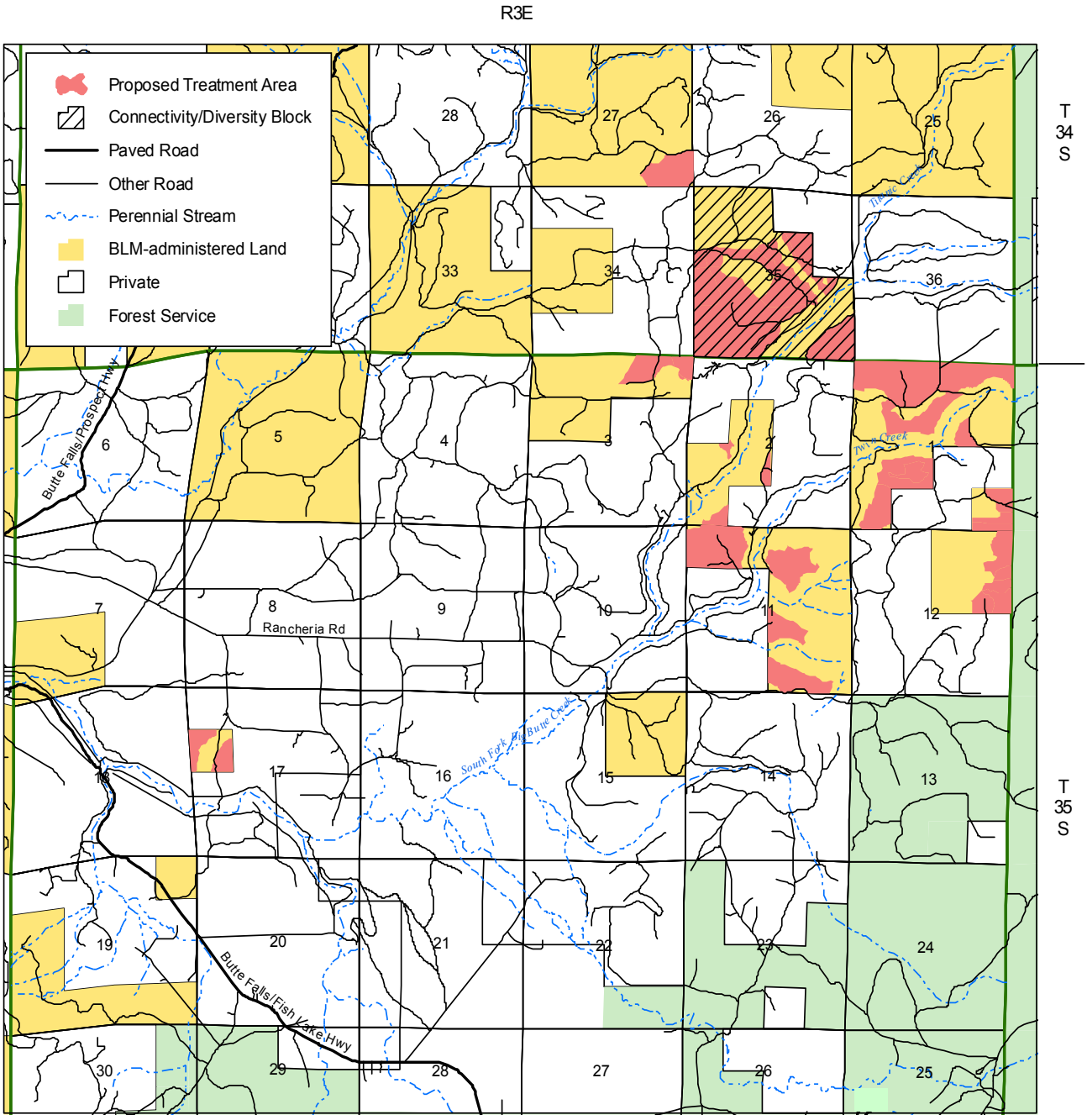


Figure 1. Project Area Location

The *Medford District Record of Decision and Resource Management Plan* (ROD/RMP) derived the following land use allocations from the major land allocations described in the Northwest Forest Plan: Designated Areas and Matrix. Designated areas include riparian reserves and late-successional reserves, which include known northern spotted owl activity centers. Forest areas outside these designated areas and not set aside for other resource values are designated as matrix lands and are available to provide a sustainable supply of timber (ROD/RMP, p. 38).

Matrix lands are divided into northern and southern GFMA (General Forest Management Area) and connectivity/diversity blocks. Matrix designations found within the Upper South Fork Big Butte Creek, Lower South Fork Big Butte Creek, and North Fork Big Butte Creek sixth field watersheds are northern GFMA and connectivity/diversity blocks. Connectivity/diversity blocks vary in size and are distributed throughout the northern GFMA. The BLM proposes forest management activities in the Connectivity/Diversity Block located in T34S, R3E, section 35.

Map 1. Twin Ranch Forest Management Project Area



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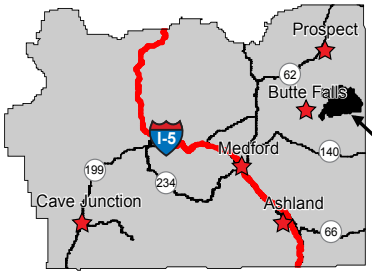

Medford District BLM

Project Area

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NATIONAL SYSTEM OF PUBLIC LANDS

MEDFORD DISTRICT
May 2010

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1.2 Purpose

To be given serious consideration as a reasonable alternative, any action alternative must meet the objectives provided in the ROD/RMP for projects to be implemented in the Project Area. The ROD/RMP specifies the following objectives to be accomplished in managing the lands in the Project Area.

1.2.1 Commercial Timber Harvest

Design commercial timber sales on matrix lands in the Upper South Fork Big Butte Creek, Lower South Fork Big Butte Creek, and North Fork Big Butte Creek sixth field watersheds.

The proposed timber sales would produce revenue for the Federal government and contribute at least 3 million board feet of timber toward the Butte Falls Resource Area's Allowable Sale Quantity of 14.8 million board feet. 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 northern GFMA exceeds the minimum harvest age of 100 years established in the Medford District ROD/RMP (p. 181). The ROD/RMP assumed stands on matrix lands that exceed the minimum harvest age would be regeneration harvested.

Reduce stand densities in stands less than 120 years old in order to make site resources available for remaining trees.

Stands which are older and developmentally more complex (exhibit a multiple layer stand structure) would be selection harvested. For this project, selection harvest treatment would be used to avoid removal of northern spotted owl habitat or to maintain northern spotted owl habitat.

Reduce tree densities in stands less than 120 years old that have a more simplified stand structure with limited layers present in order to control stocking levels and to redistribute the growth potential to fewer, but larger, trees.

Commercial thinning is programmed in the ROD/RMP on matrix lands for stands less than 120 years old that have reached a combination of stem diameter and surplus volume to allow an economical entry. Commercial thinning would be designed to assure high levels of volume productivity (ROD/RMP, p. 185).

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

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

Enhance and accelerate the production of large diameter conifers within riparian reserves located adjacent to proposed commercial thinning units.

Riparian reserves in the Project Area are overstocked with trees less than 100 years old. The ROD/RMP assumed silvicultural activities would be implemented within riparian reserves to control stocking levels and manage stands to attain Aquatic Conservation Strategy objectives (ROD/RMP, p. 195).

Aid in the 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 timeframes for the stands. ROD/RMP direction is to apply silvicultural systems that are planned to produce over time forests that have desired species composition, structural characteristics, and distribution of seral or age classes (ROD/RMP, p. 72-73).

1.2.2 Road Work associated with Timber Harvest

Reduce the potential for sediment production on up to 24 miles of roads that would be used to haul harvested timber.

Poorly surfaced roads in the Project Area are chronic sources of sediment to streams. Before timber is hauled on these roads, the timber sale purchaser must apply crushed rock to roads with depleted surface rock. The ROD/RMP specifies minimizing sediment delivery to streams from roads by surfacing inadequately surfaced roads (ROD/RMP, p. 163).

Reduce the risk of sediment delivery into streams by replacing four existing culverts and installing five new culverts.

Existing culverts are rusting or otherwise damaged. Four new cross-drain culverts would be installed to reduce distances between culverts to help reduce existing road ditch line flow and to drain existing wet areas adjacent to roads. One new draw pipe culvert would be installed to drain a small draw on the portion of BLM road 35-3E-8.1 proposed for relocation. The ROD/RMP specifies the restoration or improvement of roads to minimize sediment production and water quality degradation by repairing damaged culverts and adding necessary drainage facilities that will accommodate at least a 100-year flood event (ROD/RMP, p. 28 and 163).

Decrease the possibility of sediment entering streams by decommissioning approximately 0.7 mile of road that is no longer be needed for access and relocating approximately 0.1 mile of an existing road out of a stream channel.

The ROD/RMP 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” (ROD/RMP, p. 28).

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

The ROD/RMP directs roads to be located to minimize soil erosion, water quality degradation, and disturbance to riparian vegetation by minimizing road locations in riparian reserves and locating roads on stable positions, such as ridges (ROD/RMP, p. 28 and 157).

1.2.3 Fuels Treatment associated with Timber Harvest

Reduce the potential risk of wildfire that may result from the slash produced during harvest treatments.

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 direction is to reduce activity-based fuel hazards (ROD/RMP, p. 91).

1.3 Need

Overstocked stands in the Project Area need immediate forest management activities because the stands contain more trees than the sites have water, nutrients, and growing space to sustain. Fire suppression, recent fires, and forest management activities have altered the historic vegetative patterns in the Upper South Fork Big Butte Creek, Lower South Fork Big Butte Creek, and North Fork Big Butte Creek sixth field watersheds. Management practices such as selective cutting, overstory removal, and mortality salvage, along with fire suppression, have contributed to overstocked stands and high densities. Overstocked stands have a greater potential for severe stand-replacing wildfires. Clearcutting, 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 reverse these trends so the stands would persist and contribute to future forest production.

Road construction and the use of existing and new haul roads and skid trails associated with forest management activities are considered sources for sediment in streams (PRMP/EIS p. 4-19, 4-20). Sediment levels can adversely affect water quality and could impair fish production. When high, fine sediment levels occur in spawning gravels, less spawning occurs, eggs may be suffocated, and emerging fry become trapped, resulting in reduced fish production. Before roads are used for hauling timber, they need to be renovated to reduce the probability of sediment entering streams from these roads. Proposed timber harvest units that are currently inaccessible by vehicle need roads constructed to allow short- or long-term access. Roads 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.

In May 2008, the USFWS (US Fish and Wildlife Service) finalized the *Recovery Plan for the Northern Spotted Owl*, which contains 34 Recovery Actions. Recovery Actions are recommendations to guide activities needed to accomplish the recovery objectives and ultimately lead to delisting of the species. Specifically, Recovery Action 32 (RA32) in the Recovery Plan recommends maintaining “substantially all of the older and more structurally complex multilayered conifer forests on Federal lands outside of MOCAs” (U. S. Fish and Wildlife Service 2008b, 34). The intent of RA32 is to not further exacerbate the competitive interactions between spotted owls and barred owls. The BLM needs to maintain existing habitat within the provincial home range (1.2-mile radius) of known active northern spotted owl sites and all or substantially all of the older and more structurally complex, multilayered conifer forests.

1.4 Issues

1.4.1 Scoping

Scoping is the process used to identify the range of issues, management concerns, preliminary alternatives, and other components of a NEPA (National Environmental Policy Act) document. It involves internal and public viewpoints. The Butte Falls Resource Area mailed 2 letters to a total of 76 individuals, businesses, organizations, and government agencies to initiate scoping for the Twin Ranch Forest Management Project.

The first letter was sent December 20, 2006 to 31 individuals, businesses, organizations, and government agencies. A total of four comment letters were received. These letters are available for review at the Medford District BLM Office.

The original 2006 Twin Ranch project was delayed and a second letter was sent on January 13, 2010 to 45 individuals, businesses, organizations and government agencies to reinitiate scoping for the Twin Ranch Forest Management Project. A total of three comment letters were received. These letters are available for review at the Medford District BLM Office.

1.4.2 Issues Identified for Analysis

Issues provide a basis for comparing the environmental effects of the alternatives and aid in the decision-making process. The major issues brought forward were used to identify appropriate project design features or analyze environmental effects. Based on input from the public and the ID (Interdisciplinary) Team plus information contained in the ROD/RMP, the following issues were identified.

1.4.2.1 Soil Compaction-Soil Productivity

Can the BLM maintain or improve soil compaction and soil productivity while removing timber on Federal lands?

Due to the relative flatness of the topography on the land in the Project Area, the majority of lands have been tractor yarded with conventional logging methods (i.e., multiple entries with no designated skid trails). This has resulted in an extensive network of skid trails, roads, and landings on both private and BLM-administered lands. Due to this large concentration of skid trails, roads, and landings, soil compaction and the subsequent loss of soil productivity is a concern in the watershed. All of the proposed harvest units were previously tractor yarded using designated skid trails resulting in approximately 8 to 12 percent soil disturbance from past entries. Currently, the amount of existing compaction in all treatment units meets the Medford District ROD/RMP standard of 12 percent or less areal extent of disturbance from mechanical equipment.

1.4.2.2 Northern Spotted Owl Habitat

Can the BLM provide silviculture treatments 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). These stands are programmed for silviculture treatments. To treat these stands, the BLM should conduct owl surveys and monitoring, and avoid habitat-altering activities in known active northern spotted owl sites in order to prevent harm to known northern spotted owls.

1.4.2.3 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 prescription, yarding system, volume, road needs, activity slash treatment, hauling distances, and seasonal operating restrictions. The BLM must carefully balance these economic factors with ecosystem needs to design an economically viable timber sale.

1.4.2.4 Forest Health and Vigor

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 sites have moisture, nutrients, and growing space to sustain. The supply of essential site resources has decreased while the demand has increased. Without adequate resources, tree growth and vigor declines, increasing the probability of tree mortality from insects or disease.

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;
- provide timber resources and provide revenue to the government from the sale of those resources;
- reduce erosion and subsequent sedimentation from roads and reduce road densities;
- reduce the short-term and long-term costs of managing the lands in the Project Area;
- maintain or improve long-term soil productivity on all treatment units; and
- maintain existing 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.

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.

The project also conforms with:

- 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)
- Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (2001 Survey and Manage).

The analysis in the Twin Ranch Forest Management Project EA is site-specific and supplements the broader analyses found in the *Medford District Proposed Resource Management Plan/Final Environmental Impact Statement* (PRMP/FEIS). The PRMP/FEIS includes the analysis from the *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* (Northwest Forest Plan FSEIS).

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

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 road realignment and road decommissioning on BLM-administered lands within the Project Area.

2.0 Alternatives

Chapter 2 provides a description of the proposed project. The alternative ways for meeting the need for this project and the objectives identified in Chapter 1 are presented. 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:

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

2.1 Introduction

The ID Team for the Twin Ranch Forest Management Project developed three action alternatives for meeting the objectives of the project. These alternatives vary in the response to the issues identified in Chapter 1. In addition, we have included a No-Action Alternative (Alternative 1) to provide a baseline for comparison. The action alternatives explore a range of options for forest management in the Project Area.

2.2 Proposed Projects

2.2.1 Forest Management

2.2.1.1 Timber Harvest

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 piled and burned or trees would be whole tree yarded and slash removed from the landings. Conifer seedlings would be planted following harvest.

Regeneration harvest using **northern GFMA** (General Forest Management Area) prescription guidelines would retain 6 to 8 trees per acre greater than 20 inches DBH (diameter at breast height). Spatial distribution of these trees would vary from individual trees to groups.

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 uniformly distributed. After harvest, canopy cover would be 20 to 30 percent. 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.

Selection Harvest

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 desired basal area and tree crown ratio and form are the primary factors used

to determine which trees would be left or removed. The stand structure would be multiaged and multilayered. Canopy cover would range from 40 to 60 percent following treatment (figure 2).

Figure 2. Photographs illustrating 40% canopy cover (on left) and 60% canopy cover (on right).

Commercial Thinning

Commercial thinning is used to control stocking and to redistribute the growth potential to fewer but larger trees. Removal of smaller trees and trees in direct competition with healthy dominant and codominant trees would redirect the site resources (water, sunlight, nutrients, and growing space) toward the development and maintenance of large healthy trees. A minimum of 40 percent canopy cover would remain following treatment.

Density Management

Density management would thin trees 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 percent, depending on the current owl habitat designation (dispersal or nesting, roosting, and foraging), with multiple layers present.

Riparian Reserve Thinning

The outer 100 feet of riparian reserves that are located adjacent to proposed upland thinning units would be thinned. Equipment would not enter the 190-foot riparian reserves (unless on roads) but trees could be yarded through the outermost 100 feet (figure 3). Thinning would enhance and accelerate the production of large diameter conifer in the riparian area. Trees would be thinned from below to remove the suppressed component of the stand, followed by the thinning of the main canopy to reduce density and to remove trees infected by disease or insects or otherwise declining (based on crown ratio and form). Healthy Douglas-fir, incense cedar, ponderosa pine, and sugar pine would be left.

2.2.1.2 Timber Yarding

Yarding, or skidding, the felled timber from the stump to the landing would be accomplished using a ground-based yarding system. A skidder (rubber-tired or tracked) or tractor would move from the landing into the unit on designated skid trails. Skidders or tractors are equipped with a cable (winch) line drum, grapples, or both. The winch drum holds 75 to 150 feet of cable called the bull or winch line.

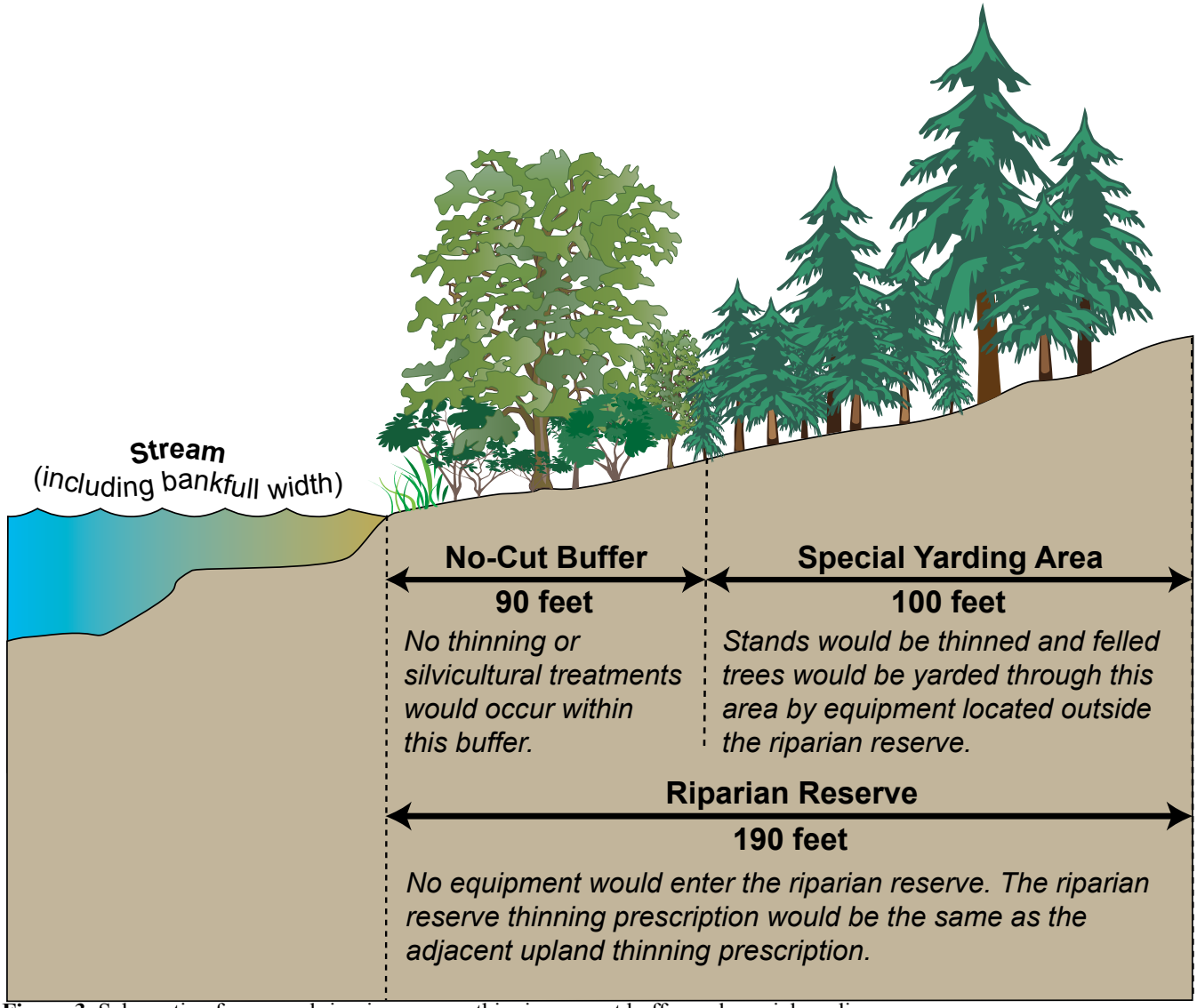


Figure 3. Schematic of proposed riparian reserve thinning no-cut buffer and special yarding areas.

Depending on their proximity, trees would be bull lined or grappled to the skid trail. The bull line can run directly to the logs or, more commonly, through an integral arch mounted on the machine. When the trees are on the skid trail, the skidder or tractor skids the trees to the landing. An integral arch or grapple lifts the front end of the logs off the ground during the skidding process. This lift reduces friction between the logs and the ground, reduces soil disturbance, and improves traction by transferring part of the log weight to the skidder. The skidder would travel on skid trails that are designated and approved by the BLM. Skid trails and landings no longer needed for future management activities would be ripped after harvest is completed.

2.2.1.3 Reforestation

Regeneration harvest units would be replanted after harvest with a mix of native conifers: 70 percent Douglas-fir, 20 percent ponderosa or sugar pine, and 10 percent incense cedar. Approximately 300 to 500 trees per acre would be planted. Vegetation would be scalped for a 6-inch radius around the planting hole prior to planting. In regeneration harvest units with root rot (T35S, R3E, section 1), no ponderosa pine seedlings would be planted; a mix of Douglas-fir, sugar pine, and incense cedar would be planted.

In regeneration harvest units located adjacent to stands infected with Douglas-fir mistletoe (T35S, R3E, section 12), no Douglas-fir would be planted within 50 feet of the perimeter.

Target stands would have a target stocking level of 229 well-spaced trees per acre with a minimum stocking level of 60 percent of the target (140 well-spaced trees per acre). At 1, 3, and 5 years after planting, the BLM would conduct surveys to determine seedling survival, stocking levels, and maintenance (e.g., tubing, mulching, shading, scalping) needs. Replanting would occur if needed to meet target number of trees per acre. If necessary, radius hand-scalping would remove competing vegetation for a 3-foot radius around planted seedlings.

2.2.2 Road Work Associated with Forest Management

2.2.2.1 Road Renovation

Before roads are used for forest management activities, road surfaces would be bladed and ditch lines 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. All drainage structures, including corrugated metal pipes, water dips, and ditch relief outlets, would be inspected and required work performed so water flow would not be impeded. Crushed aggregate material would be placed on sections of inadequately surfaced haul roads. Three 18-inch culverts and one 24-inch culvert would be replaced where they have deteriorated. Four new 18-inch culverts may be added to existing roads in order to improve drainage.

2.2.2.2 Full Decommissioning

A portion of BLM road #34-3E-35 would be ripped, seeded with native grasses, mulched, and planted to reestablish vegetation. Cross-drain culverts, road fills in stream channels, and potentially unstable fill areas would be removed to restore the natural hydrologic flow. The road would be closed with a device similar to an earthen barrier or equivalent. The road would not be maintained in the future.

2.2.2.3 Temporary Spur Road Construction

Temporary spur roads would be constructed to allow operators temporary access to harvest units. All temporary spur roads would be located on stable areas. After harvest is complete, the roads would be fully decommissioned in the same season as used. Temporary spur roads would be ripped, seeded with native grasses, mulched, and blocked.

2.2.2.4 Road Realignment

A portion of existing BLM road #35-3E-8.1 would be relocated out of a draw bottom. The length of road to be constructed would nearly equal the portion that would be bypassed and decommissioned. The route to be abandoned would be fully decommissioned by ripping, water barring, and planting. One 24-inch draw pipe would be installed to drain a small draw.

2.2.3 Fuels Treatment Associated with Forest Management

2.2.3.1 Lop and Scatter

When the slash (live and dead material 9 inches or less) remaining in the units after harvest is less than 11 tons per acre, all stems and branches would be cut from the central stem and scattered. Central stems 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 Hand Piling and Hand Pile Burning

When the slash (live and dead material 9 inches in diameter or less) remaining in the units after harvest is greater than 11 tons per acre, material between 1 and 7 inches in diameter and longer than 2 feet would be piled by hand. 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.

2.2.3.3 Biomass Removal

Whole trees or tree tops are yarded to log landings, the tree tops and limbs are removed and piled at the landings, and the resulting piles of slash are hauled away from the landings.

2.3 Alternative 1 (No-Action Alternative)

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, forest management activities would not be implemented at this time. Future harvest in this area would not be precluded and could be analyzed in a subsequent NEPA document. A portion of BLM road 34-3E-35 would not be decommissioned and BLM road 35-3E-8.1 would remain in the draw bottom. Road work and fuels treatment associated with forest management activities would not be necessary.

2.4 Alternative 2 (Map 2 and Table 2-1)

Alternative 2 implements the Medford District ROD/RMP management direction for general forest management areas and riparian reserves. Structurally complex stands on matrix lands, as defined by Recovery Action 32 from the 2008 Northern Spotted Owl Recovery Plan, would not be entered for management actions.

2.4.1 Forest Management

In Alternative 2, 624 acres are proposed for forest management actions: 66 acres of regeneration harvest (10 acres northern GFMA and 56 acres shelterwood) (figure 4), 542 acres of commercial thinning, and 16 acres of riparian reserve thinning. Trees would be tractor yarded using approved designated skid trails. Whole tree yarding for biomass removal would use approved designated skid trails. Landings to accommodate biomass removal would require 0.5-acre landings. Skid trails and landings in regeneration units would be ripped following completion of harvest. Regeneration harvest units would be replanted after harvest with a mix of native conifers.

Figure 4. Proposed northern GFMA regeneration harvest unit in T35S, R3E, section 1, Unit 1-5.

2.4.2 Road Work Associated with Forest Management

Road renovation would occur on 24.6 miles of road within the Project Area. Full decommissioning would occur on 0.7 mile of BLM road 35-3E-35. Approximately 1.1 miles of temporary spur roads and their associated landings would be constructed and decommissioned after use. Approximately 0.1 mile of BLM road 35-3E-8.1 would be relocated.

2.4.3 Fuels Treatment Associated with Forest Management

Whole tree harvesting and yarding with tops attached on 517 acres would bring much of the logging slash to the landings where it could be piled and hauled out for use as biomass. Remaining logging slash would be lopped and scattered or hand piled and burned.

2.5 Alternative 3 (Map 3 and Table 2-1)

Alternative 3 applies silviculture treatments that would be neutral or beneficial to northern spotted owl habitat. Owl habitat currently defined as structurally complex; dispersal; or nesting, roosting, and foraging would not be altered to the extent that the habitat designation would be downgraded.

2.5.1 Forest Management

In Alternative 3, 752 acres are proposed for forest management activities: 174 acres of selection harvest, 562 acres of density management on matrix lands, and 16 acres of density management in riparian reserves. Selection harvest in northern spotted owl habitat would maintain canopy cover at levels equivalent to preproject habitat designations (i.e., nesting, roosting, and foraging habitat would be maintained at 60 percent canopy cover; dispersal habitat would be maintained at 40 percent canopy cover). Selection harvest in 108 acres of nesting roosting, and foraging habitat would maintain 60 percent canopy cover. Selection harvest in 66 acres of dispersal habitat would maintain 40 percent canopy cover. Density management would be used in stands identified as RA32. Canopy cover would be maintained at levels equivalent to preproject habitat designations: 60 percent canopy cover in 270 acres of nesting, roosting, and foraging habitat and 40 percent canopy cover in 292 acres of dispersal habitat. Trees would be skidded on approved designated skid trails using a ground-based yarding system. Skid trails would not be ripped.

2.5.2 Road Work Associated with Forest Management

Road renovation would occur on 26.3 miles of road within the Project Area. Full decommissioning would occur on 0.7 mile of BLM road 34-3E-35. Two short temporary spur roads (0.2 mile total) would be constructed off BLM road 35-3E-8.1 to allow operator access to harvest units 17-1 and 17-2. The temporary spur roads would eliminate the need to construct landings within the riparian reserve adjacent to these harvest units. Approximately 0.1 mile of BLM road 35-3E-8.1 would be relocated

2.5.3 Fuels Treatment Associated with Forest Management

Logging slash would be lopped and scattered or hand piled and burned.

2.6 Alternative 4 (Map 4 and Table 2-1)

Alternative 4 implements the Medford District ROD/RMP management direction for general forest management areas and riparian reserves without removing northern spotted owl habitat. RA32 stands would not be entered for management actions.

2.6.1 Forest Management

In Alternative 4, proposed forest management activities are 558 acres of commercial thinning (542 acres in matrix lands and 16 acres in riparian reserves) and 66 acres of selection harvest. Trees would be tractor yarded using approved designated skid trails. Whole tree harvesting could occur providing equipment is restricted to approved designated skid trails. Whole tree harvesting and yarding with tops attached would bring much of the logging slash to the landings where it could be piled and removed for use as biomass. Biomass removal would require 0.5-acre landings. Remaining logging slash would be lopped and scattered or hand piled and burned. No skid trails would be ripped.

2.6.2 Road Work Associated with Forest Management

Road renovation would occur on 24.6 miles of road within the Project Area. Full decommissioning would occur on 0.7 mile of BLM road 34-3E-35. Approximately 1.1 miles of temporary spur roads would be constructed and decommissioned after use. Approximately 0.1 mile of BLM road 35-3E-8.1 would be relocated.

2.6.3 Fuels Treatment Associated with Forest Management

Whole tree harvesting and yarding with tops attached on 517 acres would bring much of the logging slash to the landings where it could be piled and hauled out for use as biomass. Remaining logging slash would be lopped and scattered or hand piled and burned.

Table 2-1. Comparison of the Action Alternatives

	Alternative 2	Alternative 3	Alternative 4
Forest Management (acres)			
NGFMA	10	0	0
Shelterwood	56	0	0
Selection Harvest - 40% Canopy	0	66	66
Selection Harvest - 60% Canopy	0	108	0
Commercial Thinning	542	540	542
Density Management - 40% Canopy	0	292	0
Density Management - 60% Canopy	0	270	0
Riparian Thinning	16	16	16
Total Harvest	624	752	624
Harvest System (acres)			
Tractor	624	752	624
Reforestation (acres)	66	0	0
Road Work Associated with Forest Management (miles)			
Renovation	24.6	26.3	24.6
Full Decommissioning	0.7	0.7	0.7
Temporary Spur Road Construction	1.1	0.2	1.1
Realignment	0.1	0.1	0.1
Fuels Treatment Associated with Forest Management (acres)			
Hand Pile and Burn	32	173	32
Lop and Scatter	76	578	76
Biomass Removal	517	0	517

2.7 Project Design Features

The following PDFs (Project Design Feature) are included in the design of forest management projects in Alternatives 2, 3, and 4. These PDFs are a combination of applicable BMPs identified in the Medford District ROD/RMP and resource protection measures identified by the interdisciplinary team of resource specialists for this EA. The PDFs serve as a basis for resource protection in the implementation of any projects and will be considered in the analysis of impacts in Chapter 3.

2.7.1 Wildlife

PDF 1. Seasonally restrict harvest activities and blasting from March 1 to September 30 within 0.25 mile of known northern spotted owl sites. 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.

PDF 2. Seasonally restrict burning from March 1 to June 30 within 0.25 mile of known active northern spotted owl nests. The seasonal restriction will be waived if nonnesting is determined.

PDF 3. Seasonally restrict activity fuels treatment with chainsaws from March 1 to June 30 within 200 feet of known active northern spotted owl nests. The seasonal restriction will be waived if nonnesting is determined.

PDF 4. Seasonally restrict harvest activities from March 1 to August 1 within 0.25 mile of active raptor nests.

PDF 5. Retain known raptor nest trees.

PDF 6. Maintain all snags except those which need to be felled for safety reasons. Snags felled for safety reasons will be left on-site.

PDF 7. Restrict harvest activities within 300 feet of meadows.

2.7.2 Riparian Reserves

PDF 8. Store all hazardous materials and petroleum products in durable containers placed outside of riparian reserves so an accidental spill will be contained and not drain into the stream system.

PDF 9. Refuel equipment in locations outside riparian reserves.

PDF 10. Stack hand piles more than 60 feet from fish-bearing, perennial streams and more than 35 feet from non-fish-bearing, intermittent streams.

PDF 11. Designated riparian reserves will be treated in areas up to 100 feet wide adjacent to upland thinning units.

PDF 12. No mechanized equipment is allowed in riparian reserves; all logs felled within riparian reserves will be cable winched to adjacent matrix land or existing roads.

PDF 13. To limit access to OHVs, barricade with debris, such as rocks, logs, and slash the first 100 feet of skid trails leading off system roads in all tractor units upon completion of yarding.

PDF 14. Construct new landings outside riparian reserves.

PDF 15. Install drainage structures where temporary roads cross intermittent streams. Remove structures after use and before fall rains begin.

PDF 16. Use erosion-control techniques on temporary roads located inside riparian reserves. Techniques may include applying native grass seed and weed-free mulch, scattering chipped material, or scattering limbs and other fine material.

2.7.3 Archaeology

PDF 17. Apply mitigating measures to areas containing known archaeological sites. Buffers will be determined based on proposed treatment, site-specific environmental conditions, and protection recommendations.

PDF 18. Stop work and notify the BLM within 12 hours if an archaeological site is discovered during the project.

2.7.4 Special Status Plants

PDF 19. Protect known Special Status and Survey and Manage vascular plant, lichen, bryophyte, and fungi sites. Buffers will be determined based upon species, proposed treatment, site-specific environmental conditions, and available management recommendations (Special Status Species Conservation Assessments and Survey and Manage Management Recommendations).

2.7.5 Noxious Weeds

PDF 20. Use weed-free gravel and fill for road work. BLM sources of rock and fill material need to be free of noxious weeds. Survey BLM rock quarries for noxious weeds prior to use. If noxious weeds are found, they will be treated by the BLM prior to quarry use.

PDF 21. Wash vehicles and equipment that will travel off system roads to remove mud, dirt, and plant parts prior to entry onto BLM-administered lands.

PDF 22. Seed and mulch ripped temporary roads, decommissioned roads, and landings using native seed and weed-free straw after final disturbance.

2.7.6 Equipment Use

PDF 23. Require a Spill Prevention, Control and Countermeasure Plan prior to operation. The Plan will include, but not be limited to, identification of hazardous substances to be used in the Project Area and purchaser's representatives responsible for supervising initial containment action for releases and subsequent cleanup.

2.7.7 Roads and Quarries

PDF 24. Restrict rock hauling, timber hauling, and landing operations on native surface or inadequately 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.

PDF 25. Restrict rock hauling, timber hauling, and landing operations on adequately rocked roads whenever soil moisture conditions or rain events could result in road damage or the transport of sediment to nearby stream channels, especially between the dates of October 15 and May 15. Allow road or landing use between those dates only during periods of dry weather.

PDF 26. Restrict all road renovation and closure work from October 15 to May 15, or when soil moisture exceeds 25 percent.

PDF 27. Block or barricade identified roads after use and before beginning of rainy season (generally by October 15).

PDF 28. 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).

PDF 29. Place waste stockpile and borrow sites resulting from road construction or reconstruction in a location where sediment-laden runoff can be confined, at least one site potential tree length (190 feet) from a stream.

PDF 30. Seasonally restrict (generally October 15 to May 15) 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.

PDF 31. To prevent the potential for runoff from quarry operations into nearby stream channels, construct silt fences or other preventative structures (diversion ditches, settling ponds) as needed.

PDF 32. To stabilize exposed soil in overburden areas from quarry operations, plant grass seed, native vegetation, or both within the same operating season.

PDF 33. If explosives are necessary in quarry development, require a detailed blasting plan to minimize the amount of rock material outside the designated quarry perimeter.

PDF 34. Apply native seed and mulch to all disturbed or exposed soils during stream culvert removal, replacement, and installation in the same operational season the work is completed.

PDF 35. To reduce sediment input into streams, remove all possible excess sediment from stream channels during stream culvert removal, replacement, and installation activities in the same operational season the work is completed.

PDF 36. To minimize the movement of sediment downstream, dewater perennial streams during culvert replacement.

PDF 37. Rip, seed, mulch and block all temporary spur roads in same season after use.

2.7.8 Fuel Hazard Reduction

PDF 38. Conduct prescribed burns within two years following harvest and plantation thinning activities. Provide an approved prescribed fire plan that complies with Prescribed Fire Handbook H-9214-1 prior to the ignition of all prescribed burn units.

PDF 39. 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.

PDF 40. 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.

PDF 41. 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 the activities.

2.7.9 Timber Harvest

PDF 42. Minimize the total number of skid trails in commercial thinning and selection harvest units by designating skid trails at an average spacing of 150 feet. In order to minimize ground disturbance, avoid creating new skid trails and use existing where feasible. Where new skid trails may be needed to access unharvested areas, maintain an average 150-foot spacing between trails.

PDF 43. Use existing skid trails in regeneration harvest units where practical.

PDF 44. Locate skid trails to minimize disturbance to coarse woody debris. Where skid trails encounter large coarse woody debris, cut out a section for equipment access. The remainder will be left in place and not disturbed.

PDF 45. Rip skid trails in all tractor-yarded regeneration harvest units.

PDF 46. Waterbar all skid trails and firelines during the same operating season as constructed. Use spacing for high erosion class soils (see ROD/RMP, Appendix D-Best Management Practices, Erosion Control for Timber Harvest, p.167).

PDF 47. Use ridge tops wherever possible for temporary road construction.

PDF 48. Restrict all tractor yarding and soil ripping operations from October 15 to May 15, or when soil moisture exceeds 25 percent.

PDF 49. Restrict tractor and mechanical operations to slopes generally less than 35 percent.

PDF 50. All ground-based, mechanized equipment will remain on designated skid trails.

PDF 51. Rip areas identified for ripping (e.g., skid trails, landings, decommissioned roads) to a depth of 18 inches using a sub-soiler or winged-toothed ripper.

PDF 52. Limit landings to 0.5 acre or less.

2.8 Alternatives Considered but Eliminated

2.8.1 2006 Twin Ranch EA

The BLM began environmental analysis for the original Twin Ranch project in 2006. Changes in priorities resulted in the BLM postponing completion of this project. The original EA proposed timber harvest activities on approximately 1,110 acres. An alternative considered northern GFMA regeneration harvest (including shelterwood retention), connectivity/diversity block regeneration harvest, and commercial thinning on matrix lands. It also considered density management treatments within riparian reserves. The alternative included 345 acres of treatment within known active spotted owl provincial home ranges. These treatments would have reduced or removed nesting, roosting, and foraging habitat within the 1.2-mile provincial home range of these known spotted owl sites resulting in potential harm to these owls. To avoid harm to these known northern spotted owls, the BLM has dropped proposed treatments in these units at this time. They may be considered at some future date. The remaining units proposed in this alternative, which are outside the provincial home range of the known active northern spotted owls, are being considered in this current proposal.

2.8.2 Citizen's Alternative

Klamath Siskiyou Wildlands Center proposed an alternative for the BLM to analyze in the Twin Ranch EA in which:

- plantations are commercially thinned to increase vigor and provide wood fiber;
- true firs that have encroached in mixed conifer, pine, and hardwood stands due to agency fire suppression activities are thinned to closer resemble the historic range of species variability and to produce wood fiber;
- remaining large-diameter conifers are retained;
- no new logging roads are constructed;
- existing roads are upgraded; and
- road density is reduced.

The Twin Ranch project ID Team discussed the proposed Citizen's Alternative and determined Klamath Siskiyou's proposals have been adequately addressed in other BLM projects in the fifth field watershed, or are included in this current proposal.

Although the Twin Ranch project does not propose plantation thinning, the BLM has three thinning projects within the Big Butte Creek fifth field watershed that are either completed, being implemented, or will be implemented. Camp Stew completed thinning on 282 acres of ponderosa pine plantations and mixed conifer stands in 2006. The Ranch Stew project began in 2009 and will thin 971 acres of ponderosa pine plantations, mixed conifer stands, and progeny test sites. The Ranch Stew II project began in spring 2010 and will thin 612 acres of ponderosa pine plantations and mixed-conifer stands. In each of these projects, the species preference for leave trees is (1) Douglas-fir, (2) incense cedar, (3) sugar pine, (4) ponderosa pine, and (5) white fir. By favoring the retention of healthy Douglas-fir, incense cedar, sugar pine, and ponderosa pine over white fir, stands should more closely represent a more natural species mix.

The range of alternatives proposed in the Twin Ranch project contains features that address the remaining proposals in the Citizen's Alternative. The areas proposed for regeneration harvest in Alternative 2 are changed to selection harvest leaving a 40 percent canopy cover in Alternatives 3 and 4. Large diameter trees would only be removed during selection harvest if they were of poor vigor and the stand would continue to function as late-successional forest.

The project soil scientist proposed analyzing an alternative that used existing roads for harvest; no new temporary logging roads would be constructed. Alternative 3 originally contained no new road construction; however, after a closer look at operational needs, the ID Team decided to include construction of two short temporary spur roads (0.2 mile total) in Alternative 3 to allow operator access to harvest units 17-1 and 17-2. The temporary spur roads would eliminate the need to construct landings within the riparian reserve adjacent to these harvest units.

In all action alternatives, road renovation is proposed that would upgrade roads in the Project Area before they are used for management activities. A portion of BLM road 34-3E-35 (0.7 mile) would be fully decommissioned in all action alternatives in order to reduce road density.

3.0 Affected Environment and Environmental Consequences

This section provides the environmental analyses of the biological, physical, and social and economic elements relative to the proposed project. For each resource topic, the setting (affected environment) is presented first, followed by the impact analysis (environmental consequences). The setting describes the existing environmental conditions that serve as the baseline for determining project impacts.

3.1 Introduction

Chapter 3 describes the current condition of the environment within the Twin Ranch Project Area. Past activities have contributed to the conditions currently existing in the Project Area and are reflected in the description of current conditions. Terms used in this section are defined as follows:

physiographic province. A region of the landscape with distinctive geographical and biological features.

site-potential tree. A tree that has attained the average maximum height possible given site conditions where it occurs.

3.1.1 Physical Setting

The Twin Ranch Project Area includes the public lands and resources administered by the Butte Falls Resource Area of the Medford District BLM. It contains approximately 10,400 acres with around 2,100 acres administered by the BLM.

The Project Area is located on a large plateau in southwest Oregon that ranges from 2,600 feet to 3,580 feet in elevation. The topography is relatively flat (figure 5) and slopes range from 0 to 30 percent with an average slope of 4 to 6 percent. Annual precipitation ranges from 35 to 45 inches; most of the precipitation falls as rain from November through March. Summer temperatures range from the high 70s to the low 90s. Winter low temperatures may drop to 10 to 20 °F. Cold air accumulates in low-lying areas with slopes less than 15 percent, forming frost-prone areas.

Important perennial streams in the Project Area that drain into Big Butte Creek are Jackass Creek, Eighty Acre Creek, Titanic Creek, Twin Creek, Friese Creek, and Rancheria Creek.

The Twin Ranch Project Area lies entirely within the Western Cascades physiographic province, which extends the full length of the Oregon Cascades Range. The southern portion of the Province experiences high fire frequencies and most of the wildfire ignitions occur from mid-July to mid-October.

Forests are primarily a mixture of conifer species: white fir, Douglas-fir, ponderosa pine, sugar pine, and incense cedar. White fir is the dominant plant series in the Project Area and Douglas-fir is the dominant overstory tree until it is replaced by white fir. Ponderosa pine is found in drier sites and in frost-prone areas where it provides protection for the development of white fir and Douglas-fir.

Figure 5. The gentle topography found in the Twin Ranch Project Area.

3.1.2 Land-Use Allocations and Restrictions

BLM lands proposed for management activities within the Twin Ranch Project Area were designated as matrix (including connectivity/diversity block), riparian reserve, and 100-acre known northern spotted owl activity center in the Medford District ROD/RMP. Following is a summary of pertinent management direction contained in the ROD/RMP as it applies to the Project Area.

3.1.2.1 Matrix

The Medford District ROD/RMP objectives on 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 associated with both late-successional and younger forests; 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" (Bureau of Land Management 1995b, 39). The Northwest Forest Plan described matrix lands as those areas where most scheduled timber harvest would occur.

Connectivity/Diversity Blocks are spaced throughout matrix lands in the northern GFMA allocation. The ROD/RMP directs that each block is to be maintained in at least 25 to 30 percent late-successional forest condition. Riparian reserves and other allocations with late-successional forest count toward this percentage. The Project Area contains a 520-acre connectivity/diversity block in T34S, R3E, section 35.

3.1.2.2 Riparian Reserves

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 for the Big Butte Creek fifth field watershed is 190 feet.

3.1.2.3 100-acre Known Northern Spotted Owl Activity Centers

Known northern spotted owl activity centers are one of five components of the 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 1995b, 32). The Twin Ranch Project Area contains two 100-acre known northern spotted owl activity centers within the provincial radius (1.2 miles) of the Project Area.

3.1.3 Other Actions in the Watershed containing the Project Area

The Twin Ranch EA Project Area covers approximately 10,397acres located in a portion of the Big Butte Creek fifth field watershed in Jackson County, Oregon. The Project Area is within portions of the Upper South Fork, Lower South Fork, and North Fork Big Butte Creek sixth field watersheds.

The Project Area is located approximately 5 miles east of the town of Butte Falls. The main transportation routes are Butte Falls-Fish Lake Highway, Butte Falls-Prospect Highway, and Rancheria Road.

3.1.3.1 History of the Project Area

Early settlers arrived in the Project Area in the 1860s and established camps to cut sugar pine shakes, cedar posts, and cord wood. In 1904, the Big Bend Milling Company built a water-powered sawmill at the falls on Big Butte Creek. The company was replaced by the Butte Falls Sugar Pine Lumber Company who surveyed a town site above Butte Creek in 1905. They cleared the area of trees to build the town of Butte Falls, named for the falls on Big Butte Creek. Butte Falls was incorporated in 1911.

The completion of the Pacific and Eastern Railroad from Butte Falls to Medford provided a means for getting wood to the market. Much of the land that was logged by the early lumber companies was purchased from homesteaders. By the 1920s, the lumber mills in Butte Falls had closed and the logs were shipped by railroad to mills in Medford for processing. In the early 1930s, Medford Corporation purchased the private forest lands in this area previously owned by the Brownlee-Olds

Lumber Company. By the mid-1940s, much of the mature timber on Medford Corporation land had been harvested and the demand for harvest on Federal lands increased. The harvest of private land had produced 70 miles of railroad spurlines out into the surrounding area (figure 6). In the 1950s, road improvements and the increased use of trucks to haul the timber lead to the removal of many of the spurlines. Logs were hauled to Butte Falls by truck and shipped by railroad to the mill in Medford. By the 1960s, the Medford Corporation stopped shipping timber by rail and all logs were hauled to Medford by trucks.

Figure 6. Medford Corporation railroad.

Passage of the O&C Act in 1937 provided direction for Federal lands managed by the BLM in this area. The O&C Act was 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. Under the O&C Act, these counties are entitled to 50 percent of the timber receipts.

Land ownership patterns, past timber harvest, wildfires, and fire exclusion have contributed to the existing conditions in the Big Butte Creek fifth field watershed. 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

The following is a general description of past harvest activities and trends on BLM-administered land within the North Fork Big Butte Creek, Upper South Fork Big Butte Creek, and Lower South Fork Big Butte Creek sixth field watersheds. Over the past 60 years, harvest has occurred on approximately 68 percent of the BLM forested land within these watersheds. Over these years, harvest practices ranged from mortality salvage, or selective cutting of individual trees, to regeneration harvest including clearcut harvest (figure 7).

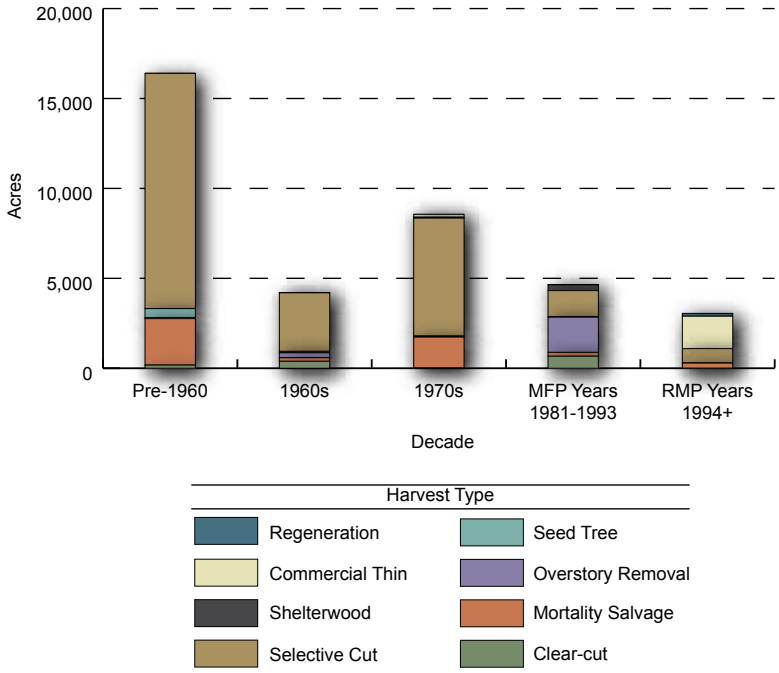


Figure 7. Past timber harvest on BLM lands within the sixth field watersheds containing the Twin Ranch Project Area.

Most activities (644 acres or 86 percent) proposed in this EA are included in the Upper South Fork Big Butte Creek sixth field watershed. A few acres, however,

are located in the Lower South Fork (49 acres or 6 percent) and North Fork Big Butte Creek (59 acres or 6 percent) sixth field watersheds. All proposed activities are within the Big Butte Creek fifth field watershed.

Pre-1960

From the early 1930s through the 1950s, approximately 10,000 acres of BLM-administered land received treatments within these 3 sixth field watersheds; many of these acres were harvested multiple times. A total of 16,400 acres, including those acres harvested multiple times, received harvest treatments. The predominant harvest treatment was selection cutting. Approximately 13,000 acres were select cut harvested, including multiple entries in some acres. Select cut harvest typically focused on the larger, high-valued Douglas-fir, sugar pine, and ponderosa pine trees. Select cut harvest methods created openings in the forest stand and allowed natural regeneration to occur. Most harvesting was completed using tractor yarding and many pioneer roads were built to access these acres. Tractor yarding and road building may have occurred under all weather and soil moisture conditions and likely resulted in soil compaction across these acres.

Other harvest treatments included approximately 2,600 acres of mortality salvage and 500 acres of seed tree harvest. It is likely mortality salvage harvest reduced the levels of snags and down woody debris on these acres because the dead and dying trees with commercial value were removed. All trees were removed from the clearcut harvest units and these areas were planted after harvest was completed.

1960s

In the 1960s, approximately 4,200 acres in the 3 sixth field watersheds were harvested; many of these acres received multiple harvest entries. Selection cutting was the primary harvest treatment.

A total of 386 acres in the sixth field watersheds were clearcut. The clearcut acres, located in frost-prone areas, were planted with ponderosa pine following harvest. The pine trees were planted to provide shelter for the natural seeding of other mixed conifer species, such as Douglas-fir and incense cedar, in these frost-prone areas. In many of these plantations, these mixed species trees are now well-established and above the frost layer where they are free to grow.

1970s

In the 1970s, selection harvest and mortality salvage were the primary harvest treatments. Of the 8,560 acres harvested in the sixth field watersheds in the 1970s, approximately 8,300 acres were either select cut or mortality salvage harvested. Multiple harvest entries into areas were typical in the 1970s and nearly 1,600 acres were harvested more than once. Road building continued in order to provide access into previously unentered stands and to access private industrial forest lands. During the 1970s, cable yarding use increased, but because of the gentle slopes in these watersheds, tractor yarding remained the primary harvest method.

1980s

In 1980, the BLM began implementing the Medford District's Management Framework Plan (MFP), which established guidance for managing the BLM-administered lands in the Medford District. Emphasis in the MFP was to maximize timber production on high intensity management lands throughout the Medford District. Direction in the MFP was to convert existing old growth stands to

rapid-growing second growth. Recommended harvest practices included clearcut, overstory removal, two-stage shelterwood, and single tree selection harvest. Intensive management practices to maximize growth and yield from these lands included commercial and precommercial thinning, reforesting and fertilizing the harvested lands, and spraying to control competing vegetation. The MFP implemented a 100-foot, no-harvest buffer on each side of designated streams. Tractor yarding was limited to slopes less than 35 percent. Logging units were designed for more sophisticated cable yarding machines which were capable of reaching farther out into units. This reduced the need for road construction to harvest these units.

The Medford District BLM operated under the MFP from 1980 through 1993. During this time, approximately 4,650 acres were harvested using mainly overstory removal, select cut, and clearcut harvest methods.

Approximately 2,000 acres of overstory removal was completed in these watersheds. These treatments were applied in stands where past select cut or mortality salvage had created openings. Natural seeding occurred in these openings and a young stand of trees became established in the understory. Overstory removal harvested the remaining larger, older overstory trees and left the understory intact and free to grow. Following overstory removal, understocked openings within these units were planted.

Approximately 1,450 acres were selectively cut during these years. The amount of clearcutting increased from previous years and approximately 670 acres were clearcut during this time. These acres were all subsequently planted and most of these plantations have been precommercially thinned.

1990s to Present

The Record of Decision for the Northwest Forest Plan was signed in April 1994. The Medford District ROD/RMP, completed in June 1995, incorporated the standards and guidelines of Northwest Forest Plan.

Under the ROD/RMP and Northwest Forest Plan, direction for timber management includes regeneration harvest, commercial thinning, density management, and selection harvest. Since implementation of the ROD/RMP, timber harvest in the sixth field watersheds containing the Project Area has included approximately 3,000 acres of harvest: 160 acres of regeneration harvest, 1,800 acres of commercial thinning, 240 acres of density management, and 800 acres of selection harvest. 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 retention, as directed by the ROD/RMP.

A windstorm in January 2008 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. Through a series of road salvage and area salvage timber sales, the BLM salvaged approximately 5,000 acres throughout the fifth field watersheds. Approximately 1,150 acres were salvaged within the three sixth field watersheds in which the Twin Ranch project is proposed; only 2 acres occur within the identified Twin Ranch Project Area.

The Camp Stew project, completed in September 2008, thinned approximately 62 acres of pine plantations within the 3 sixth field watersheds.

The landscape pattern in the Big Butte Creek fifth field watershed and the 3 sixth field watersheds containing the Project Area is largely determined by the checkerboard ownership (figure 8). Blocks of BLM-administered lands intermingle with privately owned lands. Field observation and review of aerial photographs indicates most private industrial forest 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.

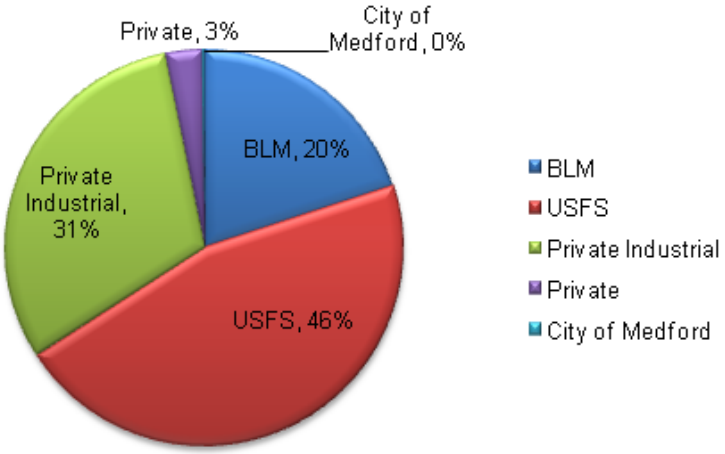


Figure 8. Land ownership within the Upper South Fork, Lower South Fork, and North Fork Big Butte Creek sixth field watersheds.

"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" (USDA and USDI 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 Twin Ranch Project Area includes portions of the Big Butte and Summit Prairie grazing allotments. Harvest activities are proposed in the Big Butte Pasture in the Big Butte grazing allotment. The BLM authorizes grazing on 22,118 acres in the Big Butte Allotment for 357 cattle from April 16 to June 30 and for 235 cattle from April 16 to May 31. Harvest activities proposed in harvest unit 17-2 (13 acres) in T35S, R3E, section 17 are located in the Fredenburg Pasture in the Summit Prairie Allotment. The BLM authorizes grazing on 3,454 acres in the Fredenburg Pasture for 13 cattle from June 1 to September 30.

Since 1997, grazing on BLM-administered lands in Oregon and Washington has been managed in accordance with the *Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington*. The Standards provide the basis for assessing and monitoring rangeland conditions and trends and the Guidelines enable the BLM to adjust grazing management to meet the Standards. The BLM completed Rangeland Health Assessments for both allotments in 2000. The assessments showed that where the Standards were not being met, grazing was not a factor. Grazing has been a past activity and is a current and anticipated future activity in this Project Area.

The largest wildfires that occurred within the Big Butte Creek fifth field watershed were the 1,236-acre Doubleday Fire in 2008, 132-acre Fredenburg Fire in 1990, 8-acre Taggart Fire in 2008, and 2-acre

Rancheria Ranch fire in 2005. From 1967 to 2006, 628 fires occurred in the fifth field watershed; the majority of the wildfires (99 percent) were less than 10 acres in size.

3.1.3.3 Future Actions

The BLM anticipates future activities in the proposed watershed would include continued forest management on private industrial forest lands. Currently there are two BLM projects under contract that are scheduled to be implemented in the next three years. The 800-acre Camp Cur Timber Sale includes approximately 760 acres located in the Project Area. The Ranch Stew Stewardship project (Ranch Stew CE and Ranch Stew II EA) has approximately 1,260 acres of thinning planned within the 3 sixth fields.

Future planned timber harvest on BLM lands within the Project Area includes 37 acres of thinning in the Vine Maple timber sale planned for 2012. This sale will continue to implement the Medford District's ROD/RMP and these 37 acres will likely be proposed for commercial thinning. The remainder of the Vine Maple timber sale is located in the adjacent South Fork Rogue River fifth field watershed.

The Forest Service began implementing the Big Butte Springs Timber Sales project in 2006. This project includes timber harvest on 6,184 acres. Approximately 5,900 acres will be harvested using ground-based logging systems and 200 acres using skyline cable systems. Reconstruction of 3.2 miles of existing road, construction of 2.0 miles of temporary roads, decommissioning of 32 miles of existing roads, and road maintenance on 20.7 miles of existing roads will occur. The Forest Service will continue to implement this project through various current and future timber sales.

Immediate suppression and control of all wildfires will continue. An agreement with Oregon Department of Forestry will continue to require control of 94 percent of all fires before they exceed 10 acres in size.

3.2 Conifer Growth and Timber Yield

This section analyzes the potential impacts from the proposed forest management activities on conifer growth and timber yield. Terms used in this section are defined as follows:

commercial thinning. The removal of trees to control stocking and encourage the growth of the remaining trees. The intent of commercial thinning is to enhance stand growth and yield.

culmination of mean annual increment. The peak of average yearly growth in volume of a forest stand (total volume divided by the age of the stand).

density management. Thinning to maintain or enhance forest health, stand structure, and function for wildlife purposes or for purposes other than growth and yield.

regeneration harvest. Final timber harvest with green legacy trees, snags, and coarse woody debris left at varying levels to meet ROD/RMP standards and guidelines.

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.

selection harvest. Stand density is reduced by harvesting trees across all diameter classes individually or in groups. Stand structure, canopy cover, and species diversity remain following treatment.

site class. A measure of an area's relative capacity for producing timber or other vegetation. Site classes range from 1 to 7 with 1 being the most productive and 7 the least productive.

stand. An aggregation of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition so that it is distinguishable from the forest in adjoining areas.

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

structurally complex stands. Forests characterized as having multiple layers; large diameter trees; high amount of canopy cover; and decadence components such as broken-topped trees, mistletoe, cavities, large snags, and fallen trees.

3.2.1 Methodology

The Medford District's 1994 PRMP/EIS determined a planned sustainable harvest level and assessed the effects of forest management on conifer growth and timber yield based on the standard and guidelines and land use allocations defined in the plan.

The PRMP/EIS used fifth field analytical watersheds for project purposes to describe existing watershed conditions (Bureau of Land Management 1994, 3-10) Consistent with the PRMP/EIS, the Big Butte Creek fifth field watershed was used as the scale for this analysis. The BLM administers 29,521 acres (18 percent) of the Big Butte Creek fifth field watershed (table 3-1).

Table 3-1. Land Ownership in the Big Butte Creek Fifth Field Watershed

Land Ownership/Jurisdiction	Acres	Percent
Bureau of Land Management	29,521	18
Forest Service	58,125	37
Industrial Forest Land	55,106	35
Private	13,985	9
City of Medford	1,426	<1
US Army Corps of Engineers	202	<1
Total	**158,365**	**100**

BLM staff conducted field visits (stand exams) in 2006 that provided stand-specific data to identify forest stands on matrix lands within the Project Area in the Big Butte Creek fifth field watershed that meet the PRMP/EIS silviculture and timber management criteria.

3.2.2 Assumptions

- The BLM Medford District administers about 860,000 acres of land. Approximately 30 percent is designated as matrix lands.
- Timber management activities will occur on BLM-administered lands allocated to planned, sustainable harvest (matrix) to maximize volume growth and timber yield. An annual timber harvest from 3,000 matrix acres is expected. The Medford District PRMP/EIS analyzed the

impacts of these timber management activities on forest health and vegetation and the effects on biological diversity, in both the short- (10 years) and long-term (decades) (Bureau of Land Management 1994, 4-22 to 4-42).

- Most private forestlands will be intensively managed with final harvest on commercial economic rotations averaging 60 years (Bureau of Land Management 1994, 4-5).

3.2.3 Affected Environment

In the Project Area, mixed-conifer, closed-canopy stands of Douglas-fir, white fir, incense cedar, sugar pine, and ponderosa pine 70 to 250 years old are present. Within these forest stands, conifer growth and timber yield is determined by environmental factors and tree age. Environmental factors that affect tree growth and yield 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 reach maturity, the rate of growth slows (figure 9). The point at which growth slows and the growth curve flattens out is called the culmination of mean annual increment. At this point, optimum volume production has been reached.

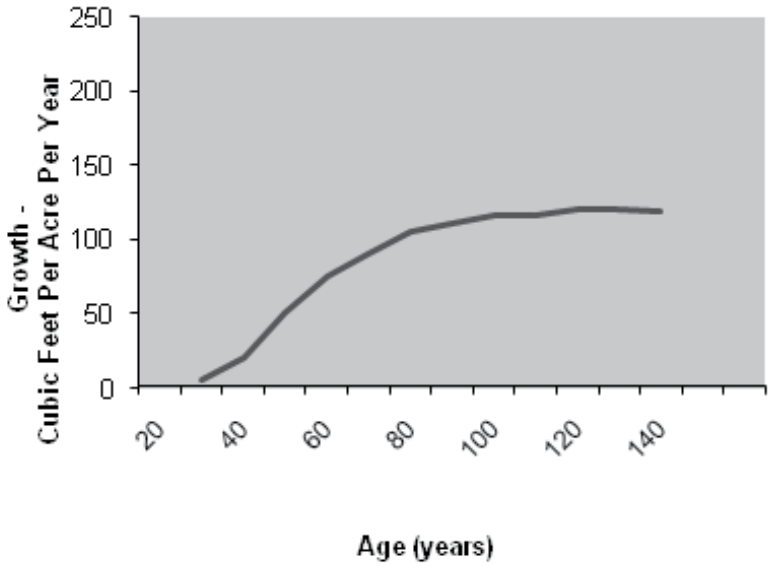


Figure 9. Predicted mean annual increment for a site class 4 Douglas-fir site, ORGANON simulation estimate (Curtis 1994).

For most sites in southwest Oregon, 100 years is the age at which the average yearly growth in volume of a forest stand has peaked (culmination of mean annual increment) (Bureau of Land Management 1994, Volume II, 101). Therefore, to provide a sustained harvest level and maximize tree growth and volume yield, regeneration harvest on matrix lands within the northern GFMA land allocation is planned at 100 years (Bureau of Land Management 1995b, 74). This harvest age also meets the ROD/RMP goals for wood quality objectives, logging economics, habitat conditions, landscape seral composition, and retention of site productivity (Bureau of Land Management 1994, Volume III, 105). Within the Big Butte Creek fifth field watershed, approximately 8,500 acres of BLM-administered lands designated as matrix are 100 years old or greater.

In northern GFMA forest stands greater than 60 years and less than 100 years old, commercial thinning or density management is scheduled where a combination of stem diameter and surplus volume permits

an economic entry (Bureau of Land Management 1995b, 185). Within the Big Butte Creek fifth field watershed, approximately 2,600 acres of BLM-administered lands designated as matrix may need thinning to reduce densities to meet the timber growth and volume objectives of the Medford District PRMP/EIS. Density management or commercial thinning from below would be the primary silvicultural treatment within these stands.

In stands 100 years or older, selection harvest may be proposed when the primary resource objective is other than growth and yield. Selection harvest reduces stand densities by thinning trees of all diameters, while maintaining stand structure, canopy cover, and species diversity.

Within the stands targeted for thinning or selection harvest, high stand densities exist. The supply of essential site resources has decreased while the demand has increased. 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.

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 (water, nutrients, and sunlight) to support. Forest stands with relative densities above 60 percent have reduced tree growth; reduced volume production; higher mortality of suppressed trees; and a higher susceptibility to insects, disease, and severe fire behavior (Perry 1994), (Hann and Wang 1990), (Curtis 1982). In forest stands proposed for treatment, the average relative density is 65 percent.

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.

3.2.4 Environmental Consequences

3.2.4.1 Effects of Alternative 1 (No-Action) on Conifer Growth and Timber Yield

This alternative would not implement the Medford District ROD/RMP management direction for general forest and riparian management areas. No timber management actions would occur.

Direct and Indirect Effects

No regeneration harvest would occur in stands 100 years or older on matrix lands in which the point of optimum net wood production has been reached. Conifer growth and timber yield would not be maximized on these sites. Forest stands that have reached the culmination of mean annual increment would remain and would not meet the sustained yield objectives of the RMP/ROD. Growth rates within these stands are less than those planned for and expected under the sustained yield objectives of the PRMP/EIS (Bureau of Land Management 1994, Volume II, 207).

In northern GFMA forest stands less than 100 years, stand densities would remain high (currently 65 percent 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 percent, the annual tree mortality rate is about double (Hann and

Wang 1990) compared to forest stands with relative densities less than 60 percent. 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).

No forest vegetation would be removed; the current pool of forest nutrients would not be affected. Except for large stand-replacement events (i.e., wildfire, catastrophic blowdown, insect epidemic) when the majority of the forest vegetation is affected, it is expected that limited changes to on-site nutrients would occur. Any decomposition of forest biomass would slowly recycle nutrients making them available for plant growth.

This alternative (No-Action) would not meet the timber management assumptions and conifer growth and timber yield projections provided for and expected in the Medford District PRMP/EIS.

Cumulative Effects

Past Actions

Since the implementation of the PRMP/EIS in 1994, approximately 5,370 acres of BLM-administered lands have been harvested within the Big Butte Creek fifth field watershed. Density reduction treatments (e.g., commercial thinning, density management, and individual tree selection) occurred on approximately 48 percent of the treatment acres, regeneration harvest on about 4 percent, and mortality salvage on the remaining 48 percent. Density management 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 harvesting has replaced stands past the point of optimum wood production with young, fast-growing conifer stands that maximize the volume growth capability of the site. Mortality salvage has removed scattered individual to large concentrations of wind-thrown or wind-damaged trees. Approximately 43 percent (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. Canopy cover declined from approximately 80-100 percent to less than 30 percent. A mix of conifer seedlings was planted to insure full site occupancy.

On BLM-administered lands, the greatest impact to nutrient recycling occurred in forest stands that had regeneration harvests and in stands that had large amounts of windthrown trees salvaged. The removal of the majority of the trees followed by slash burning reduced the amount of on-site nutrients. The loss of nutrients through timber harvest is mitigated by good site productivity (average site class 3) and long rotation lengths (minimum of 100 years). Lower intensity silviculture treatments such as density reduction (e.g., commercial thinning, density management, restoration thinning, individual tree selection and scattered mortality salvage) removes a smaller amount of vegetation and subsequently has 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) and it is not expected that the partial loss of nutrients from the stand would affect long-term site productivity.

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

On private industrial forest lands, harvest activities have ranged from partial harvests to clearcuts. Most of the 55,106 acres have been logged over the past 60 years. Within these stands, management objectives are designed to maximize volume growth per acre. Generally, private industrial forest lands are managed using even-aged silviculture systems that remove the majority of the trees on short rotations. 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. Conifer growth and timber yield rates for these lands are unknown.

Present Actions

In the Big Butte Creek fifth field watershed, the Forest Service is currently harvesting lands analyzed in the 2005 *Big Butte Springs Timber Sales Environmental Impact Statement*. The Forest Service analyzed harvest on 6,200 acres of Forest Service-administered lands using ground-based or skyline yarding systems. The Forest Service has harvested and continues to harvest timber from the timber sales that resulted from the Big Butte Springs Timber Sales EIS and Record of Decision.

The BLM's Ranch Stew stewardship contract has been awarded for restoration thinning on approximately 1,000 acres of young stands (less than 60 years old) with most of the work to be completed in 2010. The reduction in the amount of nutrients is expected to be low because only a portion of the trees and generally only the smallest trees would be removed.

On private industrial forest 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. The impact to the amount of on-site forest nutrients is unknown.

Future Actions

Three commercial timber sales, Flounce Around, Camp Cur, and Vine Maple are currently proposed by the BLM in the Big Butte Creek fifth field watershed within the three-year planning cycle. About 60 acres of the Flounce Around timber sale, 800 acres of the Camp Cur timber sale, and 37 acres of the Vine Maple timber sale are located within the fifth field watershed. The Ranch Stew and Ranch Stew II stewardship contract includes approximately 1,345 acres of restoration thinning in stands less than 60 years old within the next 5 years. In addition to these 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.

On private industrial forest lands, harvest plans are unknown. However, in stands with an average diameter of 8 inches and greater at breast height, we can reasonably expect commercial logging within the next 5 to 10 years. Industrial landowners would most likely use silviculture methods (e.g., clear-cutting and overstory removal) that create early seral stands. Post logging activities, such as conifer planting, application of herbicides to control brush and hardwoods, and precommercial thinning, would be scheduled to insure the survival, establishment, and maximum growth per acre of conifers. In stands less than 8 inches in diameter at breast height, 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 and timber yield.

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

The impacts of future actions on on-site nutrients will vary and will depend on the amount of vegetation removed. The level of on-site nutrients decreases as the amount of vegetation removed increases.

3.2.4.2 Effects of Alternative 2 on Conifer Growth and Timber Yield

This alternative implements the Medford District RMP management direction for general forest management areas and riparian reserves. Structurally complex stands on matrix lands as defined by RA32 (U.S. Fish and Wildlife Service 2008b) are reserved from management actions. RA32 stands were identified using a methodology developed by the US Fish and Wildlife Service, Medford BLM, and Rogue River-Siskiyou National Forest Service. The methodology provides a process for field units planning forest management activities to identify and document the presence or absence of forest stands meeting the RA32 characteristics (Appendix D).

Table 3-2. Proposed Silvicultural Treatments in Alternative 2

Silvicultural Treatment	Acres
Northern GFMA Regeneration	10
Shelterwood Regeneration	56
Commercial Thinning	542
Riparian Thinning	16
Total	**624**

Direct and Indirect Effects

Regeneration harvest would convert 66 acres of slow-growing stands into fast-growing early seral stands. Conifer growth and timber yield would be maximized and would meet the short- and long-term timber objectives for Matrix lands analyzed in the PRMP/EIS.

These acres meet the objective for regeneration harvest as prescribed in the ROD/RMP. The ROD/RMP (p. 9) provided for an average annual regeneration harvest of 1,040 acres across the Medford District. This equals 10,400 acres of regeneration acres for the first decade of the PRMP/EIS plan. During this 10-year period, ending in June 2005, the Medford District had completed 4,505 acres of regeneration harvests, or 43 percent of the acres planned. From 2006 to 2009, an additional 714 acres of regeneration harvest has been completed or about 17 percent of the projected average annual regeneration acres.

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 variable levels of healthy, large green trees greater than 20 inches DBH. Canopy cover would be reduced to 10 to 40 percent, depending on the level of green tree retention (table 3-3). In shelterwood harvest areas, overstory trees greater than 20 inches DBH in excess of 6 to 8 trees per acre may be

removed after 15 to 30 years if the planted understory conifer trees are no longer susceptible to damage caused by late growing-season frosts.

Table 3-3. Tree Retention Levels for Regeneration Harvest

Regeneration Harvest Type	Green Trees Per Acre Retained (greater than 20″ DBH)	Residual Canopy Cover (%)
NGFMA	6 to 8	10 to 15
Shelterwood	12 to 25	20 to 40

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

Following regeneration harvest, logging slash would be treated to minimize wildfire risk, conifer trees would be planted, and associated silviculture treatments would be applied to insure seedling survival and establishment. The growth and vigor of planted trees would be maximized because vegetative competition would be low and retained trees would have crown ratios greater than 35 percent.

Commercial thinning and riparian thinning would occur on a total of 558 acres. Stands identified for commercial and riparian thinning would have the smaller, less vigorous trees harvested. 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 density below 60 percent. Fewer trees per acre would be left in stands with larger diameter trees; more trees per acre would be left in stands with smaller diameter leave trees.

With a reduction of tree density to below 60 percent relative density, the annual mortality rate would decline by about 50 percent. 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 closure increasing approximately 10 percent every 5 years (based on ORGANON growth and yield projections) until 100 percent 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.

Whole tree harvesting of trees less than 24 inches in diameter is proposed for the majority (83 percent) of the harvest acres. Removal of vegetative biomass (tree boles, branches, and foliage) may alter the existing nutrient pool, although it is not expected to be detrimental to long-term site productivity. Whole tree harvesting removes more of the nutrients compared to harvesting the main tree bole only. About half of the above ground nutrients of a conifer tree are in the branches and needles and the other half of the nutrients are in the bole and bark. The effect on the nutrient pool depends on the amount of vegetation removed, rotation length, and productivity of the site. It is expected that regeneration harvests would have a greater loss of nutrients compared to other silviculture systems (commercial thinning, density management or selection harvest). The greatest impact of nutrient loss on site productivity occurs on low quality sites (Daniel, Helms, and Baker 1979) and in forests that are managed on short (less than 60 years) rotations (Poff 1996). Neither of these conditions exists in the Twin Ranch Project Area. The site quality is considered good (average site class 3) and the rotation length is a minimum of 100 years. Both of these factors allow for relatively rapid nutrient recovery.

Approximately 330 acres of dense, structurally complex stands as defined by RA32 (U.S. Fish and Wildlife Service 2008b) would not have planned regeneration harvest (132 acres) or commercial thinning (198 acres) implemented. Not harvesting stands planned for regeneration harvest (past the point of optimum wood production) would result in the loss of the growth capability of those stands and not meet the ROD/RMP timber growth and yield assumptions. Maximizing the volume growth capability of the site requires slow-growing trees to be harvested and young, fast-growing conifers to be planted. Thinning of dense structurally complex stands would not occur. Stands with relative densities above 60 percent have reduced tree growth; reduced volume production; higher mortality of suppressed trees; and a higher susceptibility to insects, disease, and severe fire behavior (Perry 1994; Curtis 1982; Hann and Wang 1990). The annual tree mortality rate is almost double (Hann and Wang 1990) compared to forest stands with relative densities less than 60 percent.

Not harvesting within structurally complex stands would limit the impacts to forest nutrients. Natural rates of mortality and decomposition of forest biomass would slowly recycle nutrients. Except for stand replacement events (i.e., wildfire, catastrophic blowdown, insect epidemic) limited impacts to nutrients would occur.

Permanent and temporary road construction would remove all vegetation within the road prism. The permanent roads would be converted from conifer forests to nonforested lands and would no longer contribute to future conifer growth or yield. Approximately 0.1 mile of permanent road construction would convert less than 1 acre of forested to nonforested lands. Approximately 1 mile of temporary road construction would remove all vegetation on approximately 2 acres of forested land. Following harvest activities, temporary roads would have the road bed tilled, seeded, and mulched. Removal of the compacted surface would restore site productivity and provide suitable growing conditions for planted conifers.

The stands proposed for treatment under this alternative would meet the timber management assumptions and conifer growth and timber yield projections provided for in the Medford District PRMP/EIS.

Cumulative Effects

See section 3.4.4.1, Effects of Alternative 1 (No-Action) on Conifer Growth and Timber Yield, Cumulative Effects.

Silvicultural practices would keep forest stands on desired developmental trajectories, speed the development of desired habitat components, maintain or improve stand vigor, and enhance timber yield.

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 at rates less than full site potential. Forest nutrients would remain on-site, with changes limited to periodic mortality and normal rates of decay.

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 558 acres (31 percent) of the BLM matrix lands 60 to 100 years old estimated as needing commercial thinning within the Big

Butte Creek fifth field watershed. The reduction of on-site nutrients is expected to be low because only a portion of the trees and generally only the smallest trees would be removed.

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 managed with final harvest on commercial economic rotations averaging 60 years (Bureau of Land Management 1994, Volume I, 4-5). Stands that are clearcut rather than thinned have a greater loss of forest nutrients.

3.2.4.3 Effects of Alternative 3 on Conifer Growth and Timber Yield

This alternative applies silviculture treatments that would be neutral or beneficial to spotted owl habitat. 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 is downgraded.

Table 3-4. Proposed Silviculture Treatments in Alternative 3

Silviculture Treatment	Treatment Acres
Selection Harvest - 40% canopy cover	66
Selection Harvest - 60% canopy cover	108
Density Management - 40% canopy cover	292
Density Management - 60% canopy cover	270
Riparian Thinning - 40% canopy cover	16
Total	**752**

Direct and Indirect Effects

No acres are proposed for regeneration harvest. In older (more than 100 years) dense stands, selection harvests would be used in place of regeneration harvests planned in the ROD/RMP. Selection harvests would not meet the sustained yield objectives of the PRMP/EIS (Bureau of Land Management 1994, 207). Not harvesting stands planned for regeneration harvest (past the point of optimum wood production) would result in the loss of the growth capability of those stands. Maximizing the volume growth capability of the site requires slow-growing trees to be harvested and young, fast-growing conifers to be planted. The ROD/RMP (p. 9) provided for an average annual regeneration harvest of 1,040 acres across the Medford District. This equals 10,400 acres of regeneration acres for the first decade of the ROD/RMP. During this 10-year period, ending in June 2005, the Medford District had completed 4,505 acres of regeneration harvests, or 43 percent of the acres planned. From 2006 through 2009 an additional 714 acres of regeneration harvest has been completed or about 17 percent of the projected average annual regeneration acres for those 3 years. This alternative continues to add to the regeneration harvest deficit and affects the ROD/RMP growth and yield projections by not implementing the planned and expected level of treatment on matrix acres.

Selection harvest, density management, and riparian thinning, would occur on a total of 752 acres. Stands identified for density management and riparian 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 towards levels that 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 percent. With a reduction of tree density to below 60 percent relative density, the annual mortality rate would be expected to decline by about

50 percent. 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. These silviculture treatments would result in increased growth rates and increased volume yields.

Approximately 201 acres of dense, structurally complex stands as defined by RA32 (U.S. Fish and Wildlife Service 2008b) would be treated to increase the vigor and resiliency of these stands to environmental extremes and disturbances. The silviculture systems applied would either be selection harvest or density management. The stands proposed for treatment have an average relative density of 81 percent. Reducing stand relative density below 60 percent would increase tree vigor, reduce tree mortality, and increase stand resiliency. Stands with relative densities above 60 percent have reduced tree growth; reduced volume production; higher mortality of suppressed trees; and a higher susceptibility to insects, disease, and severe fire behavior (Perry 1994; Hann and Wang 1990; Curtis 1982). The annual tree mortality rate is almost double (Hann and Wang 1990) compared to forest stands with relative densities less than 60 percent. Structurally complex stand characteristics, such as large trees, multiple canopy layers, snags, coarse woody debris, and canopy cover 60 percent or greater, would be retained.

Conventional harvesting rather than whole tree harvesting of trees would occur within all treatment areas. Harvesting only the bole removes fewer nutrients by leaving the branches and foliage well distributed throughout the stand. The impacts of harvesting on forest nutrients are further mitigated by the site quality (average site class 3) and the longer rotation length (100 years) of BLM-administered lands. In general, rotation lengths greater than 60 to 80 years should not export nutrients faster than they accrue (Powers, et al. 1990).

Permanent road construction would remove all vegetation within the road prism. The permanent roads would be converted from conifer forests to nonforested lands and would no longer contribute to future conifer growth or yield. Approximately 0.1 mile of permanent road construction would convert less than 1 acre of forested to nonforested lands.

In the absence of regeneration harvest in stands that have reached culmination of mean annual increment this alternative would meet some (commercial and riparian thinning) 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 3.4.5.1, Effects of Alternative 1 (No-Action) on Conifer Growth and Timber Yield, Cumulative Effects.

In forest stands 100 years old or greater, optimum net wood production has been reached. This alternative replaces regeneration harvests with individual tree selection. The selection harvests would not convert these slow-growing stands into fast-growing early seral stands. Conifer growth and timber yield would not be maximized and would not meet the timber objectives in the PRMP/EIS. This alternative would treat 174 acres or approximately 2 percent of the BLM matrix land 100 years old or greater within the Big Butte Creek fifth field watershed. In selectively harvest stands, the impacts to site nutrients would be less than if the stand was regeneration harvested. Selection harvests retain 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 578 acres or approximately 33 percent of the BLM matrix land 60 to 100 years old estimated as needing commercial thinning within the Big Butte Creek fifth field watershed. The reduction in the amount of nutrients is expected to be low because only a portion of the trees and generally only the smallest trees would be removed.

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 forest lands would be intensively managed with final harvest on commercial economic rotations averaging 60 years (Bureau of Land Management 1994, Volume I, 4-5). Stands that are clearcut rather than thinned have a greater loss of forest nutrients compared to thinned or selectively cut stands.

3.2.4.4 Effects of Alternative 4 on Conifer Growth and Timber Yield

No regeneration harvests are proposed. Commercial thinning and individual tree selection are planned to reduce stand densities. Structurally complex stands as defined by RA32 (U.S. Fish and Wildlife Service 2008b) are reserved from management actions.

Table 3-5. Proposed Silviculture Treatments in Alternative 4

Silviculture Treatment	Treatment Acres
Selection Harvest	66
Commercial Thinning	542
Riparian Thinning	16
Total	**624**

Direct and Indirect Effects

Selection harvest, commercial thinning, and riparian thinning, would occur on a total of 624 acres. In stands selectively harvested, low vigor trees across all diameter sizes would be removed. Stands identified for commercial and riparian thinning would have the smaller, less vigorous trees harvested. These silviculture treatments 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 relative density below 60 percent. With a reduction of tree density to below 60 percent relative density, the annual mortality rate would be expected to decline by about 50 percent. 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 utilize moisture, nutrients, and additional growing space. These silviculture treatments would result in increased growth rates and increased volume yields.

On about 66 acres of forest stands that meet the ROD/RMP regeneration harvest criteria, selection harvest is proposed. Selection harvest removes only a portion of the understory and overstory trees, leaving a forest stand that is still at the culmination of mean annual increment. Selection harvests would not meet the sustained yield objectives of the PRMP/EIS (Bureau of Land Management 1994, Volume II, 207). Not regenerating stands that are past the point of optimum wood production would result in the loss of the growth capability of those stands.

Whole tree harvesting of trees less than 24 inches in diameter is proposed for the majority (83 percent) of the harvest acres. Removal of vegetative biomass (tree boles, branches, and foliage) would alter the existing nutrient pool. The impact of nutrient loss from logging is expected to be minimal. Long rotations and good site quality in the Project Area allow for relatively rapid nutrient recovery. In general, rotation lengths greater than 60 to 80 years should not export nutrients faster than they accrue (Powers, et al. 1990). Effects of slash removal on nutrient budgets are short term with sites recovering preharvest nutrients levels within approximately 5 years (Hacker 2005).

Approximately 330 acres of dense, structurally complex stands as defined by RA32 (U.S. Fish and Wildlife Service 2008b) would not receive planned regeneration harvest (132 acres) or commercial thinning (198 acres). Not harvesting stands planned for regeneration harvest (pass the point of optimum wood production) would result in the loss of the growth capability of those stands. Maximizing the volume growth capability of the site requires slow-growing trees to be harvested and young, fast-growing conifers to be planted. Thinning of dense, structurally complex stands would not occur. Stands with relative densities above 60 percent have reduced tree growth; reduced volume production; higher mortality of suppressed trees; and a higher susceptibility to insects, disease, and severe fire behavior (Perry 1994; Hann and Wang 1990; Curtis 1982). The annual tree mortality rate is almost double (Hann and Wang 1990) compared to forest stands with relative densities less than 60 percent. Not harvesting within structurally complex stands would limit the impacts to site nutrients. Natural rates of mortality and decomposition of forest biomass would slowly recycle nutrients. Except for stand replacement events (i.e., wildfire, catastrophic blowdown, and insect epidemic) these stands would have minimal loss of nutrients.

Permanent and temporary road construction would remove all vegetation within the road prism. The permanent roads would be converted from conifer forests to nonforested lands and would no longer contribute to future conifer growth or yield. Approximately 0.1 mile of permanent road construction would convert less than 1 acre of forested to nonforested lands. Approximately 1 mile of temporary road construction would remove all vegetation on approximately 2 acres of forested land. Following harvest activities, temporary roads would have the road bed tilled, seeded and mulched. Removal of the compacted surface would restore site productivity and provide suitable growing conditions for planted conifers.

This alternative would meet most (commercial and riparian thinning) but not all of the timber management assumptions and conifer growth and timber yield projections provided for in the Medford District PRMP/EIS. The selection harvests would not convert slow-growing stands into fast-growing early seral stands. Conifer growth and timber yield would not be maximized and would not meet the timber objectives in the PRMP/EIS.

Cumulative Effects

See section 3.4.5.1, Effects of Alternative 1 (No-Action) on Conifer Growth and Timber Yield, Cumulative Effects.

In forest stands 100 years old or greater, optimum net wood production has been reached. This alternative replaces regeneration harvests with selection harvest. By changing the silviculture system, conifer growth and timber yield would not be maximized and would not meet the timber objectives in the PRMP/EIS on 66 acres of matrix lands. This affects less than 1 percent of the BLM matrix land 100 years old or greater within the Big Butte Creek fifth field watershed.

The impacts to forest nutrients would be less with selection harvests than with regeneration harvests because a smaller amount of vegetation is removed.

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 558 acres or approximately 33 percent of the BLM matrix land 60 to 100 years old estimated as needing commercial thinning within the Big Butte Creek fifth field watershed. The reduction in the amount of nutrients is expected to be low because only a portion of the trees and generally only the smallest trees would be removed.

On private industrial 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 industrial forest lands would be intensively managed with final harvest on commercial economic rotations averaging 60 years (Bureau of Land Management 1994, Volume I, 4-5). The amount of on-site nutrients would decrease from logging and short rotations; the long-term impacts on site productivity are expected to decrease.

3.3 Soil

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

colluvium. Rock and soil that accumulates at the foot of a slope from gravitational forces.

decommissioning. Ripping the compacted soil of roads and landings to a depth of 18 inches with a winged-tooth ripper, excavating and removing culverts if needed, waterbarring, seeding with native grasses, mulching with native straw, and blocking with a barricade.

residuum. Material resulting from the disintegration, decomposition, and weathering of bedrock in place.

soil bulk density. The mass (weight) of dry mineral soil per unit volume, usually expressed as grams/cubic centimeter.

3.3.1 Methodology

The project soil scientist used the following sources for this analysis:

- Field reviews on each unit conducted in winter 2010 to assess current soil conditions and determine pertinent soil issues relative to the proposed project.
- GIS (geographical information system) to calculate watershed and soil unit acreages in the Project Area.
- *Soil Survey of Jackson County Area, Oregon* (National Resource Conservation Service 1993) to characterize the soils in the Project Area.

- Medford District ROD/RMP (1995b) to identify and define soil resource objectives.
- *Central Big Butte Creek Watershed Analysis* (Bureau of Land Management 1995a) to help describe current and past conditions of the landscape in the watershed.
- 2005 aerial photographs to determine acres of soil compaction on private industrial forest lands.
- BLM operations inventory data and 2005 aerial photographs to calculate acres of soil compaction on BLM-administered lands.
- The Soil analysis area includes five analytical areas made up of seventh field drainages in the Upper South Fork Big Butte Creek, Lower South Fork Big Butte Creek, and North Fork Big Butte Creek sixth field watersheds. Cumulative effects for soils were analyzed at the Big Butte Creek fifth field watershed scale.

3.3.2 Assumptions

- All proposed PDFs will be implemented in order to meet resource objectives.
- Private industrial forest lands will continue to be managed for timber harvest as they have in the past.

3.3.3 Affected Environment

Key points in the Project Area:

- The high road density (5.3 miles per square mile) and skid trail density is due to the gently sloping terrain that allows roads and skid trails to be built without topographic restraints. This has resulted in greater amounts of soil compaction than on lands with more topographical constraints such as steeper slopes, deeply incised stream channels, and instable soils. Soil compaction (increase in soil bulk density) adversely affects tree growth (Wert and Thomas 1981) by reducing soil pore size and continuity. For the soil types in the Project Area, this results in slower infiltration rates, increased runoff rates, lower water supplying capacity of the soil, and reduced exchange of carbon dioxide and oxygen within the soil profile. These factors have reduced soil productivity in the Project Area.
- In 2008, the Butte Falls Resource Area conducted a soil compaction analysis that included several of the treatment units in the Project Area (Parker 2007). The objective was to measure and compare soil bulk density between undisturbed sites, highly disturbed sites (main skid trails), and moderately disturbed sites (secondary skid trails).
- A summary of the data shows that the average soil bulk density (compaction) increased as skid trail use increased. There was a 32 percent increase in soil bulk density in the heavily used main skid trails when compared to undisturbed sites. There was a 24 percent increase in soil bulk density in the moderately used secondary skid trails when compared to undisturbed sites.
- The data also showed that natural recovery of compaction did occur on some secondary skid trails in the upper 6 inches over the last 10 to 15 years. This was observed on sites where shrubs and forbs were growing in and around the secondary skid trails. This most likely indicates that the plant roots loosened some of the compacted soil surface layer and that the degree of compaction in the secondary skid trails was more variable than in the main skid trails. However, the higher soil bulk density of the secondary skid trails at the 6 to 12 inch depths still remained. The main skid trail data indicated no natural recovery in soil bulk density at any depth in the

last 10 to 15 years. Review of the data confirms similar findings that length of time to recover from compaction varies with soil types and the degree of compaction. Effects of compaction have been reported to persist unchanged for 16, 18, 32, and 50 years (Froehlich 1979; Hatchell, Ralston, and Foil 1970; McColl and Powers 1984; Wert and Thomas 1981).

- In conclusion, the BLM expects that residual soil compaction from tractor skid trails and landings in the Project Area will have a long-term adverse effect (greater than 10 years) on soil productivity.
- Flat to gently sloping terrain in the Project Area acts to moderate runoff velocity, erosion rates, and subsequent sedimentation potential.
- Past tractor logging in all treatment units employed designated skid trails with approximately 150-foot spacing which currently meets the Medford District ROD/RMP long-term soil productivity standard of 12 percent or less areal extent of soil disturbance from mechanical equipment.
- The CWD (coarse woody debris) standard of the Medford District ROD/RMP (p.45) is currently being met on all treatment units.

3.3.3.1 Soil Types

The two dominant soil types within the Project Area are the Geppert and Freezner soil series. They are found in the project units as individual soil units as well as soil complexes where the two soils are so intermingled on the landscape they cannot be separately delineated at this scale (Order 4 Soil Survey). These soils are considered to be relatively stable with respect to surface erosion and landslide potential (Bureau of Land Management 1995a).

The Geppert soil is moderately deep (20 to 40 inches) to weathered volcanic rocks and is skeletal (greater than 35 percent rock fragments in the subsoil). The subsoil consists of an extremely cobbly clay loam which can make possible tillage operations difficult. This soil has formed in colluvium from andesitic rocks and is typically found on valley sideslopes.

The Freezner soil is very deep (60 inches or more) and has formed in colluvium and residuum from andesitic rocks. This soil type is well drained and has a clay loam subsoil. Freezner soil is normally found on the tops of plateaus and gentle, sloping hillsides.

Clay content (greater than 25 percent) in the subsoil allows ground-based equipment to readily compact Geppert and Freezner soils.

There are no fragile soil types within the Project Area, as identified in the Medford District ROD/RMP.

3.3.3.2 Topography of the Project Area

The Project Area is located on a large plateau with relatively flat topography. All proposed treatment units are on flat terrain with slopes ranging from 0 to 30 percent with the average slopes closer to 4 or 6 percent.

The gently sloping terrain in the Project Area has resulted in an extensive network of skid trails, roads, and landings which has compacted soils (Bureau of Land Management 1995a).

3.3.3.3 Soil Erosion in the Project Area

Although the flat terrain in the Project Area is conducive to increased tractor yarding and road building, the gentle topography also serves to moderate runoff and subsequent sedimentation of streams. Runoff velocities are much lower in this Project Area when compared to more mountainous watersheds that are more dissected with higher gradient streams and roads. Lower stream and runoff velocity reduces the erosive potential of stream and overland flow. This is reflected in the lack of visible channel scour in the local streams and the low amount of observed rill or gully erosion from existing roads and skid trails in the Project Area.

Road construction on flatter ground is also less invasive on the landscape because there is less cut and fill excavation required during construction. This results in less soil disturbance and narrower road prisms which greatly reduces the amount of exposed soil subject to erosion when compared to hillside construction. Although, it was observed that some of the roads in the Project Area could benefit from road renovation such as increasing surface rock and grading to improve drainage.

Another cause of soil erosion observed in the Project Area, but to a much lesser extent, is cattle grazing. This is typically found around springs and streams where cattle tend to congregate. The wet soil in and around these areas are susceptible to trampling that can destabilize streambanks and alter flows from springs. These impacts tend to be small in size and scattered throughout the Project Area. A scheduled project in 2010 will fence off a large wet meadow in T35S, R3E, section 11. This will prevent cattle and vehicle damage and help restore water flow in and around the meadow.

3.3.3.4 Soil Compaction-Soil Productivity in the Project Area

Currently, the amount of existing compaction in all treatment units meets the Medford District ROD/RMP standard of less than 12 percent areal extent of disturbance from mechanical equipment. The Medford District ROD/RMP (p. 166) states that assessment of soil compaction and subsequent losses in soil productivity will be made on a unit-by-unit basis on BLM-administered lands.

Soil compaction across the Project Area varies by land ownership and when the compaction occurred. Timber harvest on private industrial forest lands has rarely employed designated skid trails or ripping of compacted soil when tractor logging. Prior to 1983, the BLM did not use designated skid trails to reduce the areal extent of soil disturbance from tractor logging and did not require ripping of compacted soil. These factors have contributed to higher than average soil compaction levels in this Project Area. Since 1983, tractor logging on BLM-administered lands has used designated skid trails spaced an average of 150 feet and ripped skid trails where practical, which has reduced compaction and improved soil productivity.

Soil displacement by mechanical equipment is also a concern relating to soil productivity. Soil surface displacement by ground-based equipment can remove or alter the nutrient-rich top soil. Like soil compaction, limiting the areal extent of soil displacement to designated skid trails is effective at reducing soil displacement and maintaining current long-term soil productivity.

For purposes of defining the affected environment and analyzing the effects of the proposed project for water resources, we combined seventh field drainages in the Project Area to form five analytical areas of various sizes (figure 10). The five analytical areas are composed of hydrologic units that were delineated using drainage boundaries.

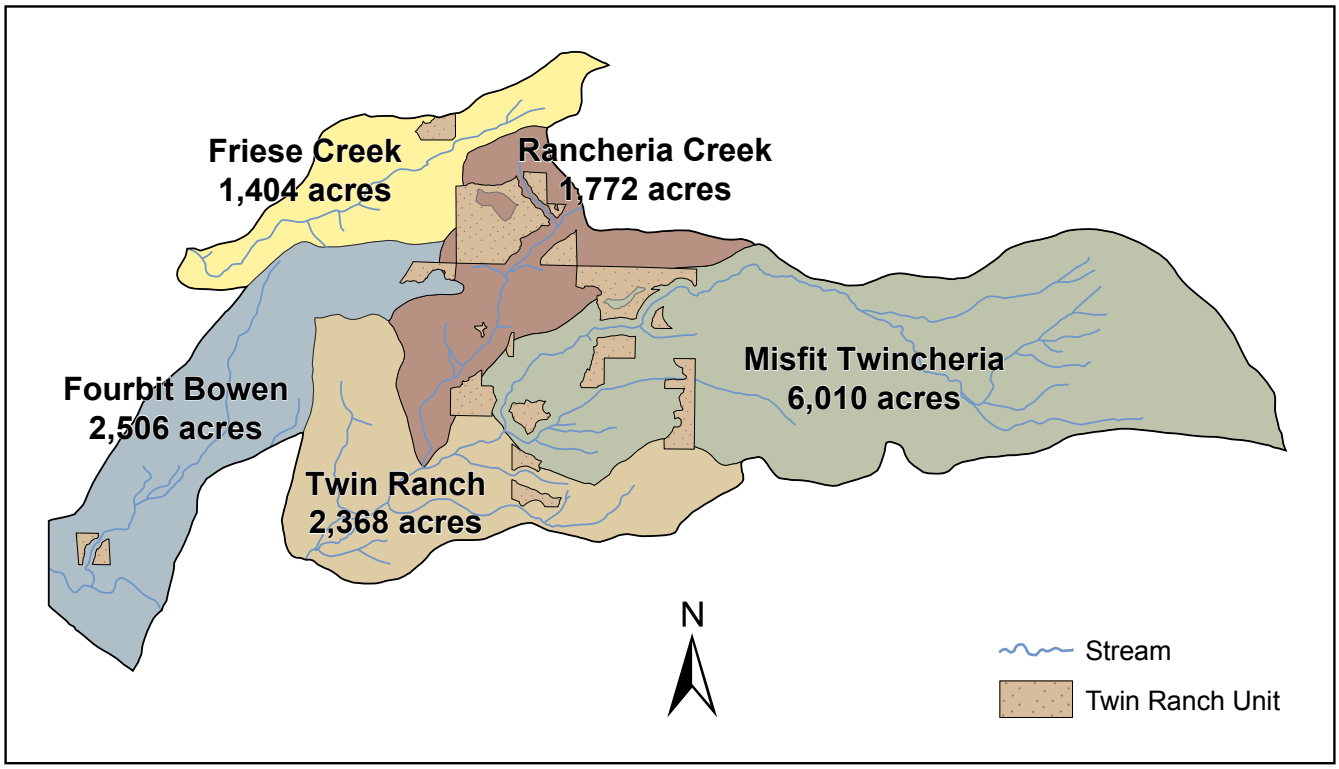


Figure 10. Analytical areas for Soil Resources analysis.

The following assumptions were used to estimate existing soil compaction (table 3-6):

- Designated skid trails spaced approximately 150 feet apart result in compaction of 12 percent or less on a unit-by-unit basis (Bureau of Land Management 1995b, 166).
- Roads are assumed to be permanently compacted at a width of 7 feet for jeep roads and 12 feet for natural or unknown surfaced roads (R. Bryan, personal communication).
- 25 percent of the tractor yarded acres are compacted for all areas tractor yarded prior to 1980 on BLM-administered lands (Swanston and Dyrness 1973; Adams and Froehlich 1981).
- 12 percent of the tractor yarded acres are compacted for all areas tractor yarded after 1980 on BLM-administered lands (Bureau of Land Management 1994, 3-9).
- 4 percent of the cable yarded acres are compacted (Dyrness 1967).
- 25 percent of the harvest acreage would be compacted for tractor logging on private industrial forest lands.

3.3.4 Environmental Consequences

3.3.4.1 Effects of Alternative 1 (No-Action) on Soil

Direct and Indirect Effects

Under the No-Action Alternative, no timber harvest would occur, no temporary spur roads or landings would be constructed, and no logging slash would be treated. This would result in no direct effect to the soil resource.

Road-related erosion and subsequent sedimentation in local stream channels would not be reduced because the following road work would not be completed (as proposed in the action alternatives): 20.3

Table 3-6. Existing Soil Compaction in the Twin Ranch Project Area across All Ownerships

Analytical Area	Total Acres	Acres Harvested		Compacted Road Acres	Acres Decompacted (ripped)	Total Compacted Area	
		Tractor	Cable/ Skyline			Acres[1]	Percent
Friese Creek	1,404	251	0	6.0	-69	188.0	13.4
Misfit Twincheria[2]	6,010	331	0	51.0	0	382.0	6.4
Rancheria Creek	1,772	323	0	19.0	0	342.0	19.3
Twin Ranch	2,368	436	1.0	26.0	0	463.0	19.5
Fourbit Bowen	2,506	720	0.4	38.0	0	758.4	22.7
Totals	**14,060**	**2,061**	**1.4**	**140.0**	**-69**	**2,133.4**	**15.2**

[1]Some of the acres included in this table were compacted 40 to 50 years ago. It is expected that compaction in the secondary skid trails that were harvested by tractors and cable yarders have had some level of natural recovery from roots of the surrounding vegetative regrowth. There is currently no site-specific data to quantify this effect. Permanent roads and mainline skid trails are not expected to recover without tillage.

[2]Several smaller seventh field watersheds with similarities in soil impacts, soil types, and topography were combined to make the Misfit Twincheria analytical area: unnamed Twincheria Creek tributary seventh field (1,490 acres), Middle Twincheria Creek above unnamed tributary seventh field (1,438 acres), Misfit Creek above Rancheria Creek confluence seventh field (2,259 acres), and Upper Twincheria Creek above Misfit Creek confluence seventh field watershed (820 acres).

miles of road renovation, 3.5 miles of road surfacing, 0.1 mile of road realignment, replacement of 4 damaged culverts, and installation of 5 new culverts,.

Cumulative Effects

Past actions in the Project Area include timber harvest, road and landing construction, and cattle grazing on both private and BLM-administered lands.

Under the No-Action Alternative, there would be no increase in soil compaction and no loss in soil productivity in the Project Area.

There would also be no reduction in soil compaction and improvement of soil productivity from the decommissioning of 0.7 mile (approximately 3 acres) of natural surface road (BLM road 34-3E-35) proposed under the action alternatives.

Timber harvest activities (i.e., road construction and tractor logging) are expected to continue on private industrial forest lands in the Project Area within the next 5 years. It is expected that these activities would contribute to road density and soil compaction in the Project Area. Future BLM projects in the Project Area will continue to assess soil productivity on a unit-specific basis in accord with Medford District ROD/RMP objectives.

3.3.4.2 Effects of Alternative 2 on Soil

Direct and Indirect Effects

Soil Erosion in the Project Area

The Medford District ROD/RMP (p. 44) acknowledges ground-disturbing activities associated with tractor yarding, temporary spur road and landing construction, road realignment, and road renovation exposes soil that can be subject to accelerated erosion. It also states that best management practices are expected to avoid or minimize impacts to soils.

Under Alternative 2, soil erosion from tractor yarding (624 acres) would be avoided or minimized for the following reasons:

- Flat to gently sloping topography (slopes average 6 to 8 percent) in the treatment units reduces overland flow potential from skid trails.
- Water barring skid trails (PDF 45) disperses channelized flow and reduces subsequent rill and gully erosion.
- Restricting ground-based equipment to designated skid trails (PDF 50) reduces the amount of exposed soil subject to erosion.
- Seasonally restricting ground-based equipment to dry soil conditions (PDF 48) reduces the potential for sediment laden runoff from saturated soils.
- The management practices and mitigation previously employed on BLM-administered lands in the Project Area for the same type of proposed actions have been effective at avoiding or minimizing soil erosion in the Project Area.

Under Alternative 2, soil erosion from temporary spur road and new landing construction is expected to be avoided or minimized for the following reasons:

- Temporary spur roads and newly constructed landings would be ripped, grass seeded, mulched, and blocked after use (PDFs 22, 27, and 51). Ripping would improve infiltration and reduce runoff, mulching would protect the soil surface from raindrop detachment, and grass seeding would provide long-term surface protection and promote organic development in the soil. Blocking would help prevent soil damage from unauthorized vehicle use.
- Seasonal restrictions during all road construction activities (PDFs 24 and 25) would reduce the potential for runoff and erosion from intensive winter storms and saturated soil conditions.
- Flat to gently sloping topography (slopes generally less than 30 percent) in the treatment units reduces overland flow potential from roads and skid trails.
- Approximately half of the proposed temporary spur roads would be located on existing skid trails used in previous entries. Since this is relatively flat ground, construction would require very little soil excavation for most temporary spur roads.

Under Alternative 2, road renovation, installation and replacement of culverts, realignment of eroding roadway, and road resurfacing would reduce road-related erosion from the portion of the roads where these actions are proposed. Initially, there could be a minor increase in erosion during the first year from these ground-disturbing activities until the road running surface stabilizes with increased compaction from traffic use and vegetation becomes reestablished on the cutbanks and fillslopes. The amount of erosion that could occur is mostly dependent on rainfall intensity and timing during the first year after completion. Although there is the possibility of a slight increase in soil erosion initially, the proposed road work would be effective at reducing road-related erosion for at least the following 2 to 5 years. Road renovation involves cleaning sediment from culvert catchments and ditch lines, grading the running surface to reestablish drainage design of the road, and applying aggregate to portions of inadequately surfaced haul roads. This reduces the potential for erosion and road-related sediment to be transported to local stream channels. Improving culvert spacing and replacing damaged culverts would improve roadway drainage and reduce the potential for erosive channelized flow from roads. Realignment of an actively eroding road (BLM road 35-3E-8.1) would reduce sedimentation in an

adjacent stream channel. Road resurfacing would protect the road running surface from erosion and prevent damage to the road subgrade during log hauling.

In summary, all soil erosion from the actions proposed in this alternative is expected to be avoided or minimized in the first year after completion and road-related erosion is expected to decline in the next two to five years on those portions of roads proposed for renovation.

Soil Compaction-Soil Productivity in the Project Area

Restricting mechanical equipment to existing and designated skid trails (PDF 50) would maintain the current level of soil compaction in all treatment units (624 acres), which currently meets the Medford District ROD/RMP (p. 166) objective for long-term soil productivity on a unit-by-unit basis. New skid trail construction would slightly increase soil compaction in the commercial thinning units (454 acres) and ripping the skid trails in the regeneration and shelterwood units (66 acres) would slightly reduce soil compaction. All units would meet soil productivity objectives by continuing to maintain an average of 150-foot spacing on the skid trails.

Decommissioning all temporary spur roads and newly constructed landings would loosen compacted soil and improve infiltration, reduce runoff, increase soil porosity, and accelerate reestablishment of vegetation. A study evaluating the effectiveness of decompacting soil with winged-tooth rippers (Froehlich and Andrus 1983) showed that 85 percent of the compacted soil profile is ameliorated with one pass. Therefore, the estimated amount of loss in soil productivity within the area of disturbance from constructing and subsequently ripping the temporary spur roads would be approximately 15 percent initially. Although an improvement in soil physical properties is initially achieved when ripping compacted soil with a winged tooth ripper, it may take longer than 10 years for recovery of the remaining 15 percent of soil productivity loss on the roads and landings proposed for decommissioning (T. Hass, personal communication). Recovery is delayed because the organic surface layer is removed during the construction of roads and landings. Without this organic layer available for the living organisms in the soil, the biological processes responsible for decomposition of organic matter and mineralization of nitrogen in the soil profile are slowed until soil organic matter levels return to near predisturbance conditions. Placing logging slash and applying grass seed and straw mulch on the decommissioned roads would help increase organic matter accumulation, improve nutrient availability, protect the soil surface from erosion, and expedite restoration of soil productivity.

Whole-tree harvesting of trees less than 24 inches in diameter is proposed for the majority (83 percent) of the harvest acres. Removing the vegetative biomass (tree boles, branches, and foliage) may alter the existing nutrient pool, although it is not expected to be detrimental to long-term site productivity. Whole-tree harvesting removes more nutrients compared to harvesting the main tree bole only. About half the above-ground nutrients of a conifer tree are in the branches and needles; the other half are in the bole and bark up until the stand canopy closes. The effect on the nutrient pool is dependent on the amount of vegetation removed, rotation length, and site productivity.

It is expected that regeneration harvest would result in a greater loss of nutrients compared to other silviculture systems (e.g., commercial thinning, density management, or selection harvest). The greatest impact of nutrient loss on site productivity occurs on low quality sites (Daniel, Helms, and Baker 1979) and in forests that are managed on short (less than 60 years) rotations (Poff 1996). Neither of these conditions exists in the Twin Ranch Project Area. The site quality is considered good (average site class 3) and the rotation length is a minimum of 100 years. Both of these factors allow for relatively rapid

nutrient recovery. The effects of slash removal on nutrient budgets are short term with sites recovering to preharvest nutrient levels within approximately five years (Hacker 2005).

Coarse woody debris (CWD), which also plays an important role in long-term soil productivity, would remain at current levels and would be in compliance with the Medford District ROD/RMP (p. 45) CWD standard (PDF 43).

Cumulative Effects

Soil Erosion in the Project Area

All ground-disturbing actions proposed in Alternative 2 can expose soil that is subject to erosion. However, based on field observations, there is currently little evidence of soil erosion from similar timber harvest activities in the Project Area. This is primarily due to the relatively flat topographic features and stable soil types found in the Project Area. The majority of erosion observed in the Project Area is road related. Road-related erosion was observed to be due to the lack of road surfacing, drainage issues resulting from inadequate culvert spacing and malfunctioning culverts, and the need to grade and reshape the road running surface. Road-related sedimentation in the Project Area would be improved through road renovation, installation of new culverts and replacement of malfunctioning culverts, realignment of eroding roadway, road decommissioning, and road resurfacing. When combined with the PDFs for soil erosion from timber harvest activities and under normal local rainfall scenarios, soil erosion in the Project Area is expected to remain static in the first year after completion and to decline in the next several years with the implementation of this alternative. In the future, it is expected that timber harvest activity would continue on private and BLM-administered lands in the Project Area. It is also expected that BLM would continue to use management practices designed to reduce and limit soil erosion on future projects.

Soil Compaction-Soil Productivity in the Project Area

Unmitigated soil compaction from new skid trail construction would contribute to existing soil compaction in the Project Area. However, ripping the skid trails in regeneration harvest units (66 acres) would reduce existing soil compaction in the Project Area. The amount of new skid trail construction needed in some units is not specifically known; however, it is expected that any increase in soil compaction across the Project Area would be slight or reduced because existing skid trails would be used, new skid trails would be well-spaced (average 150 feet), and skid trails on 66 acres would be ripped. Therefore, soil compaction in all units would still meet the Medford District ROD/RMP (p. 166) long-term soil productivity objectives with the implementation of designated and existing skid trails (PDFs 42 and 43).

3.3.4.3 Effects of Alternative 3 on Soil

Under Alternative 3, density management, selection harvest, and riparian thinning are proposed on a total of 752 acres. The differences between Alternative 3 and Alternative 2 that could affect the soil resource are (table 2-1, Comparison of the Action Alternatives):

- 752 acres of tractor yarding in Alternative 3 (624 acres in Alternative 2).
- No biomass removal in Alternative 3 (517 acres of biomass removal in Alternative 2). This would result in 578 acres of lop and scatter and 173 acres of hand pile and burn for slash

treatment in Alternative 3 versus 76 acres of lop and scatter and 32 acres of hand pile and burn in Alternative 2.

- No ripping of the skid trails in Alternative 3 (ripping of skid trails in regeneration units in Alternative 2).
- 0.2 mile of temporary spur road construction in Alternative 3 (1.1 mile in Alternative 2).
- 26.3 miles of road renovation in Alternative 3 (24.6 miles in Alternative 2).

Direct and Indirect Effects

Soil Erosion in the Project Area

Under Alternative 3, an additional 1.7 miles of road renovation would reduce road-related erosion on the portions of roads proposed for these actions.

Soil Compaction–Soil Productivity in the Project Area

The effect of an additional 128 acres in tractor yarding under Alternative 3 would also meet soil long-term productivity objectives. Using existing and well-spaced (150 foot) skid trails would limit soil compaction and displacement on the additional 140 acres proposed for tractor yarding.

No biomass removal is proposed under Alternative 3. This would ensure no possible short-term reduction in soil productivity.

The effect of not ripping skid trails in regeneration and selection harvest units (66 acres) would not improve long-term soil productivity in those units.

Construction of 0.2 mile of temporary spur roads under this alternative would have no measurable effect on the soil resource. There would be minimal short-term loss in soil productivity from constructing and ripping the temporary spur roads as compared with Alternative 2.

Cumulative Effects

Soil Erosion in the Project Area

Same as Direct and Indirect effects.

Soil Compaction-Soil Productivity in the Project Area

There would be no short-term (one to five years) loss in soil productivity associated with temporary spur road construction and biomass removal in the Project Area.

An additional 128 acres of tractor yarding would slightly increase the extent of compaction and slightly reduce soil productivity in the Project Area because new designated skid trails would be needed in some units and no skid trails would be ripped. Medford District ROD/RMP long-term soil productivity objectives would still be met.

3.3.4.4 Effects of Alternative 4 on Soil

Under Alternative 4, commercial thinning (556 acres) and selection harvest (65 acres) are proposed. Skid trails are typically not ripped in commercial thinning or selection harvest units in order to protect the roots of the residual trees. As a result, no skid trails would be ripped in Alternative 4. This would result in a slight overall increase in compaction and a slight reduction in soil productivity on all harvest units. Although no skid trail ripping would occur under this alternative, the Medford District ROD/RMP long-term soil objectives would be met with the use of designated skid trails.

There are no other differences between Alternative 2 and 4 that would have a measurable effect on the soil resource.

3.4 Water Resources

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

ephemeral. Stream that flows only in direct response to precipitation, and whose channel is at all times above the water table.

colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

3.4.1 Methodology

The project hydrologist used the following sources for analysis:

- Field visits to proposed harvest units and associated roads in 2010 to determine current watershed conditions and to identify issues related to water resources.
- *Central Big Butte Creek Watershed Analysis* (Bureau of Land Management 1995a) for general water resources background information for the Project Area.
- GIS to analyze the existing condition of the Project Area.
- 2005 aerial photographs to estimate conditions on private land.
- 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 adjacent Forest Service and nonfederal land stream types.
- The Water Resources analysis area includes five analytical areas made up of seventh field drainages in the Upper South Fork Big Butte Creek, Lower South Fork Big Butte Creek, and North Fork Big Butte Creek sixth field watersheds. Cumulative effects for water resources were analyzed at the Big Butte Creek fifth field watershed scale.

3.4.2 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 private industrial forest lands (Bureau of Land Management 1994, 4-5).
- Historic canopy cover is approximately 40 percent for forested lands in the Southern Cascades ecoregion (Watershed Professionals Network 2001, A-83).
- All proposed PDFs will be properly implemented in order to meet resource objectives.

3.4.3 Affected Environment

3.4.3.1 Introduction

The Twin Ranch Project Area lies within the Big Butte Creek fifth field watershed (158,134 acres/247.2 square miles). The Big Butte Creek fifth field watershed is one of 7 fifth field watersheds within the Upper Rogue fourth field subbasin. The land in the Project Area drains into North Fork Big Butte Creek and South Fork Big Butte Creek. The Twin Ranch Project Area contains 50.6 square miles within the 247.2-square mile Big Butte Creek fifth field watershed. The majority of proposed harvest units are within the Upper South Fork Big Butte Creek sixth field subwatershed. One proposed unit is within the North Fork Big Butte Creek sixth field and one proposed unit is within the Lower South Fork Big Butte Creek sixth field subwatershed.

For purposes of defining the affected environment and analyzing the effects of the proposed project for water resources, we combined seventh field drainages in the Project Area to form five analytical areas of various sizes (figure 10 and table 3-7). The five analytical areas are composed of hydrologic units that were delineated using drainage boundaries. These analytical areas are large enough to assess the effect of actions that may not be substantial when taken individually (site scale), but may have potential impacts (cumulative effect) when combined with effects from other actions in the drainages. The analytical areas are small enough to avoid “drowning out” evidence of adverse effects. As the size of the analytical area increases, there is an increasing possibility the analysis may indicate “no problem” when in fact individual drainages may have issues of concern.

Table 3-7. Water Resources Analytical Areas in the Twin Ranch Project Area

Analytical Area	Area (acres)	Square Miles
Fourbit Bowen	2,506	3.9
Friese Creek	1,404	2.2
Misfit Twincheria	6,010	9.4
Rancheria Creek	1,772	2.8
Twin Ranch	2,368	3.7
Total	**14,060**	**22**

The landscape patterns in the analytical areas are a mixture of ownerships. BLM lands are generally intermixed with private while Forest Service lands are typically in block ownership (figure 11). Overall, the BLM manages 20 percent of the lands in the combined analytical areas.

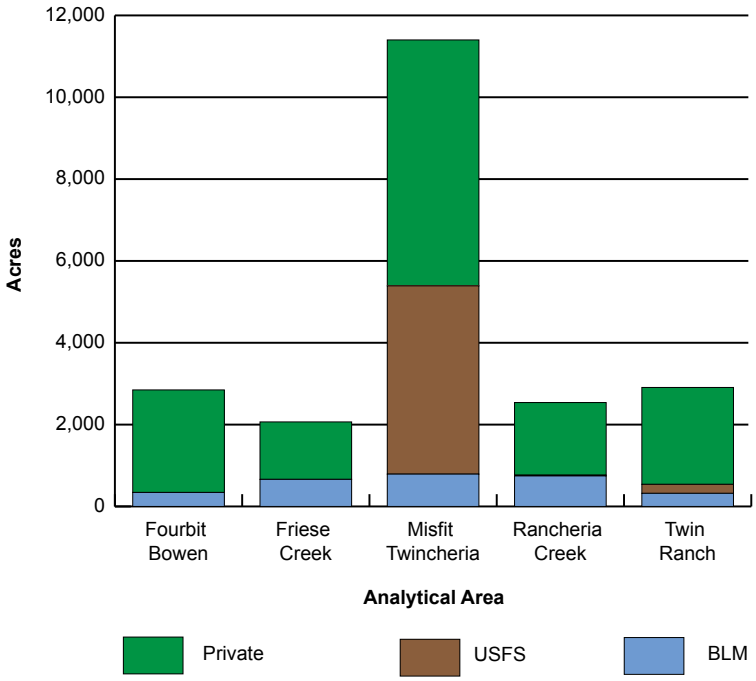


Figure 11. Land ownership in the water resources analytical areas.

3.4.3.2 Water Quantity

Average annual precipitation in the Twin Ranch Project Area ranges from about 35 inches per year to 45 inches per year. Precipitation generally falls from November through March and summer months are typically very dry. The rain patterns in the winter months are widespread with relatively low intensity and long duration in contrast to the localized, short duration, and high intensity summer storms that occasionally occur. A USGS (United States Geological Survey) gaging station located on South Fork Big Butte Creek near Butte Falls, Oregon collected streamflow data from 1910 to 1991. Mean monthly streamflows during that time period ranged from a low of 78 cfs (cubic feet per second) in October to a maximum of 245 cfs in March. The highest streamflows usually occur from December through May. The maximum discharge recorded at the gaging station was 12,600 cfs on December 22, 1964.

Within the Project Area, rain predominates in the lower elevations (generally below 3,500 feet). The majority of BLM-administered lands in the Project Area are located within the rain zone (table 3-8).

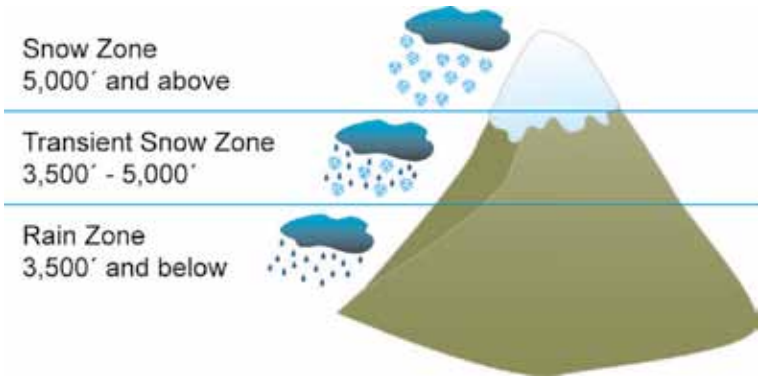
Table 3-8. Water Resources Analytical Areas by Precipitation Zone

Analytical Area	Acres by Precipitation Zone			Percent in Transient Snow Zone
	Rainfall Zone	Transient Snow Zone	Snow Zone	
Fourbit Bowen	2,506	0	0	0
Friese Creek	1,405	0	0	0
Misfit Twincheria	1,704	3,669	637	61
Rancheria Creek	1,772	2	0	<0.01
Twin Ranch	2,263	105	0	0.04
Totals	**9,650**	**3,776**	**637**	**27**

Winter precipitation in the higher elevations (generally above 5,000 feet) usually occurs as snow, which ordinarily melts during the spring runoff season from April through June. 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) (figure 12). 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.

Figure 12. Precipitation Zones



The low percentage of the Project Area in the TSZ in four of the five analytical areas results in a low risk for peak flow changes from timber harvest activities. A high percentage (61 percent) of the Misfit Twincheria analytical area is located in the TSZ. However, over 99 percent of the TSZ in Misfit Twincheria is located on Forest Service lands and has stands with canopy cover at or above historic levels.

Streamflows during April, May, and early June are increased by melting snowpack in the high elevations. 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.

Surface water in the Twin Ranch 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 (table 3-9).

Table 3-9. Stream Classification by Ownership

	Perennial (miles)			Long-Duration Intermittent (miles)			Short-Duration Intermittent (miles)			Total (miles)		
Analytical Area	**BLM**	**FS**	**Private**	**BLM**	**FS**	**Private**	**BLM**	**FS**	**Private**	**BLM**	**FS**	**Private**
Fourbit Bowen	0	0	3.3	0.4	0	5.5	0	0	1.1	0.4	0	9.9
Friese Creek	1.3	0	0.5	0.5	0	1.1	0.6	0	1.7	2.4	0	3.3
Misfit Twincheria	2.8	5.9	1	0	4.9	1	0.4	1.1	0.8	3.2	11.9	2.9
Rancheria Creek	1.6	0	1.3	0	0	0	0.8	0	2	2.4	0	3.3
Twin Ranch	0.4	0	4.2	0.3	0.4	0.1	0.4	0	4.6	1.1	0.4	8.9
Total	**6.1**	**5.9**	**10.3**	**1.2**	**5.3**	**7.7**	**2.2**	**1.1**	**10.2**	**9.5**	**12.3**	**28.3**

Streams categorized as perennial or intermittent on Federal lands are required to have riparian reserves as defined in the Northwest Forest Plan (Forest Service and Bureau of Land Management 1994). 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 1995b). Streams on private industrial 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.

3.4.3.3 Water Quality

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 Federal CWA 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 2004/2006 303(d) list is the most recent listing of these streams (Oregon Department of Environmental Quality 2006).

Within or directly adjacent to the Twin Ranch Project Area, there are two streams included on DEQ's 2004/2006 303(d) list for exceeding stream temperature (table 3-10). North Fork Big Butte Creek lies within the Project Area; Jackass Creek is located near the Project Area and drains into North Fork Big Butte Creek. Although these streams are within the Project Area boundary, there are no proposed units adjacent to 303(d) listed streams.

Table 3-10. 303(d) Streams in the Twin Ranch Project Area

Stream Name	Listing Parameter	Stream Miles	Stream Miles on BLM	Percentage of Stream on BLM
North Fork Big Butte Creek	Temperature	0 to 13.9	6.4	46
Jackass Creek	Temperature	0 to 4.8	2.4	50

Removal of riparian vegetation and the shade it provides contributes to elevated stream temperatures. Past human activities in riparian areas such as timber harvest, road construction, residential and agricultural clearing, and livestock grazing have reduced the amount of riparian vegetation in the Project Area. Water withdrawals during the summer also contribute to elevated stream temperatures.

In December 2008, the Oregon DEQ issued the Rogue River Basin TMDL (Total Maximum Daily Load) as an executive order. The TMDL addresses temperature and bacteria (*E. coli*) impairments for an area that includes the Project Area. TMDLs are numerical loadings that are set to limit pollutant levels such that instream water quality standards are met. The BLM is recognized by Oregon DEQ as a DMA (Designated Management Agency) for implementing the CWA on BLM-administered lands in Oregon. Each DMA has 18 months from the time the Rogue River Basin TMDL becomes an executive order to develop or submit to Oregon DEQ an implementation plan. The BLM and Oregon DEQ have a Memorandum of Agreement that defines the process by which the BLM will cooperatively meet State and Federal water quality rules and regulations. In accordance with the Memorandum of Agreement, the BLM will develop or revise existing WQRPs (Water Quality Restoration Plan) as described in the Memorandum of Agreement; the WQRPs will be the TMDL implementation plans for the BLM (ODEQ and USDI 2003). The BLM prepared a WQRP for BLM-administered lands in the Big Butte Creek Watershed (Bureau of Land Management 2008a) in 2008 and it was approved by the Oregon DEQ. Recovery goals focus on protecting areas where water quality standards are being met and avoiding future impairments of these areas, and restoring areas not currently meeting water quality standards.

The topography of the Twin Ranch Project Area is flat to gently sloping terrain with broad, low-gradient drainage ways and sideslopes less than 35 percent (Bureau of Land Management 1995a). The generally flat terrain with low-gradient streams results in a low stream density (table 3-11). 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 3-11. Stream Drainage Density for the Twin Ranch Project Area

Analytical Area	Total Streams (miles)	Total Area (square miles)	Stream Drainage Density (mile/square mile)
Fourbit Bowen	12.9	5.2	2.48
Friese Creek	5.6	2.2	2.55
Misfit Twincheria	17.9	9.4	1.90
Rancheria Creek	5.7	2.8	2.04
Twin Ranch	12.6	3.7	3.41
Totals	**54.7**	**23.3**	**2.35**

While there is less hydrologic connectivity in the Twin Ranch Project Area compared to steeper watersheds, there is still a concern from road- and skid trail-related sediment as a result of the Project Area being well roaded with many natural surface roads. The relative flatness of the watershed has resulted in large areas of compaction from tractor skidding, roads, and landings (Bureau of Land Management 1995a).

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 hillslope; (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). Roads connected to stream channels through ditch lines effectively extend the stream channel network, changing runoff timing and ultimately increasing the magnitude of peak flows (Wemple, Jones, and Grant 1996). The effect of roads on peak stream flows depends strongly on the size of the watershed; for example, capture and rerouting of water can remove water from one small stream while causing major channel adjustments in another stream receiving the additional water (Gucinski, et al. 2001). Roads have relatively insignificant effects on peak flow in large watersheds where they constitute a small proportion of the land surface, they do not seem to change annual water yields, and no studies have evaluated their effect on low flows (Gucinski, et al. 2001).

Roads that cross dry draws have the potential to route storm flow into the dry draw. Subsurface flow through the colluvium 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).

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 to the local environment.

Road density provides a general index of the relative amount of road in the analytical areas. Areas with higher road densities will generally experience more road-related effects; however, many other factors

such as design, location, maintenance, use, surface type, gradient, and geology can influence the effect of any particular road.

The BLM obtained road miles from the BLM GIS database, 2005 aerial photograph analysis, and field visits (table 3-12). This is the best information available. We acknowledge roads such as non-GIS roads that are hidden by tree canopy, OHV trails, and private roads built after the 2005 photographs were taken may not be included. These additional roads would not change the outcome of the analysis because the existing roads far outnumber any additional roads not identified.

Table 3-12. Road Miles, Road Density, and Percent of Roaded Area in the Water Resources Analytical Areas

Analytical Area	Road Miles			Total Road Miles	Road Density (mile/square mile)	Percent of Area in Roads
	BLM	USFS	Private			
Fourbit Bowen	1.7	0	21.1	22.8	4.4	1.1
Friese Creek	4.1	0	10.6	14.7	6.7	0.4
Misfit Twincheria	5.0	26.4	5.3	36.7	3.9	0.8
Rancheria Creek	5.3	0	10.6	15.9	5.7	1.1
Titanic Rancheria Fire	5.0	47.5	10.6	63.1	4.2	0.9
Twin Ranch	1.7	1.7	15.8	19.2	5.2	1.1
Totals	**22.8**	**75.6**	**74**	**172.4**	**5.3**	**1.1**

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. Analytical areas in the Twin Ranch Project Area have a low density of road-stream crossings (table 3-13).

Table 3-13. Total Stream Miles and Road Stream-Crossings in the Twin Ranch Project Area by Analytical Area

Analytical Area	Total Road Stream-Crossings	Total Stream Miles	Road Stream-Crossings per Stream Mile
Fourbit Bowen	21	10.2	2
Friese Creek	18	5.7	3
Misfit Twincheria	24	17.9	1
Rancheria Creek	10	5.7	2
Twin Ranch	22	10.5	2
Totals	**95**	**50.0**	**2**

Since 2000, road construction has declined and road decommissioning and upgrading has increased (table 3-14).

Table 3-14. Road Surface Types for All Roads on BLM-Administered Lands and BLM-Controlled Roads on Non-BLM Lands

Analytical Area	Road Surface Type (miles)			Total (miles)	Percentage of Roads with Natural Surface
	Natural	Rocked	Paved		
Fourbit Bowen	22.2	4.1	0	26.3	84
Friese Creek	8.8	3.8	0	12.6	70
Misfit Twincheria	10.3	24.0	0	34.3	30
Rancheria Creek	7.9	6.7	0	14.6	54
Twin Ranch	7.6	11.9	0	19.5	39
Totals	**56.8**	**50.5**	**0**	**107.3**	**53**

Implementation of BMPs during road and logging 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 summer stream temperatures and sediment input.

3.4.4 Environmental Consequences

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 Twin Ranch project. Discussion for Alternatives 2, 3, and 4 reflects 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 actions past, present, and reasonably foreseeable. 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).

3.4.4.1 Effects of Alternative 1 (No-Action) on Water Resources

Direct and Indirect Effects

No actions are proposed under Alternative 1; therefore, direct and indirect effects are the current conditions in the Project Area that are the result of past actions not related to the Twin Ranch project. Alternative 1 describes anticipated effects of not implementing the proposed project.

Under Alternative 1, there would be no change in existing water quality on BLM-administered lands. Streams in the analytical area that are on the DEQ's 2004/2006 303(d) list would continue to exceed water quality standards. Over the long-term, shade would increase on the temperature-listed segments of streams 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 prevent major sediment input or repair drainage failures. There would be no action to decrease overall road densities or decrease road interactions with streams.

Riparian reserves that are currently overstocked would not receive treatment to reduce stand densities and increase growth of remaining trees. Riparian reserves would not receive the benefits of increasing growth rates on trees which, if completed, would provide benefits of large wood to streams and increased resiliency to large-scale disturbances such as wildfire.

This alternative would not relocate approximately 0.1 mile of a road that currently has water running down the natural surface causing sediment to be transported downstream. This project would not be completed and the road would continue to erode, ruts would become larger, and sediment would continue to be transported downstream.

Alternative 1 would not decommission 0.7 mile of natural surface road (BLM road 34-3E-35). There would be no reduction in total road miles and no improvement to infiltration under this alternative.

Cumulative Effects

The existing condition is the result of past actions that have occurred on both public and private lands in the Project Area. Past actions have resulted in elevated stream temperatures, increased fine sediment levels above background levels, and simplified stream channels. The main actions resulting in these conditions are timber harvest and road building. Other contributions to these conditions include water withdrawals, agriculture, and grazing.

Natural events such as the windstorm in January 2008 and the 2008 Doubleday Fire also contribute to watershed cumulative effects such as elevated water temperatures and increased sediment. OHV (off-highway vehicle) use also contributes to watershed cumulative effects by increasing erosion and subsequent sedimentation in the Big Butte Creek fifth field watershed, although the extent of this effect is not known.

Timber sales completed in the last 10 years on BLM-administered lands in the Big Butte Creek fifth field watershed include the Blowdown Salvage, Lower Big Butte, Titanic, and Ginger Springs. These timber sales implemented riparian reserves and likely did not contribute to the cumulative effect of increased stream temperature. Road renovation and road improvement occurred as part of these projects to reduce the overall amount of sediment coming from roads.

The Camp Cur timber sale is planned for the Big Butte Creek fifth field watershed. The timber sale has been developed using full riparian reserves, as required under the Medford District ROD/RMP, to ensure water quality protection.

Restoration projects in the Big Butte Creek fifth field watershed added large wood to Jackass Creek and North Fork Big Butte Creek and constructed livestock exclosures along Jackass Creek and North Fork Big Butte Creek. Adding large wood to streams aids in restoring stream complexity in simplified stream channels. The added structure dissipates stream energy which reduces erosion and promotes deposition of transported sediment. The livestock exclosures fenced off approximately 5 miles of streams and riparian areas to reduce grazing pressure on riparian vegetation allowing streambank and riparian vegetation to grow and provide stability and cover.

The Camp Stew project thinned 62 acres of pine plantations. The Ranch Stew project has 470 acres of pine plantation and young stand thinning proposed within the Water Resource analytical area. These restorative treatments would increase the growth of trees and release the understory to increase the growth rates of the stands in the watershed. The amount of large wood in stream channels has increased because trees blown down during the January 2008 windstorms were not salvaged inside the riparian reserves.

Road decommissioning is proposed through other projects on approximately 1.5 miles of road in the Big Butte Creek fifth field watershed. While this amount of road decommissioning does not greatly affect

road density in the watershed, the trend on BLM lands is to reduce the amount of roads in the watershed while minimizing new construction.

3.4.4.2 Effects of Alternative 2 on Water Resources

Direct and Indirect Effects

Under Alternative 2, there is a low risk for peak flow changes from timber harvest activities. Of the 624 acres proposed for harvest, only 1.5 acres are within the TSZ. The low risk to changes in peak flow means that changes to water quantity are unlikely as a result of this project. In addition, 454 (73 percent) of the proposed acres to be treated would be thinned to a 40 percent or greater canopy cover, which is within the range of natural variability. Approximately 10 acres of a root rot pocket, which would eventually lose its canopy, would be regeneration harvested to prevent the spread of the root rot. An additional 56 acres of shelterwood harvest would result in a canopy cover of 20 to 30 percent. The regeneration and shelterwood harvest would result in canopy covers below the range of natural variability. These areas are located in the rain zone where the risk for peak flow changes is low.

Ripping skid trails on 66 acres in regeneration and shelterwood harvest units upon final entry would help to ameliorate compacted conditions by increasing porosity and infiltration. Ripping skid trails would not occur in commercial thinning or select cut units in order to protect the roots of the remaining live trees.

Projects proposed under Alternative 2 would not affect steam temperatures because no shade would be removed on perennial streams as a result of timber harvest; therefore, this alternative would not affect 303(d) listed streams.

Upland timber harvest would occur on approximately 608 acres using ground-based equipment including tractors and feller-bunchers. Ground-based machinery would use existing and designated skid trails to minimize the area of soil disturbance. Water quality would be maintained while using ground-based equipment through the use of PDFs, distance from stream channels through riparian reserves, relative flatness of the area, and low stream density of the area.

Riparian reserve thinning is proposed on 16 acres. Thinning would occur in the outer 100 feet of the 190-foot riparian reserve, leaving a 90-foot no-cut buffer next to the stream. Trees outside the no-cut buffer would be thinned to leave a 40 to 60 percent canopy cover. Thinning would reduce competition for resources and allow the remaining trees to grow larger quicker. This would benefit riparian reserves by increasing the growth of trees to provide large wood structure to streams. Stream temperatures would not be affected because both streams where thinning is proposed are intermittent streams that do not contain water during the summer months when stream temperatures are subject to heating and increased temperatures.

The 90-foot no-cut buffer on all streams would be sufficient to trap any sediment leaving the unit before the sediment could reach stream channels. This distance is sufficient based on the gentle slopes between the unit and the stream and because overland flow is uncommon in forested watersheds where infiltration rates are high. There are no draws draining units into streams so there would be no mechanism to transport sediment to channels. Heavy equipment would not be allowed in the riparian reserve and all logs would be yarded out of the reserve. Soils in the Project Area are relatively stable (section 3.3.3.1, Soil Types). Based on these factors, the risk of sediment delivery to stream channels is low. This project would be beneficial to riparian reserves by increasing the rate of growth on the remaining trees causing them to become larger with healthy canopies sooner.

Biomass removal would occur on 517 acres which would require 0.5-acre landings. These landings would be constructed outside riparian reserves to minimize the potential for sedimentation.

Road work proposed under this alternative includes road renovation, road decommissioning, temporary spur road construction, and road relocation away from a stream channel.

Road renovation would occur on 24.6 miles of road. This work involves blading the road surface, cleaning ditch lines and culvert inlets where needed, replacing culverts that have deteriorated, spot rocking depleted areas, and brushing the roadways. This alternative would include adding rock surfacing to approximately 3.5 miles of road in the Upper South Fork Big Butte Creek sixth field subwatershed. This work would improve the long-term drainage of the roadway which would reduce the amount of sediment produced from these roads. Cleaning ditches and culverts would increase the amount of sediment transported to streams in the short-term, but this amount is expected to be small because work would occur during the dry season when sediment transport is low.

Approximately 0.7 mile of BLM road 34-3E-35 would be decommissioned under Alternative 2. This natural surface road would be ripped, seeded, and mulched to restore water infiltration and reduce the total amount of roads in the Project Area.

Approximately 1.1 miles of temporary spur roads would be constructed under Alternative 2. These temporary roads would be built on stable locations, used, and decommissioned within the same operating season to minimize the potential for erosion to occur. This activity would not contribute to increased road density in the Project Area because these roads are temporary and the effects would be mitigated by ripping, water barring, mulching, and seeding.

One proposed 0.2-mile temporary spur road would cross a short-term intermittent stream to access harvest units including a riparian thinning unit. The proposed road is on an existing skid trail used during the last harvest. A temporary culvert would be placed in the stream channel and removed the same season, limiting the potential for erosion and sedimentation. The rock placed over the culvert would be removed and the stream would be restored to natural flow. The road would be ripped, seeded, and mulched to further reduce the potential for erosion.

Under Alternative 2, 0.1 mile of natural surface road that currently has water running down it would be relocated. Water running on this road surface is causing sediment to be transported downstream. Relocating this road would reduce the amount of sediment being transported to this stream channel. The existing road would be obliterated and revegetated to reduce the current erosion rates. Two short, temporary spur roads would be needed as a result of the road relocation to access nearby units and avoid landing construction within riparian reserves.

Cumulative Effects

See cumulative effects section under Alternative 1 for previous, ongoing, and future projects in the area.

Projects proposed in Alternative 2 would not contribute to the cumulative watershed effect of increased stream temperatures because no overstory canopy would be removed within riparian reserves.

The short-term supply of sediment to stream channels would increase under Alternative 2 through road renovation, culvert replacement, partial road decommissioning, and road surfacing; however, these

projects would reduce the long-term sediment supply to stream channels. These projects would be beneficial to water quality and would reduce sedimentary cumulative effects where these projects occur.

The proposed 0.7 mile of road decommissioning, when added to the 1.5 miles of road decommissioning occurring in other projects, would reduce the total miles of road in the Big Butte Creek fifth field watershed. While this amount of road decommissioning does not greatly affect road density in the fifth field watershed, the trend on BLM lands is to reduce the amount of roads while minimizing new construction.

3.4.4.3 Effects of Alternative 3 on Water Resources

Direct and Indirect Effects

Under Alternative 3, there is a low risk for peak flow changes from timber harvest activities. Of the 761 acres proposed for harvest, only 1.5 acres are within the TSZ. The low risk to changes in peak flow means that changes to water quantity are unlikely as a result of this project. In addition, all of the proposed acres to be treated would be thinned to a 40 percent or greater canopy cover, which is within the range of natural variability.

Stands proposed for regeneration and shelterwood harvest in Alternative 2 would receive selection harvest in Alternative 3. As a result, no skid trails would be ripped in order to protect the roots of the remaining trees. Infiltration and porosity would not be restored in these harvest units.

Upland timber harvest would occur on approximately 736 acres using ground-based equipment including tractors and feller-bunchers. Ground-based machinery would operate on existing and designated skid trails to minimize the area of soil disturbance. Water quality would be maintained while using ground-based equipment through the use of PDFs, distance from stream channels through riparian reserves, relative flatness of the area, and low stream density of the area.

Riparian reserve thinning is proposed on 16 acres. Thinning would occur in the outer 100 feet of the 190-foot riparian reserve buffer, leaving a 90-foot no-cut buffer next to the stream. Trees outside the no-cut buffer would be thinned to leave a 40 to 60 percent canopy cover. This would reduce competition and allow the remaining trees to grow larger quicker. This would benefit riparian reserves by increasing the growth of trees to provide large wood structure to streams. Stream temperatures would not be affected because both streams where thinning is proposed are intermittent streams that do not have water in the channels during the summer months when stream temperatures are subject to heating and increased temperatures. Timber harvest proposed in Alternative 3 would not affect steam temperatures and, therefore, would not affect 303(d) listed streams.

Biomass would not be removed in Alternative 3, so landings would be 0.25 acre versus 0.5 acre.

A total of 26.3 miles of road would be renovated in Alternative 3. This would be an increase of 1.7 miles over Alternative 2. Road renovation involves blading the road surface, cleaning ditch lines and culvert inlets where needed, replacing culverts that have deteriorated, spot rocking depleted areas, and brushing the roadways. Rock surfacing would be added to 3.5 miles of road in the Upper South Fork Big Butte Creek sixth field subwatershed. This would improve the long-term road drainage, which would reduce the amount of sediment being produced from these roads. Cleaning ditches and culverts would increase the amount of sediment transported to streams in the short-term; the amount is expected to be small because work would occur during the dry season when sediment transport is low.

Approximately 0.7 mile of BLM road 34-3E-35 would be decommissioned under Alternative 3. This natural surface road would be ripped, seeded, and mulched to restore water infiltration and reduce the total amount of roads in the Project Area.

Approximately 0.2 mile of temporary spur roads would be built under Alternative 3. Alternative 3 would avoid building temporary roads to minimize ground disturbance such as compaction and soil displacement. An existing skid trail would require a temporary crossing on a short-duration intermittent stream. The temporary crossing would be used and restored, seeded, and mulched the same season as used to reduce the potential of erosion and sedimentation. Fewer miles of temporary spur roads (0.9 mile) would be constructed in Alternative 3 than in Alternatives 2 and 4.

This alternative would relocate approximately 0.1 mile of a natural surface road that currently has water running down it. Water running on this road surface is causing sediment to be transported downstream. This project would reduce the erosion and rutting that is currently occurring and sediment transportation downstream would be reduced. The current road would be decommissioned through ripping, seeding, and mulching. Two short temporary spur roads would be needed as a result of the road relocation to access nearby units and avoid landing construction within riparian reserves.

The road decommissioning, road relocation, and temporary spur road construction and decommissioning could result in a short-term delivery of small amounts of sediment and a long-term reduction in chronic sediment delivery thereby improving water quality.

Cumulative Effects

See cumulative effects section under Alternative 1 for previous, ongoing, and future projects in the Project Area.

Projects proposed in this alternative would not contribute to the cumulative watershed effect of increased stream temperatures because no overstory canopy would be removed within riparian reserves.

Culvert replacement, road decommissioning, and road renovation would cause short-term increases in the supply of sediment to stream channels and long-term decreases in the supply of sediment to stream channels. These projects would be beneficial to water quality and would reduce sedimentary cumulative effects where these projects occur.

The proposed 0.7 mile of road decommissioning when added to the 1.5 miles of road decommissioning that would occur through other projects would reduce the total miles of road in the Big Butte Creek fifth field watershed. While this amount of road decommissioning does not greatly affect road density in the fifth field watershed, the trend on BLM lands is to reduce the amount of roads while minimizing new construction.

3.4.4.4 Effects of Alternative 4 on Water Resources

Direct and Indirect Effects

Under Alternative 4, there is a low risk for peak flow changes from timber harvest activities. Of the 624 acres proposed for harvest, only 1.5 acres are within the TSZ. The low risk to changes in peak flow means that changes to water quantity are unlikely as a result of this project. In addition, all of the proposed acres to be treated would be thinned to a 40 percent or greater canopy cover, which is within the range of natural variability.

Stands proposed for regeneration and shelterwood harvest in Alternative 2 would receive selection harvest in Alternative 4. As a result, skid trails would not be ripped in order to protect the roots of the remaining trees. Porosity and infiltration would not be restored in these harvest units.

Upland timber harvest would occur on approximately 608 acres using ground-based equipment including tractors and feller-bunchers. Ground-based machinery would use existing and designated skid trails to minimize the area of soil disturbance. Water quality would be maintained while using ground-based equipment though the use of PDFs, distance from stream channels through riparian reserves, relative flatness of the area, and low stream density of the area.

Riparian reserve thinning is proposed on 16 acres. Trees outside the no-cut buffer would be thinned to leave a 40 to 60 percent canopy cover. This would reduce competition and allow the remaining trees to grow larger quicker. This would benefit riparian reserves by increasing the growth of trees to provide large wood structure to streams. Timber harvest proposed in Alternative 4 would not affect steam temperatures and, therefore, would not affect 303(d) listed streams.

Biomass removal would occur on 517 acres and would require 0.5-acre landings. These landings would be built outside of riparian reserves to minimize the potential for sedimentation.

Road renovation would occur on 24.6 miles of road. This work involves blading the road surface, cleaning ditch lines and culvert inlets where needed, replacing culverts that have deteriorated, applying aggregate to depleted areas, and brushing the roadways. This alternative would include adding rock surfacing to 3.5 miles of road in the Upper South Fork Big Butte Creek sixth field subwatershed. This work would improve the long-term drainage of the roadway, which would reduce the amount of sediment being produced from these roads. Cleaning ditches and culverts would increase the amount of sediment transported to streams in the short-term; the amount is expected to be small because work would occur during the dry season when sediment transport is low.

Approximately 0.7 mile of BLM road 34-3E-35 would be decommissioned under Alternative 4. This natural surface road would be ripped, seeded, and mulched to restore water infiltration and reduce the total amount of roads in the Project Area.

Approximately 1.1 miles of temporary spur roads would be constructed under Alternative 4. These temporary spur roads would be built on stable locations, used, and decommissioned within the same operating season to minimize the potential for erosion to occur. This activity would not contribute to increased road density in the Project Area because these roads are temporary and the effects would be mitigated by ripping, water barring, seeding and mulching.

One proposed 0.2-mile temporary spur road would cross a short-term intermittent stream to access harvest units including a riparian reserve thinning unit. The proposed road is on an existing skid trail used during the last harvest. A temporary culvert would be placed in the stream channel and removed the same season, limiting the potential for erosion and sedimentation. The rock placed over the culvert would be removed and the road would be ripped. The stream would be restored to natural flow, seeded, and mulched to further reduce the potential for erosion.

This alternative would relocate approximately 0.1 mile of a natural surface road that currently has water running on it. Water running on this road surface is causing sediment to be transported downstream.

This project would reduce the erosion and rutting that is currently occurring and sediment transportation downstream would be reduced. The current road would be decommissioned through ripping, seeding, and mulching. Two short temporary spur roads would be needed as a result of the road relocation to access nearby units and avoid landing construction within riparian reserves.

Cumulative Effects

See cumulative effects section under Alternative 1 for previous, ongoing, and future projects in the area.

Projects proposed in Alternative 4 would not contribute to the cumulative watershed effect of increased stream temperatures because no overstory canopy would be removed within riparian reserves.

Culvert replacement, road decommissioning, and road renovation would cause short-term increases and long-term decreases in the supply of sediment to stream channels. These projects would be beneficial to water quality and would reduce sedimentary cumulative effects where these projects occur.

The proposed 0.7 mile of road decommissioning when added to the 1.5 miles of road decommissioning that would occur through other projects would reduce the total miles of road in the Big Butte Creek fifth field watershed. While this amount of road decommissioning does not greatly affect road density in the fifth field watershed, the trend on BLM lands is to reduce the amount of roads while minimizing new construction.

3.5 Fisheries

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

anadromous. Species that live their adult lives in the ocean but move into freshwater streams to reproduce or spawn.

CCH (coho critical habitat). On May 5, 1999, the NMFS (National Marine Fisheries Service) designated CCH for SO/NC (Southern Oregon/Northern California) coho salmon. CCH includes “all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers.” It further includes “those physical or biological features essential to the conservation of the species and which may require special management considerations or protection . . .,” including all historically accessible waters (64 FR 86:24049).

EFH (essential fish habitat). EFH is defined by NMFS as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” This definition includes all waters historically used by anadromous salmonids of commercial value (including coho salmon).

ESU (evolutionarily significant unit). A population or group of populations of salmon that (1) is substantially reproductively isolated from other populations and (2) contributes substantially to the evolutionary legacy of the biological species.

salmonid. Soft-finned fishes of cold and temperate waters belonging to the family salmonidae, includes trout, salmon, and whitefish.

3.5.1 Methodology

- Information used in this analysis includes GIS, Aquatic Habitat Inventories (Oregon Department of Fish and Wildlife 1996, Oregon Department of Fish and Wildlife 1997, Oregon Department of Fish and Wildlife 1999), BLM field observations, and Lower Big Butte Creek and Central Big Butte Creek Watershed Analyses.
- Literature related to fisheries, streams, hydrology, road activities and timber harvest was also used for the analysis of this project.
- The Fisheries analysis area is composed of the North Fork Big Butte Creek, Lower South Fork Big Butte Creek, and Upper South Fork Big Butte Creek sixth field watersheds and will concentrate on the Project Area.

3.5.2 Assumptions

- Fish are dynamic and adaptive, and move throughout the stream systems (Bramblett, Bryant, et al. 2002; Hilderbrand and Kershner 2000; Kahler, Roni, and Quinn 2001) to avoid short-term increases in sediment levels (Kahler, Roni and Quinn 2001).
- Riparian reserves are successful in protecting aquatic ecosystems during timber harvest (Murphy, et al. 1986).
- Road decommissioning creates short-term erosion and sedimentation of streams at stream crossings, but in the long-term, reduces chronic erosion and sedimentation of streams (Madej 2000, McCaffery, Switalski, and Eby 2007).
- Coho salmon, Chinook salmon, and steelhead trout numbers over Gold Ray Dam reflect the overall population trends for the Upper Rogue River subbasin and SO/NC coho salmon ESU.
- Aquatic Habitat Inventories conducted by ODFW (Oregon Department of Fish and Wildlife) and BLM in the Big Butte Creek fifth field watershed are considered to represent the overall trend of aquatic habitats in the watershed and therefore in the Twin Ranch Project Area.
- All proposed PDFs will be properly implemented in order to meet resource objectives.

3.5.3 Affected Environment

3.5.3.1 Introduction

The Project Area is located within the Big Butte Creek fifth field watershed. The Big Butte Creek fifth field watershed consists of 8, sixth field watersheds, three of which contain proposed units in the Project Area: North Fork Big Butte Creek, Lower South Fork Big Butte Creek, and Upper South Fork Big Butte Creek.

3.5.3.2 Fish Populations

Major fish species found in the Big Butte Creek fifth field watershed include coho salmon (*Oncorhynchus kisutch*), steelhead trout (*O. mykiss*), cutthroat trout (*O. clarki*), and Chinook salmon (*O. tshawytscha)*. Cutthroat trout have the widest distribution, followed by steelhead, coho salmon, and Chinook salmon, which are only found in the mainstem of Big Butte Creek (figure 13).

Fish populations are influenced by natural and human-caused disturbances. Factors such as habitat loss or degradation, commercial fishing, and variable ocean conditions are primarily responsible for the

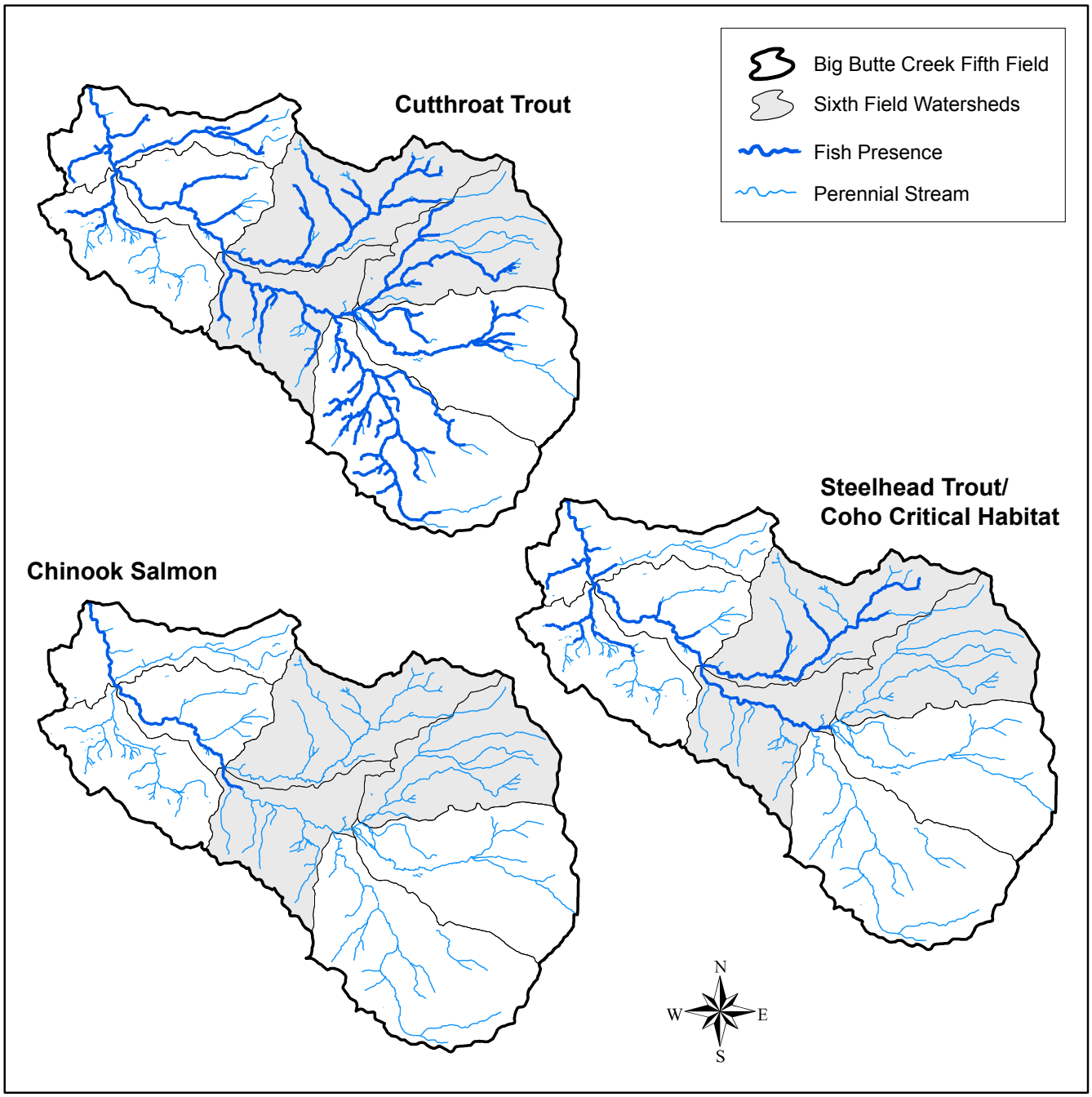


Figure 13. Fish distribution in the Big Butte Creek fifth field watershed.

depressed status of most fish species (Nehlsen, Williams and Lichatowich 1991). Primary issues for fish in the Project Area include road-related sediment, high stream temperatures and lack of large woody debris. ROD/RMP direction is to maintain or enhance the fisheries potential of streams and other waters (Bureau of Land Management 1995b, 49).

3.5.3.3 Fish Habitat

All 3 sixth field watersheds with proposed harvest units contain fish habitat (table 3-15). The NMFS listed the SO/NC coho salmon ESU as “threatened” under the ESA in May 1997. As directed under ESA, NMFS designated SO/NC coho salmon critical habitat and EFH. The Big Butte Creek fifth field watershed contains 177 stream miles of fish habitat: 13 stream miles are used by Chinook salmon and 55

stream miles are classified as CCH. North Fork Big Butte Creek, South Fork Big Butte Creek, and Camp Creek are the only streams in the Project Area that contain CCH. The North Fork Big Butte Creek and Lower South Fork Big Butte Creek sixth field watersheds contain 7.7 miles of CCH. Streams within the Project Area that contain fish habitat are Rancheria Creek, Twincheria Creek, and an unnamed tributary to Twincheria Creek

Table 3-15. Stream Miles of Fish Habitat in the Twin Ranch Project Area

Sixth Field Watershed	Seventh Field Watershed	Miles of Fish Habitat	
		CCH	NonCCH
North Fork Big Butte Creek	Camp Creek	1.5	2.8
	North Fork Big Butte Creek, above Camp Creek	4.1	5.4
	North Fork Big Butte Creek, below Camp Creek, above Mule Creek	0.6	0.6
Lower South Fork Big Butte Creek	South Fork Big Butte Creek, below Willow Creek, above Bowen Creek	1.5	1.5
Upper South Fork Big Butte Creek	Upper Rancheria Creek, above Titanic Creek	0	0.9
	Titanic Creek	0	2.4
	Middle Rancheria Creek, below Titanic Creek, above Fireline Creek	0	0.1
	Fireline Creek	0	0.2
	Lower Rancheria Creek, below Fireline Creek, above Twincheria confluence	0	2.8
	Upper Twincheria Creek, above Misfit Creek	0	0.0
	Middle Twincheria Creek, above unnamed tributary	0	3.3
	Misfit Creek, above Twincheria Creek confluence	0	4.2
	Unnamed Twincheria Tributary	0	1.1
	Lower Twincheria Creek, below unnamed tributary, above Rancheria Creek confluence	0	0.8
	South Fork Big Butte Creek, below Rancheria/Twincheria confluence, above Fourbit/Clarks Fork/Big Butte Creek confluence in T35S, R3E, sec. 16	0	1.4
Total		**7.7**	**27.5**

3.5.3.4 Population Trends

Limited information is available on the current fish populations in the Fisheries analysis area. Fish counts for the Rogue River basin have been monitored by ODFW at Gold Ray Dam since 1942. The coho salmon, steelhead trout, and Chinook salmon numbers over Gold Ray Dam reflect the overall population trends for the Upper Rogue River fourth field subbasin and ESU, including the Fisheries analysis area.

The wild adult coho salmon population over Gold Ray Dam was extremely low from 1965 to 1979. Populations were on an upward trend from 1979 to 2002. The wild adult population has been dropping since 2002 and the 2009 returns are among the lowest of the last 10 years. Over the last decade the steelhead trout population over Gold Ray Dam reached a high in 2002 and has been on a downward trend since then. The 2009 returns of steelhead trout are among the lowest in the last 10 years. Chinook salmon over Gold Ray Dam have been on a general increase since the late 1970s (figure 14) (Oregon Department of Fish and Wildlife 2010).

The Oregon Native Fish Status Report (Oregon Department of Fish and Wildlife 2009b) assessed production and abundance of coho salmon, spring and fall Chinook salmon, and winter and summer steelhead within the Upper Rogue River fourth field subbasin. All species, except spring Chinook

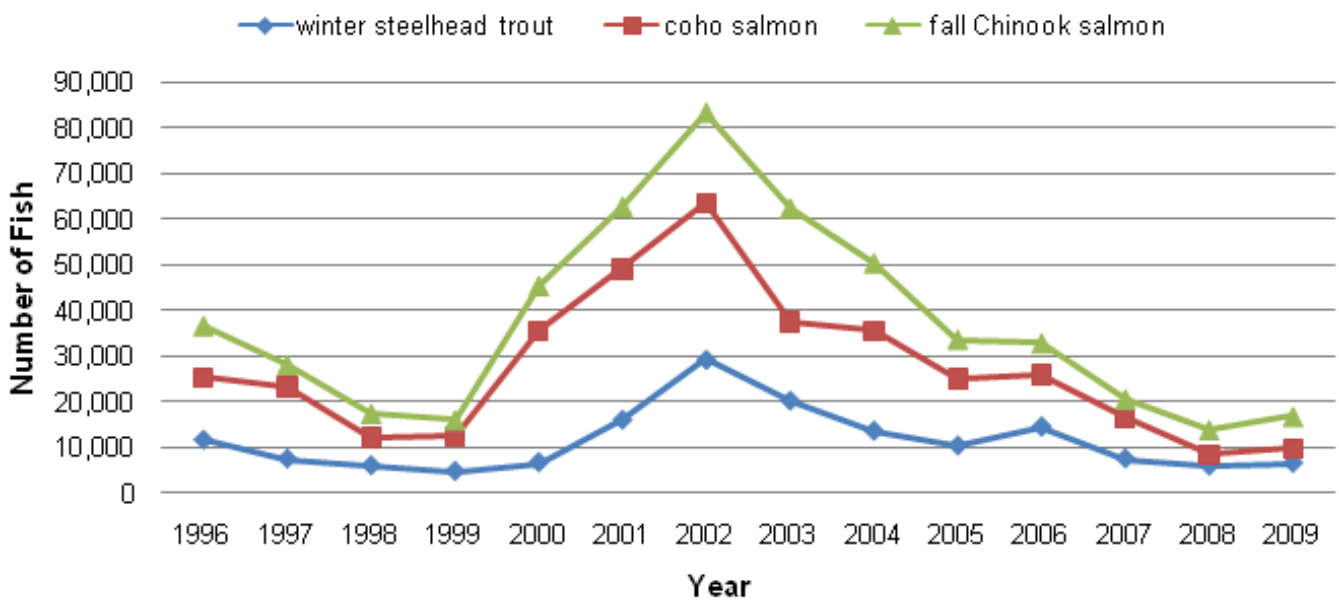


Figure 14. Winter steelhead trout, coho salmon, and fall Chinook salmon over Gold Ray Dam from 1996 to 2009.

salmon, met ODFW production, abundance, productivity, distribution, reproductive independence, and hybridization goals, indicating short-term (5 to 10 years) sustainability for these species is not at-risk. Spring Chinook salmon did not meet the reproductive independence goal due to the large number of hatchery fish in the Rogue River Basin and were therefore given an interim assessment of potentially at-risk.

3.5.3.5 Aquatic Habitat

Salmon and trout species need cool water temperatures, hiding cover, clean spawning gravels, rearing pools, adequate food supply, and unimpaired passage for good fish production. Large wood in the streams provides cover for fish and traps fine sediment.

Temperature

Water temperature is one of the most important variables controlling habitat suitability for salmonids. Optimum temperatures for coho salmon, steelhead trout, Chinook salmon, and cutthroat trout are 55 to 60 °F (Bjorn and Reiser 1991).

Under the CWA requirements, Oregon DEQ rules have set the 7-day average maximum summer temperature limit as 64.4 °F. Within the Fisheries analysis area, Oregon DEQ has listed four streams on the 303(d) list as water quality limited for temperature: North Fork Big Butte Creek, Doubleday Creek, Hukill Creek, and Jackass Creek. All of these streams contain fish habitat and North Fork Big Butte Creek and Jackass Creek contain CCH (Oregon Department of Environmental Quality n.d.). Sun exposure is the largest cause of increasing temperatures. Other factors, such as climate, stream size, elevation, and groundwater flows, also influence stream temperature (Beschta, et al. 1987). See Water Resources, section 3.4.3.3, Water Quality for more information on water quality.

Sediment

Clean gravel is important for spawning fish (Bjorn and Reiser 1991). When high, fine sediment levels occur in spawning gravels, less spawning occurs, eggs tend to be suffocated, and emerging fry become trapped, resulting in reduced production (Phillips, et al. 1975; Tappel and Bjornn 1983; Chapman 1988; Meehan 1991). Pools provide important rearing habitat for juvenile salmon and trout (Nickelson, et al. 1992; Rosenfeld, Porter and, Parkinson 2000) and winter holding habitat for adult fish (Cunjak 1996). Streams with high levels of fine sediment tend to have shallow pools because sediment deposits fill in these areas (Bjorn and Reiser 1991).

Based on ODFW and BLM aquatic habitat inventories of 10 streams on private and federally administered land in the Big Butte Creek fifth field watershed conducted since 1996, all 10 streams met the benchmark for desirable levels of sediment in riffles (Oregon Department of Fish and Wildlife 1996, Oregon Department of Fish and Wildlife 1997, Oregon Department of Fish and Wildlife 1999). These 10 streams are spread throughout the Big Butte Creek fifth field watershed and are considered representative of streams within the Fisheries analysis area.

Large Woody Debris

Large woody debris is important for providing cover for fish, forming pools, stabilizing channels, and trapping and sorting fine sediment (Bjorn and Reiser 1991). Large woody debris also provides habitat complexity and channel roughness to dissipate stream energy which causes bank erosion and increases channel widths (Montgomery and Buffington 1997). Reductions in large woody debris through past wood removal and timber harvest in riparian areas have led to channel simplification and reduced cover for fish. ODFW and BLM aquatic habitat inventories indicate streams in the Big Butte Creek fifth field watershed are lacking large woody debris. A windstorm in January 2008 created a pulse of large woody debris in a few specific stretches of streams in the Big Butte Creek fifth field watershed. The streams affected the most by the blowdown event were outside of the Twin Ranch Project Area and the Fisheries analysis area. See *Butte Falls Blowdown Salvage Environmental Assessment* for more information (Bureau of Land Management 2008c). Overall, the streams in the Fisheries analysis area are still lacking large woody debris.

3.4.3.6 Riparian Habitat

Riparian areas are important for fish and the aquatic ecosystem. Riparian vegetation provides large woody debris for streams and cover for fish. Streamside vegetation provides bank stability, maintains undercut banks, and provides habitat for insects, an important food source for salmonids. Riparian vegetation provides a protective canopy layer that helps maintain cool water temperatures (Beschta, et al. 1987; Meehan 1991) on perennial streams during summer months. When riparian vegetation is removed, increasing stream temperatures (Johnson and Jones 2000) and declining large woody debris levels can result in declining fish production (Hartman, Scrivener, and Powell 1987).

ODFW and BLM aquatic habitat inventories in the Big Butte Creek fifth field watershed indicate all 10 streams are in undesirable condition in at least three of the ODFW habitat benchmarks: riparian conifers greater than 20 inches DBH per 1,000 feet of stream length, pieces of large woody debris per 100 meters of stream length, pool frequency, and canopy cover (Oregon Department of Fish and Wildlife 1996, 1997, and 1999). These 10 streams are considered representative of the Big Butte Creek watershed and therefore represent the streams within the Fisheries analysis area.

3.4.3.7 Aquatic and Riparian Habitat Trends

Timber harvest has decreased on BLM-administered land over the last decade in the Big Butte Creek fifth field watershed and timber harvesting that has occurred has protected riparian reserves as designated by the Northwest Forest Plan (Bureau of Land Management 2008d, 240). This has resulted in reduced erosion and stream sediment levels. Most culverts allow fish passage and have been upgraded to handle 100-year flood events, reducing the risk of major washouts and providing fish access to most available habitat. Riparian areas are improving throughout the Big Butte Creek fifth field watershed. As a result, the younger stands are recovering and will provide increased shade and large woody debris levels.

3.5.4 Environmental Consequences

3.5.4.1 Effects on Fisheries Common to All Alternatives

Threatened and Endangered Fish Species

The road relocation and associated culvert installation proposed on an intermittent non-fish-bearing stream in the Twin Ranch Forest Management Project was originally consulted on through the biological assessment for the 2006 Bowen Arrow Forest Management Project. In January 2007, NOAA Fisheries issued a letter of concurrence (NMFS Number: 2007/06304) for the road relocation project and adjacent timber harvest in T35S, R3E, section 7. The road relocation project and adjacent timber harvest would be implemented as originally designed and consulted on. The road relocation and adjacent timber harvest “May Effect, Not Likely to Adversely Affect” SO/NC coho salmon and are consistent with the NOAA Fisheries letter of concurrence; therefore, these projects will not be taken into consideration in the determination of effect for the Twin Ranch Forest Management Project.

Given the absence of direct effects, low potential of sediment delivery, and no effect on water temperature, implementation of this project would be a “No Effect” ESA determination on fish production, CCH, and fisheries resources in the North Fork Big Butte Creek, Lower South Fork Big Butte Creek, and Upper South Fork Big Butte Creek sixth field subwatersheds.

Effects of Alternative 1 (No-Action) on Fisheries

Direct and Indirect Effects

Under Alternative 1, no treatment would be implemented. Aquatic and riparian habitat would continue at the current rate of recovery and would be subject to past and ongoing disturbances. Sediment inputs to streams from roads are expected to remain relatively constant. Overall road densities and road-stream interactions would remain unchanged.

Natural surface BLM road 35-3E-8.1 in T35S, R3E, section 17 would continue to erode, capture water, and cause sediment to be transported downstream and potentially reach CCH on South Fork Big Butte Creek about 0.25 mile downstream.

Overstocked riparian reserves would not receive treatment to reduce stand densities and increase growth of remaining trees. Riparian reserves would not receive the benefits of increasing growth rates which would ultimately increase large woody debris recruitment.

Cumulative Effects

Past actions including timber harvest, road construction, and grazing have occurred on both public and private lands in the Lower South Fork Big Butte Creek, North Fork Big Butte Creek, and Upper South Fork Big Butte Creek sixth field subwatersheds. Past actions have resulted in degraded fish habitat and riparian habitat through decreased large woody debris recruitment, decreased instream large woody debris, increased stream temperatures, and increased fine sediment levels.

Timber sales completed within the last 15 years in the Lower South Fork Big Butte Creek sixth field subwatershed are Ginger Springs, Rancheria, Tokyo Ginger, and Titanic. Recently completed salvage sales in this sixth field subwatershed are Bowen Over, Windy Salt, Double Down, and Doubleday Fire. There are no other planned timber sales in this subwatershed.

Timber sales completed within the last 15 years in the Upper South Fork Big Butte Creek sixth field subwatershed are Rancheria and Titanic. Camp Cur is the only other planned timber sale in this subwatershed.

Timber sales completed within the last 15 years in the North Fork Big Butte Creek sixth field subwatershed are Fred-N-Jack, Rancheria, Lower Big Butte, and Titanic. Lookout B Low is the only recently completed salvage sale in this subwatershed. The Ranch Stew Stewardship project (Ranch Stew and Ranch Stew II) has approximately 1,260 acres of thinning planned within the 3 sixth fields. Camp Cur and Vine Maple timber sales have planned units in this subwatershed.

All the completed timber and salvage sales implemented riparian reserves and best management practices from the ROD/RMP; therefore, it is not likely they contributed to the decrease in large woody debris recruitment, decrease of instream large woody debris, or increases in stream temperature. Road improvement and renovation occurred as part of these projects to reduce the overall amount of sediment coming off roads. Timber sales completed before the implementation of the Northwest Forest Plan in 1994 likely had more of an effect on the stream and riparian conditions listed above.

Restoration projects have been implemented in the North Fork Big Butte Creek sixth field subwatershed. Large wood was added to Jackass Creek and Eighty Acre Creek and livestock exclosures were constructed along Jackass Creek and North Fork Big Butte Creek. The livestock exclosures fenced approximately 5 miles of streams and riparian areas to reduce grazing pressure and allow for streambank and riparian vegetation recovery. Planned restoration projects in the Big Butte Creek fifth field watershed include riparian planting along Jackass Creek and adding large wood to North Fork Big Butte Creek.

3.5.4.2 Effects of Alternative 2 on Fisheries

Direct and Indirect Effects

Activities proposed in Alternative 2 would have no direct effects to fish or fish habitat. Activities may indirectly increase short-term stream sedimentation, decrease long-term stream sedimentation, and increase large woody debris recruitment.

Riparian reserve thinning is proposed on 16 acres in Alternative 2. Treatment would occur in the outer 100 feet of the 190-foot riparian reserves, leaving a no-cut buffer of 90 feet. Trees outside the no-cut buffer would be thinned from below leaving a 40 percent canopy cover to enhance and accelerate production of large diameter conifers in the riparian area. Thinning dense riparian areas would increase

long-term supply of large woody debris in the treated areas. Stream temperature would not be affected because the 90-foot no cut buffer would retain stream shade. Riparian reserve thinning would occur on intermittent stream channels that do not have flowing water in the summer months when streams are susceptible to heating and increased stream temperatures.

Stream sediment levels would not be affected by riparian reserve thinning because the topography is relatively flat, the 90-foot no-cut buffer would trap any sediment leaving the unit, and heavy equipment would not be allowed in riparian reserves. All cut trees in riparian reserves would be winched through the outer 100 feet of the riparian reserve to the adjacent upland unit.

Road work for this alternative consists of renovating 21 miles of road, decommissioning 0.7 mile of road, constructing 1.1 miles of temporary spur roads, surfacing 3.5 miles of road, relocating 0.1 mile of road away from an intermittent stream channel, replacing 4 culverts, and installing 5 new culverts.

Roads identified for hauling would include 14 stream crossings. Two stream crossings are on streams identified as CCH, four are on non-CCH fish-bearing streams, and eight are on non-fish-bearing streams. All of the haul routes with stream crossings are identified to be renovated or surfaced; this would limit the risk of sedimentation. One haul route that crosses an intermittent stream is currently a natural surface road proposed for renovation; all other haul routes with stream crossings are currently rocked roads. Short-term increases in stream sedimentation rates from hauling, road renovation, and road surfacing are not expected to be detectable from the background levels.

A total of 0.7 mile of road would be decommissioned; 0.1 mile is associated with relocating BLM road 35-3E-8.1 in the Lower South Fork Big Butte Creek sixth field watershed. The remaining 0.6 mile is in T35S, R3E, section 35 in the Upper South Fork Big Butte Creek and North Fork Big Butte Creek sixth field watersheds. This road has no hydrologic connection to fish habitat and the topography of the area is relatively flat; therefore, no effect to fish or fish habitat is expected to occur.

To reduce the risk of sedimentation from temporary spur roads, all temporary spur roads would be fully decommissioned in the same season as used. One temporary spur road would be constructed in the riparian reserve of an intermittent stream channel. No new landings would be constructed within riparian reserves. Full decommissioning would consist of ripping, water barring, seeding with native grasses, mulching, and blocking. New landings would be limited to 0.5 acre in size and would be ripped, seeded, and mulched after use.

The proposed 0.1-mile road relocation would decrease the long-term risk of stream sedimentation, indirectly affecting fish species downstream in South Fork Big Butte Creek. In the short-term, there is the potential for an increase in stream sedimentation. This would be limited because work would be completed in the dry season, the stream channel is intermittent with no water flow during the dry season, and the existing road would be decommissioned and revegetated to reduce erosion.

Culvert installations and replacements have the potential to increase stream sediment supply in the short-term but would decrease the long-term stream sedimentation rates. The closest culvert installation to CCH is on the proposed road relocation in T35S, R3E, section 17 about 0.25 stream miles from CCH on South Fork Big Butte Creek. The other culvert replacements and installations are at least 2.5 stream miles from CCH and within a couple hundred feet of non-CCH fish-bearing streams. Short-term increases in sedimentation are not expected to be detectable from background rates because eight of the

nine culverts being replaced or installed are cross-drain culverts. One draw culvert is on an intermittent stream and all construction would be completed during the dry season.

Cumulative Effects

Past, future, and ongoing actions would be the same as Alternative 1.

The projects proposed in Alternative 2 would not contribute to cumulative effects on stream temperature change or instream large woody debris levels because no overstory canopy would be removed in riparian reserves and riparian reserve thinning would occur only in the outer 100 feet of the riparian reserve. Long-term large woody debris recruitment is expected to increase in the two proposed riparian reserve thinning units.

Alternative 2 has the potential to increase short-term stream sedimentation; however, the increase is expected to be insignificant and not detectable from the background. Long-term effects of decreased stream sedimentation are expected.

3.5.4.3 Effects of Alternative 3 on Fisheries

Direct and Indirect Effects

The effects of the actions proposed in Alternative 3 are similar to Alternative 2 because many of the proposed actions are the same. Road maintenance, road decommissioning, road relocation, haul routes, culvert installations, and culvert replacements are the same as Alternative 2. In Alternative 3, less temporary road construction would occur (0.9 mile less), stand prescriptions would change, and more harvest (120 acres more) would occur.

Alternative 3 would have no direct effects to fish or fish habitat. This alternative has the potential to indirectly affect fish habitat by increasing stream sedimentation in the short-term and decreasing the risk of stream sedimentation in the long-term as a result of road renovation, road decommissioning, road relocation, culvert replacement, culvert installation, and road surfacing.

Riparian reserve thinning is proposed on 16 acres in Alternative 3. Treatment would occur in the outer 100 feet of the 190-foot riparian reserves, leaving a 90-foot no-cut buffer next to the stream. Trees outside the no-cut buffer would be thinned from below using a density management prescription and would retain a 40 percent canopy cover. The purpose of density management is to maintain or enhance forest health, stand structure, and function. Stream temperature would not be affected because riparian reserve thinning would occur on intermittent stream channels that do not have flowing water in the summer months when streams are susceptible to heating and increased stream temperatures. In addition, treatment would only occur in the outer 100 feet of riparian reserves.

Stream sediment levels would not be affected by riparian reserve thinning because the topography is relatively flat, a 90-foot no-cut area would trap any sediment leaving the unit, and no heavy equipment would be used inside riparian reserves.

Cumulative Effects

Past, future, and ongoing actions would be the same as in Alternative 1.

Alternative 3 would not contribute to cumulative effects on stream temperature change or instream large woody debris levels because only 16 acres are proposed for riparian thinning and a 90-foot no-cut buffer would be implemented.

Alternative 3 has the potential to increase short-term stream sedimentation; however, the increase is expected to be insignificant and not detectable from the background levels. Long-term effects of decreased stream sedimentation are expected.

3.5.4.4 Effects of Alternative 4 on Fisheries

Direct and Indirect Effects

Proposed project activities in Alternative 4 are similar to Alternative 2. Alternative 4 does not include regeneration or shelterwood harvest. Skid trails ripped in Alternative 2 in association with regeneration harvest would not be ripped in Alternative 4.

The direct and indirect effects of this alternative would be the same as Alternative 2.

Cumulative Effects

Past, future, and ongoing actions would be the same as in Alternative 1. Cumulative effects on fisheries from projects proposed in Alternative 4 are the same as Alternative 2.

3.6 Wildlife

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

active 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.

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.

provincial radius. Radius of a circle that represents an approximate home range for an owl in a given geographic location or province. The Twin Ranch project is located in the Western Cascades Province. The provincial radius for the Western Cascades Province is 1.2 miles.

treat and maintain. An action or activity will occur 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 posttreatment.

3.6.1 Methodology

- The process for conducting biological evaluations and assessments includes review of existing records, field reconnaissance, field surveys, and analysis of potential impacts.
- A review of potential wildlife habitat was conducted using maps, aerial photographs, Micro*Storms computer data, GIS data, and stand exam records.
- Spotted owl habitat for the Big Butte Creek fifth field watershed was analyzed using the Medford BLM owl habitat GIS layer. All historic northern spotted owl sites and suitable spotted owl habitat within 1.2 miles of the proposed timber sale units would be surveyed using the most current USFWS draft protocol, "2010 Protocol for Surveying Proposed Management Activities That May Impact Northern Spotted Owls Version 1.0."
- Proposed timber sale units were evaluated for RA32 properties using the current methodology (version 1.3, January 2010). The methodology for identifying RA32 structurally complex forest for project-level planning and northern spotted owl consultation needs in southwestern Oregon was developed by an interagency, interdisciplinary team with members from Rogue River-Siskiyou National Forest, Medford District BLM, and US Fish and Wildlife Service.
- The list of special status species known to be present in the Medford District BLM was updated in January 2008 using the latest information from the Oregon Natural Heritage Program and the BLM Oregon State Director's Special Status Species list.
- In February 2003, USFWS released a list of species of migratory nongame birds that are identified as birds of conservation concern (68 FR 25:6179). The list was updated in the Migratory Bird Program Strategic Plan 2004-2014 with an additional update in 2008 that included birds listed by USFWS as Game Birds below Desired Condition.
- A list of birds in the Big Butte Creek fifth field watershed was compiled from historical records and surveys, casual observations, and bird surveys in the Rancheria Road area (Appendix F, Wildlife).
- The BLM completed all required Survey and Manage wildlife surveys consistent with the January 2001 Survey and Manage Record of Decision (Forest Service and Bureau of Land Management 2001). Mollusk surveys were conducted in fall 2006 and completed in spring 2007, using interagency protocol standards, as described in Duncan, et al. (2003). Great gray owl surveys were conducted in 2006 and 2007 using interagency protocol standards, as described in Quintana, et al. (2004).
- Red tree vole surveys are not required in the Big Butte Creek fifth field watershed because the Project Area is located outside the known range of red tree voles (Biswell, et al. 2000; Biswell, et al. 2002).

3.6.2 Assumptions

- All known spotted owl sites within the 1.2-mile provincial radius of the Project Area will be monitored annually through the life of the project. No activities will occur within the 100-acre activity centers or 300-meter nest patch radius of known nest sites.
- PDFs will be properly implemented.
- If no T&E (threatened and endangered) or special status species habitat is known or suspected to be present in the Project Area or the area is outside the range for the species, then no further analysis is needed. If habitat is present, but no activities are planned for that habitat or the project

would not impact the population or habitat, no further analysis is needed. If a T&E or special status species is known or suspected to be present and habitat is proposed to be disturbed, then the species will be analyzed.

- Coarse wood already on the ground will be retained and protected from disturbance to the greatest extent possible during treatment.
- Snags which do not need to be felled for safety reasons will be retained within the harvest units to the extent possible.
- "Treat and maintain" spotted owl NRF habitat will retain at least 60 percent canopy cover, large trees, multistoried canopy, standing and down dead wood, and diverse understory adequate to support prey, and may contain some mistletoe or other decay.
- "Treat and maintain" spotted owl dispersal habitat will retain at least 40 percent canopy, flying space, and trees 11 inches DBH or greater, on average. The habitat classification of the stand following treatment will be the same as the pretreatment habitat classification.
- Downgrade of spotted owl NRF habitat will alter the function of spotted owl NRF habitat so the habitat no longer supports nesting, roosting, and foraging behavior. Downgraded NRF habitat has enough tree cover to support spotted owl dispersal.
- Habitat removal would alter known spotted owl NRF or dispersal habitat so the habitat no longer functions as nesting, roosting, foraging, or dispersal.
- Late-successional forest is forest habitat 80 years or older. Late-successional forest generally, but not always, provides suitable habitat for spotted owls. Suitable spotted owl habitat is generally 80 years and older, but also contains other attributes such as multiple layers.
- Spotted owl habitat is specifically rated for suitability for spotted owls, while late-successional habitat not rated as suitable spotted owl habitat may provide habitat for other species such as fishers and goshawks.

3.6.3 Affected Environment

3.6.3.1 Connectivity/Diversity Block

Connectivity/diversity blocks provide important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees (Bureau of Land Management 1995b, 39). The ROD/RMP requires the BLM to maintain 25 to 30 percent of the connectivity/diversity block in late-successional forest (table 3-16). "The size and arrangement of habitat within a block will provide effective habitat to the extent possible" (Bureau of Land Management 1995b, 40). A spotted owl 100-acre activity center is located in the northwest corner of the connectivity/diversity block in the Project Area.

Table 3-16. Connectivity/Diversity Block Habitat Assessment

	Acres
Total forested habitat on BLM-administered lands in connectivity/diversity block	521
Late-successional habitat present in connectivity/diversity block	433
Late-successional habitat needed to meet 25-30% ROD/RMP requirement	130-156

3.6.3.2 Threatened and Endangered Species

Northern Spotted Owl

T&E species are those species listed under the 1973 ESA. Northern spotted owls are the only T&E species within the Twin Ranch Project Area. The U.S. Fish and Wildlife Service listed the northern spotted owl as a threatened species under the ESA in 1990.

Spotted owls prefer older, forested habitats that contain the structures and characteristics required for NRF habitat. Owls may also be found in younger stands with multilayered, closed canopies with large diameter trees and abundance of dead and down woody material. Based on studies of owl habitat selection, including habitat structure and use and prey preference throughout the range of the owl, spotted owl habitat consists of four components: nesting, roosting, foraging, and dispersal (table 3-17).

Table 3-17. Northern Spotted Owl Habitat Types

Habitat Type	Description
Suitable habitat (NRF)	Meets all spotted owl life requirements. Stands are generally older than 80 years, have a high canopy cover (greater than 60 percent), a multilayered structure, and large overstory trees. Deformed, diseased, and broken-top trees, as well as large snags and down logs, are also present. Suitable habitat also includes areas with more uniform structure that may not have nesting structures, but provides roosting and foraging habitat with flying space for owls in the understory.
Dispersal habitat	Not suitable for spotted owl nesting/roosting/foraging, but has sufficient patchy cover to be used for travel between suitable stands, a minimum 40 percent canopy cover, and an average tree diameter greater than 11 inches with flying space for owls in the understory.
Capable habitat	Forest that is currently not spotted owl habit, but can become NRF or dispersal in the future as trees mature and canopy fills in.
Nonhabitat	Lands that do not provide habitat for spotted owl and would not develop into NRF or dispersal in the future (open prairies, meadows, shrub lands, etc.)

Suitable habitat (NRF) is an area of forest vegetation with age-class, species of trees, structure, sufficient area, and adequate food source to meet some or all the life needs of the spotted owl. Suitable habitat provides nesting, roosting, and foraging for spotted owls. It also includes areas with more uniform structure that may not have nesting structures but provides roosting and foraging habitat with flying space in the understory.

Dispersal habitat does not meet the criteria for NRF habitat, but has adequate cover to facilitate movement between blocks of NRF habitat. Dispersal habitat is generally defined as forested habitat greater than 40 years old with canopy cover greater than 40 percent and flying space in the understory. NRF habitat also functions as dispersal habitat. In this document when the term dispersal is used, it is dispersal-only habitat and does not include NRF habitat that also functions as spotted owl dispersal habitat.

In 2008, the USFWS released a final recovery plan for the northern spotted owl that identified criteria and actions necessary to stop the owl's decline, reduce threats, and return the species to a stable, well-distributed population in Washington, Oregon, and California (US Fish and Wildlife Service 2008b). Facing lawsuits by conservation and timber groups, the Federal government announced it would conduct a thorough review of the Recovery Plan prior to its full implementation. A review is currently being conducted by USFWS and a final recovery plan is anticipated to be completed by the end of 2010.

The recovery plan is not a regulatory document; rather, it provides guidance to bring about recovery and establishes criteria to be used in evaluating when recovery has been achieved. The recovery plan

identified the primary threats facing the northern spotted owl and described 34 recovery actions to address these threats.

The BLM continues to work with the USFWS to incorporate Recovery Goals and Actions from the Recovery Plan that are consistent with BLM laws and regulations. For example, the BLM is a participant in the interorganizational spotted owl working group, as specified in Recovery Action 1, and will continue demographic monitoring to address Recovery Actions 2 and 3.

RA32 (Recovery Action 32) recommends agencies maintain substantially all of the older and more structurally complex, multilayered conifer forests on Federal lands (US Fish and Wildlife Service 2008b, 34). These forests are characterized as having large diameter trees; high amounts of canopy; and decadence components such as broken-topped live trees, mistletoe, cavities, large snags and large coarse wood. RA32 stands are the highest quality NRF habitat. Stands proposed for harvest in the Twin Ranch Project Area were evaluated using interagency draft methodology. Stands evaluated and meeting the definitions in the methodology are referred to as RA32 stands. Through field evaluations, an interdisciplinary group determined 342 acres met RA32 stand conditions (figure 15).

Figure 15. RA32 stand in T35S, R3E, section 11.

The proposed actions would occur within lands designated as matrix by the Medford District ROD/RMP. No northern spotted owl critical habitat units are present in the Project Area. Within the Big Butte

Creek fifth field watershed, 29,521 acres of land are administered by the BLM. Of these, 10,206 acres (35 percent) are spotted owl NRF habitat and 8,530 acres (29 percent) are dispersal habitat.

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 owl 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 1995b, 32) (Forest Service and Bureau of Land Management 1994, C-10). Known northern spotted owl activity centers are a component of the late-successional reserve system.

Two 100-acre known northern spotted owl activity centers are located on BLM-administered land within the provincial radius (1.2 miles) of the proposed Project Area. The first activity center, MSNO (master site number) 3260, is vacant and resident spotted owls have not been detected since 1993. This site was given an activity center because it was considered active on January 1, 1994 and met the Northwest Forest Plan Standards and Guidelines for establishment of 100-acre known northern spotted owl activity centers.

The second 100-acre known northern spotted owl activity center (MSNO 2059) had a pair detected in 2005. They did not nest in 2005. A single spotted owl response was heard in 2006 with no detections during a follow-up visit or subsequent surveys since that date. The female from this site has been confirmed nesting in another location approximately 2.5 miles from the historic activity center.

A third spotted owl site is located on Forest Service lands within the 1.2-mile provincial radius of the Project Area. This site does not have a 100-acre activity center and has not been verified as having resident single or pair status since 1992. A single response was detected in 2008, but surveys were unable to determine occupancy status of this site. The site does not meet the definition of an active site.

The Twin Ranch Project Area is located in the Western Cascades Province within the Southern Oregon Cascades. According the 2004 Status and Trends in Demography of Northern Spotted Owls report, populations in the Southern Oregon Cascades were stable at the time when the meta-analysis was conducted (Anthony, et al. 2006).

The data from all of the demographic study areas located across the range of the spotted owl were analyzed again in 2009. This document is in press and final conclusions are not available at this time. Initial reports indicate populations of northern spotted owls are declining across the range and in all study areas (Anthony, Forsman, and Dugger 2010). Specific information for the Klamath and Southern Oregon Cascades Demography Study areas will be available when the report is released.

BLM biologists have noted the presence of barred owls in the Big Butte Creek fifth field watershed. Although biologists have not conducted specific barred owl surveys in the Project Area, the species was detected during spotted owl or great gray owl surveys. The number of barred owl sites has remained at one to two per year, but the barred owls appear to shift locations from year-to-year. Barred owls have been detected in the proposed Twin Ranch Project Area.

The BLM is a collaborator in many of the Recovery Actions, such as RA32, that address barred owl issues. The intent of RA32 is to maintain substantially all of the older and more structurally complex multilayered conifer forests on Federal lands in order not to further intensify the competitive interactions between spotted owls and barred owls. RA32 stands provide hiding cover for the spotted owls to avoid pursuit by the more aggressive barred owls.

3.6.3.3 Bureau Sensitive Species

BLM Bureau Sensitive Species are species listed or proposed for listing under the ESA and species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. BLM Bureau Sensitive wildlife species known or suspected to be present in the Project Area are northwestern pond turtles, pacific fisher, fringed myotis bat, and Townsend's big-eared bat. See Appendix F, Wildlife for a complete list of special status species considered and evaluated for this project.

Northwestern pond turtles

Northwestern pond turtles (Bureau Sensitive) live in fresh water environments with abundant aquatic vegetation, basking spots, and terrestrial surroundings for nesting and overwintering. Northwestern pond turtles may move up to 0.5 mile from the nearest source of water for egg laying, but most nests are within 100 yards of water (Brown, et al. 1995).

Two northwestern pond turtles were observed in a pond in a former rock pit in the Twin Ranch Project Area, approximately 0.125 mile from a proposed harvest unit.

Pacific fisher

Pacific fishers are found in forest woodland landscape mosaics that include conifer-dominated stands. Their occurrence is closely associated with low to mid-elevation (generally less than 4,100 feet) forests with a coniferous component, large snags or decadent live trees and logs for denning and resting, and complex physical structure near the forest floor to support adequate prey populations (Aubry and Lewis 2003). They are not limited to older seral habitat. They will use harvested areas if patches of habitat with residual components (i.e., logs, hardwoods) and areas with patches of larger trees are left in the landscape (Diller, Hamm, and Thompson 2004). This includes 5- to 10-year-old regeneration harvests and heavily thinned stands with large residual trees associated with them, either within the stands or at the edge.

Forest type is probably not as important to fishers as the vegetative and structural aspects that lead to abundant prey populations. Prey and scavenged remains recovered from den and rest sites in southwest Oregon include rabbit, ground squirrel, flying squirrel, woodrat, opossum, skunk, porcupine, bobcat, deer and elk carrion, jay, woodpecker, grouse, berries, and yellow jackets (Aubry and Raley 2006, 26).

Females usually give birth in cavities in large live or dead trees. These cavities are in trees with openings that access hollows created by heartwood decay (Aubry and Raley 2002, 7). After the kits become more active, the females move them to a larger den on or near the forest floor. These dens are primarily cavities in the lower bole or butt of live or dead large trees. Fisher also uses mistletoe brooms and rodent nests for rest sites (Aubry and Raley 2002, 23). Connectivity of late-successional forests is important. Fishers have been found to avoid nonforested areas, so they are affected by fragmentation (Zielinski, et al. 2004).

The Pacific Northwest Research Station's Olympia Forestry Services Laboratory and Rogue River National Forest (now the Rogue River-Siskiyou National Forest) conducted a fisher research project from 1995 to 2000 in the Prospect Ranger District (now the High Cascades Ranger District). Researchers captured 22 fishers during the project (Aubry and Raley 2006, 10). During the study, a fisher was located on BLM lands approximately 1.5 miles north of the Project Area.

Fishers are highly mobile and have large home ranges. The research project established that fishers travel over large areas. The average home range for females was approximately 6,200 acres (25 square kilometers). Male home ranges varied from approximately 36,300 acres (147 square kilometers) during breeding season to 15,300 acres (62 square kilometers) during the nonbreeding season (Aubry and Raley 2006, 14). One male dispersed approximately 34 miles (55 kilometers) to the Big Marsh area on the Deschutes National Forest (Aubry and Raley 2002, 5).

The BLM conducted fisher surveys south of the Project Area in 2007 and 2008 using bait stations and camera sets. During the study, BLM biologists detected a fisher approximately 5 miles southeast of the Project Area in the Big Butte Creek fifth field watershed.

Fishers appear to use a variety of habitats. No habitat management guidelines have been established for fisher, relative to how much of what stand character units should be maintained. The 25,630 forested acres of BLM-administered lands in Big Butte Creek fifth field watershed contain approximately 15,900 acres of late-successional forest (80 years and older) that provide potential habitat for Pacific fisher. These lands would provide habitat (foraging, hiding, and denning) for the Pacific fisher.

USFWS published a finding in April 2004 that a petition to list fishers as a “Federally Threatened” species was warranted but precluded by higher priority listing actions. The species remains a USFWS candidate species (69 FR 68: 18769-18792). An interagency Fisher Conservation Assessment is currently being developed and is expected to be released in 2010.

Bats

Past surveys indicate two Bureau Sensitive bat species are present in the Big Butte Creek fifth field watershed: fringed myotis (*Myotis thysanodes*) and Townsend’s big-eared bat (*Corynorhinos townsendii*). A suspected pallid bat (*Antrozous pallidus*) was observed at a pond within the Project Area, but was not captured and positively identified.

Fringed myotis appear adapted to live in areas with diverse vegetative substrates. They are associated with a variety of habitats including conifer forests and oak woodlands. They roost in buildings, caves, and mines, and in crevices and cavities in large trees. A single fringed myotis bat was captured at a pond approximately 4.5 miles from any proposed Twin Ranch harvest unit.

Townsend’s big-eared bats are associated with a wide variety of habitats. They are commonly considered a cave-dwelling species, using caves or cave-like roosting habitat. They may use rock outcrops or buildings and large snags. There are no caves or mines, large rock outcrops, or cliffs with cave-like structures within the Project Area. A single Townsend’s big-eared bat was captured at a pond in the Project Area.

Pallid bats west of the Cascade Range are restricted to the drier interior valleys of the southern portion of the state. They are usually found in brushy, rocky terrain, but have been observed at edges of coniferous and deciduous woods and open farmland (Verts and Carraway 1998, 116). Roost habitat includes buildings, bridges, large decadent snags, and rock outcrops. Pallid bats have not been confirmed in the watershed, but they could be present.

3.6.3.4 Neotropical Migratory Birds

In April 2008, USFWS released an updated list of species of migratory nongame birds identified as migratory birds of concern under the Migratory Bird Treaty Act. This list includes game birds below desired condition. Four birds on the migratory birds of concern list are known or suspected to be present within the Project Area:

- Olive-sided flycatcher—present in Project Area
- Purple finch—present in the Project Area
- Rufous hummingbird—present in Project Area
- Band-tailed pigeon—suspected, but not documented in Project Area

Olive-sided flycatchers, purple finch, and rufous hummingbird were found during bird surveys in the Big Butte Creek fifth field watershed. These species use coniferous woodlands, burns, and clearings and may breed in moderately moist, open conifer forests and edge habitat at low to middle elevations. Purple finches nest in vigorously regenerating clearcuts and forests with partial stand retention, deciduous forests, orchards, pastures and lawns with scattered conifers and shrubs, hedgerows, and developed areas.

Band-tailed pigeons are classified as an upland game bird by ODFW. They have not been documented nesting in the Project Area, but could migrate through. Band-tailed pigeons inhabit coniferous forests (Marshall, Hunter, and Contreras 2003) (Sanders 2009). They generally nest in Douglas-fir, but will also nest in hardwoods and shrubs within closed-canopy conifer or mixed hardwood/conifer stands. There is nesting habitat throughout the Big Butte Creek fifth field watershed and the Project Area. The results of breeding bird surveys of Pacific Coast band-tailed pigeons show there is no evidence that annual counts have significantly changed since 1996 (Sanders 2009). Band-tailed pigeons are often found near mineral springs or seeps.

3.6.3.5 Survey and Manage

Great gray owls

Great gray owls nest in a wide variety of habitat types as long as suitable nest sites are available. They use old hawk and raven stick nests, natural depressions in broken-topped trees, platforms of dwarf mistletoe, and stumps for nest sites (Duncan and Hayward 1994). They are not restricted to late-successional habitat. One great gray owl nest was located in the Butte Falls Resource Area in a large broken-top snag in a 20-year-old clearcut. Nesting habitat is present throughout the Big Butte Creek fifth field watershed. Great gray owls may reuse an old nest or they can easily shift territories and construct a new nest each year up to 0.5 mile from the previous nest.

Great gray owls forage for voles, mice, and gophers in open areas such as meadows, recent clearcuts, and oak woodlands. They have been observed foraging up to 2 miles from the nest (Bull and Henjum 1990). The home ranges for breeding adults in northeastern Oregon average 1,112 acres (Quintana-Coyer, et al. 2004).

Wildlife biologists completed surveys for great gray owls in 2007 using current survey protocols (Quintana-Coyer, et al. 2004), surveying the best great gray owl habitat within 1,000 feet of natural meadows in the Twin Ranch Project Area. No great gray owls were detected.

Great gray owls have been observed in the two 100-acre known northern spotted owl activity centers on BLM-administered lands in the Project Area. The owls may have nested in the activity centers, although the nests were not located. Follow-up surveys were completed and no great gray owls were located. Protocol surveys in these areas were negative. No nests have been found in the Project Area.

Great gray owls are raptors and management direction under the ROD/RMP (48) for raptors would be followed. Survey and manage requirements would be applied if a nest is located.

3.6.3.6 Other Species of Concern

Northern goshawks

Northern goshawks nest in mature forest with high canopy cover and an open understory (Woodbridge and Hargis 2006, 2-3). Foraging areas, typically 4,900 to 5,900 acres, are comprised of a forest mosaic, including openings interspersed with large trees, snags, and down logs (Marshall, Hunter, and Contreras 2003, 152). In the Butte Falls Resource Area, wildlife biologists have located nests in lightly thinned stands, but no nests have been found on steep slopes or in stands with thick understory. Goshawks nest in conifer stands containing patches of large trees. The size of forest patches used for nest areas appears to be highly variable across the species' range.

Five historic goshawk nesting territories are located within the Big Butte Creek fifth field watershed; three of these territories are within the Project Area. BLM wildlife biologists have monitored the historic nest stands annually since they were discovered. Only 1 nest in the Project Area, located in a 100-acre known northern spotted owl activity center, has been active in the last 6 years. Known goshawk nests and adjacent timber stands near proposed harvest units were surveyed in 2008 and 2009 by BLM wildlife biological survey crews. No active nests were located. All known goshawk historic nest trees will be protected from harvest. The remaining two historic goshawk nest trees in the Project Area are on matrix lands but are not within proposed harvest units.

Approximately 15,900 acres of late-successional (80+ years) forest occur on BLM-administered lands in the Big Butte Creek fifth field watershed. Trees with suitable nest structure would remain throughout the late-successional forests in the watershed.

Northern goshawks are not on the 2010 BLM special status species list. They are a raptor and would be protected under ROD/RMP management direction to protect raptor nest sites from disturbance (Bureau of Land Management 1995b, 48). Wildlife biologists will check known nests before harvest activities begin. Current ROD/RMP guidelines are to protect goshawk nests by restricting activities within 0.25 mile of active goshawk nests from March 1 to August 1.

3.6.4 Environmental Consequences

3.6.4.1 Effects of Alternative 1 (No-Action) on Wildlife

Direct and Indirect Effects

Connectivity/Diversity Block

No actions are proposed in Alternative 1. No disturbance or loss of habitat from harvest activities would occur. However, natural processes are dynamic and the habitat in the connectivity/diversity block would change over time.

Threatened and Endangered Species

Northern Spotted Owl

The No-Action Alternative would have no direct effect on the northern spotted owl. Forested stands would continue to develop into mature seral stages, benefiting spotted owls. There would be increased opportunities for establishing new spotted owl sites as marginal habitat grows larger and develops into suitable habitat for spotted owls.

Currently dense and overstocked stands would continue to experience competition between the trees. Growth would slow and trees would begin to die due to competition for moisture and nutrients, slowing the development of large overstory trees. Conifers in these stands would not attain potential growth rates. This would result in a longer time frame for large, native conifers to return to dominance. The areas which currently provide dispersal habitat would be slower to develop into suitable spotted owl habitat conditions.

Bureau Sensitive Species

Northwestern pond turtles

The No-Action Alternative would not remove or modify any habitats currently used by northwestern pond turtles.

Pacific fisher

Fishers have not been documented in the Project Area; however, there is a possibility the area could overlap with one or two fisher territories. If fishers are in the Project Area, they would continue to use the area with no disturbance. Habitat would not be removed and disturbance from work activities, such as temporary and permanent road construction and associated noise, would not occur. Forested stands would continue to develop into mature seral stages, increasing the availability of large decadent trees that could provide future resting and denning structures. Patches of trees in a root rot pocket would continue to die and fall over. Adjacent large green trees would be impacted and continue to die. Snags and CWD habitat would increase and openings in the forest would increase as the mistletoe continues to spread.

Larger overstory trees would take longer to develop as competition for nutrients and light continues. Fisher resting habitat would increase as mistletoe continues to infest trees in the southwest part of the Project Area. Snag numbers would increase in stands infected with mistletoe as the trees succumb to the parasite. No disturbance or removal of any constituent elements would occur under the No-Action Alternative.

Bats

There would be no change in current habitat trends under the No-Action Alternative.

Neotropical Migratory Birds

There would be no change in habitat trends under the No-Action Alternative. As the trees grow and canopy cover increases, there would be a reduction in understory forbs and flowering shrubs. A slight decline in foraging habitat for hummingbirds could occur. As the understory closes in, the stand would become less suitable for species that use open understory, such as olive-sided flycatchers and purple finches.

There would be an expected long-term increase in productivity in other species that use older forests with high canopy. There would be a slight decrease in productivity in species that use early and mid-seral forests.

Survey and Manage

Great Gray Owl

There would be no change in habitat trends for great gray owls under the No-Action Alternative.

Other Species of Concern

Northern Goshawks

Northern goshawk's nesting habitat would continue to develop as the overstory trees continue to grow and develop old-growth characteristics. Suitable nesting habitat would remain suitable for the foreseeable future. As the mid-seral stands develop into trees with larger limbs and forked tops, goshawk nesting substrate would increase.

Goshawks need open understory to forage. Thinning would not occur and unthinned stands would take longer to exclude the understory through shading and competition and would not provide good foraging for goshawks for a longer period of time.

Cumulative Effects

No change from current trends in the fifth field watershed is expected. Private industrial forest lands adjacent to the Project Area would be harvested and most would remain in early to mid-seral conditions.

Barred owls may continue to immigrate into the 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 the species. Barred owls may be more of a habitat generalist and may occupy a wider diversity of habitat types than spotted owls. The displacement of spotted owls by barred owls is likely occurring, but the rate and extent of this are unknown. Whether this effect is exacerbated by other confounding issues (including timber harvest) is uncertain (Courtney, et al. 2004).

3.6.4.2 Effects on Wildlife Common to Alternatives 2, 3, and 4

Bureau Sensitive

Northwestern pond turtles

Proposed timber harvest activities in all action alternatives would not affect the persistence of the northwestern pond turtles in the pond and nearby creek. The nearest harvest unit is approximately 0.125 mile from a pond in the Project Area containing turtles. The proposed actions would not impact the pond because it is filled through groundwater seepage and precipitation. The open grassy areas adjacent to the pond and between the road and the creek are likely nesting habitat. The actions proposed in Alternatives 2, 3, and 4 would not modify habitat for northwestern pond turtles.

Bats

Retention of large snags and decadent trees (included in the standard and guidelines for green tree patches in the matrix), riparian reserves, 100-acre known northern owl activity centers, and other

reserves would provide snag and large tree habitat for bats. Although some trees that could be used by bats as roost sites could be harvested, existing snags and coarse woody debris would be retained. Proposed activities would not affect persistence of any of the three Bureau Sensitive bat species known or suspected to be present in the Big Butte Creek fifth field watershed.

Survey and Manage

Great gray owls

The proposed actions would have no expected impacts on great gray owls because no great gray owls were located during protocol surveys. A great gray owl has been observed in two 100-acre known northern spotted owl activity centers located adjacent to the Project Area. No nests were located during survey visits to follow-up the observations. The proposed actions would not affect the ability of great gray owls to forage or nest in the watershed. If a great gray owl nest is found, PDFs would be applied to protect the nest from disturbance.

Other Species of Concern

Goshawk

Proposed harvest activities would have no known impacts to goshawks because no goshawks have been located in the Project Area. Outside the Project Area, approximately 15,600 acres of late-successional (80+ years) forest occur on BLM-administered lands in the Big Butte Creek fifth field watershed. Trees with suitable nest structure would remain throughout the late-successional forests in the watershed. Historic goshawk nests would be checked and any active nest would be protected by leaving a buffer around the nest tree and establishing a seasonal restriction within 0.25 mile to avoid interrupting the breeding cycle any year the action occurs (Bureau of Land Management 1995b, 48). Foraging habitat would be improved by commercial thinning.

The proposed action would not affect the ability of the goshawks to forage or nest in the watershed or migrate through to adjacent watersheds. The proposed actions would not affect the persistence of the species in the watershed where the project is located.

3.6.4.3 Effects of Alternative 2 on Wildlife

Direct and Indirect Effects

Connectivity/Diversity Block

The proposed actions under Alternative 2 meet Medford District ROD/RMP requirements for connectivity/diversity blocks (table 3-16). Late-successional stands reserved from harvest at this time that contribute to meeting late-successional habitat requirements include 100 acres in the known northern spotted owl activity center and 44 acres in a 250-year-old stand. RA32 stands (93 acres) in the connectivity/diversity block would also be reserved from harvest at this time. RA32 stands are late-successional forest.

Alternative 2 proposes commercial thinning on 188 acres of late-successional forest. The thinned acres would continue to retain late-successional forest habitat characteristics. Thinning would not reduce late-successional habitat in the connectivity/diversity block.

Threatened and Endangered Species

Northern Spotted Owls

Alternative 2 meets Medford District ROD/RMP and Northwest Forest Plan requirements for management on matrix and riparian reserve lands. Under Alternative 2, 624 acres are proposed for harvest including 255 acres NRF habitat and 365 acres dispersal habitat. No actions are proposed in the 100-acre known northern spotted owl activity centers or RA 32 stands.

Northern GFMA and shelterwood harvest would remove 66 acres of spotted owl dispersal habitat. Northern GFMA harvest would maintain 6 to 8 trees per acre and shelterwood harvest would retain 12 to 25 trees per acre. After harvest, these stands would have less than 40 percent canopy cover. Stands containing less than 40 percent canopy cover would no longer provide dispersal habitat because the stands would be too open. The remaining stands providing dispersal habitat would be commercially thinned, leaving 40 percent canopy and would retain characteristics that would allow owls to disperse through them.

Spotted owl habitat on 255 acres would be changed from NRF habitat to dispersal habitat. The proposed commercial thinning in NRF habitat would maintain at least 40 percent canopy cover so these stands could be used by dispersing spotted owls. Snags that do not have to be felled for safety reasons would be left in the stand and large CWD would also remain after the action.

Following proposed harvest, the amount of dispersal habitat would increase in the Big Butte Creek fifth field watershed (table 3-17). Spotted owls can use NRF and dispersal habitat for dispersing through the landscape. Spotted owls can disperse across a fragmented mosaic of nonforest areas and a variety of forest age classes (Forsman, et al. 2002). Dispersal habitat in the Big Butte Creek fifth field watershed would not limit the ability of the spotted owl to disperse between fifth field watersheds in the region.

The action would affect, is likely to adversely affect spotted owls because 66 acres of dispersal habitat would be removed and 255 acres of NRF habitat would be changed to dispersal habitat. Impacts to individual resident owls are not known because surveys of known sites in the Project Area in the past three years have been negative. The BLM will conduct protocol surveys in the Project Area following the 2010 USFWS protocol before forest management activities begin. If a resident spotted owl single or pair is found, the harvest units would be reviewed and proposed treatment would be changed to “treat and maintain” within 1.2 miles of the spotted owl location and a seasonal restriction would be implemented. The BLM submitted a Biological Assessment of the Proposed Action to the USFWS and expects to receive a Biological Opinion in July. A decision for the Twin Ranch project will not be signed without a Biological Opinion from USFWS.

Bureau Sensitive

Pacific fisher

Most of the forested Federal land in the Big Butte Creek fifth field watershed is considered to be fisher habitat. The BLM administers 25,630 acres of forested acres in the fifth field watershed; 62 percent of the BLM-administered land is late-successional forest. Late-successional forest generally has the features that fishers use: large overstory trees, hardwoods, high canopy, snags, and CWD. Stands that provide NRF and dispersal habitat for spotted owls also provide fisher habitat. Stands that are not suitable for spotted owls may provide habitat for fisher because fishers will forage in young stands with high canopies that may not be suitable spotted owl habitat.

Fishers are highly mobile and could select a proposed harvest unit for a natal or maternal den. However, fisher density in the Big Butte Creek fifth field watershed is low and none have been documented in the Project Area. Fishers have been located approximately 1.5 miles north and approximately 5 miles south of the Project Area, in different years. The BLM-administered lands are likely on the edge of the range of the fishers in the Southern Oregon Cascade population.

Alternative 2 proposes harvest on 624 forested acres. An array of stand ages and structures would remain after completion of the proposed action. Fishers were found to avoid recent clearcuts and forested stands with less than 40 percent canopy cover (Aubry and Lewis 2003). An array of stand ages and structures would remain after completion of the proposed action. All snags which do not need to be felled for safety reasons would be left in the stands and existing large CWD would remain in the stands.

Under Alternative 2, northern GFMA and shelterwood harvest on 66 acres would leave a residual canopy cover less than 40 percent. This would occur in three units located in different sections in the Project Area. These acres would likely not be used by fishers until the understory brush and small trees begin to grow and provide habitat in 5 to 10 years. Brush and forbs in the recovering regeneration harvest areas provide berries for quail and other birds and for small mammals (e.g., squirrels, skunks, rabbits, hares) that are part of the fisher's diet. The impacts to fisher due of the loss of 66 acres of late-successional forest in 3 scattered areas would not increase the need to list the fisher as T&E.

Proposed commercial thinning would maintain fisher constituent elements (e.g., canopy, snags, and large trees) within the stands and could be used for denning, resting, and foraging. The unharvested acres would continue to provide denning, resting and foraging in the fifth field watershed after the proposed action is completed. The Pacific Northwest Research Station study (Aubry and Raley 2006) showed that although 56 percent of fisher den locations were in unmanaged forests and 38 percent of the den locations were in managed forests, 12 percent of the den locations were in managed forest with more than 66 percent of the overstory trees removed. Younger forested acres which retain some large overstory trees and dense canopy also provide fisher habitat.

Noise disturbance from timber harvest and work activities would occur. However, since fishers are highly mobile, they could move out of the area when the action is ongoing. A loss of habitat in the proposed regeneration and shelterwood harvest areas (66 acres) would occur but fishers have large home ranges and riparian reserves, 100-acre known northern spotted owl activity centers, and unharvested areas would be available to fishers in the Project Area.

Little information is available about the direct impact of logging with the associated noise and spur road construction on fishers. There is evidence that fishers avoid roaded areas (Harris and Ogan 1997). However, fishers cross roads in their territories. Road realignment would move 0.1 mile of new road in the Project Area. Decommissioning 0.7 mile of road is proposed in Alternative 2. There would be a net loss in miles of roads under the Proposed Action. Temporary spur roads (1.1 mile) would be opened and decommissioned after use.

The impacts from new road construction are expected to be minimal, as fishers could move into another area when the disturbance occurs. The amount of road decommissioning versus road construction would lead to a net decrease in open roads. There is no evidence that road construction or use would reduce the persistence of fisher in the fifth field watershed because they could still move through the area and denning, resting, and foraging cover would still be available.

Biomass removal on 517 acres is proposed in Alternative 2. The biomass would remove logging slash to a landing where it would be hauled away. There would be fewer piles of logging slash left in the units because the logging slash would be removed as the logging operation occurs. Fishers occasionally forage in logging slash piles.

Impacts are expected to be mitigated through retention of no-cut buffers in riparian reserves, owl activity centers, and late-successional habitat in the watershed. Approximately 15,340 acres of late-successional habitat on BLM-administered lands would remain after the proposed action. Canopy cover of 40 percent in the commercial thin areas plus retention of snags and coarse wood would maintain the forests for use by fishers for their daily activities. Younger stands 5- to 10-years-old that are recovering from past harvest actions would provide cover for travel and foraging between the older stands. Forest Service lands adjacent to the Project Area in the Big Butte Creek fifth field watershed also provide late-successional habitat for fisher denning, foraging, and resting.

The Proposed Action is not expected to substantially affect denning or resting habitat. Because of the large home ranges, the removal of 66 acres of potential denning habitat would be negligible and is not expected to affect the persistence of fishers in the local population. The proposed action would not reduce the persistence of fishers in the watershed.

Neotropical Migratory Birds

In Alternative 2, northern GFMA and shelterwood regeneration harvest would remove 66 acres of late-successional habitat for Neotropical birds that use older forests. However, the proposed action would add 66 acres of habitat for species that use early seral habitat.

Timber harvest would reduce the suitability of the stands for some bird species and improve the suitability for others. There would be an increase in early seral habitat which would increase the amount of flowering forbs and shrubs in the regeneration harvest areas. This would improve conditions for early seral species, such as rufous hummingbirds, by providing increased nectar-producing flowers.

Edge habitat would increase due to proposed regeneration harvest in 66 acres. Snag and CWD levels would be met on all northern GFMA and shelterwood regeneration harvest units. There would be an increased benefit for species such as olive-sided flycatchers that use edges and residual canopy trees.

Habitat would be improved within commercial thin and selection harvest units for species that use the open understory, including purple finches. Olive-sided flycatchers forage at the edge of clearcuts, perching on large trees and snags at the edge of the forest. Harvest would not reduce these habitat elements and would improve foraging for the flycatchers. All snags that are not felled for safety reasons and existing large CWD would remain. Snags would be left to provide hunting perches for olive-sided flycatchers.

Riparian reserves, untreated areas, 100-acre known northern spotted owl activity centers, late-successional habitat retention, and connectivity/diversity block late-successional acres would preserve patches of late-successional habitat for cover and nesting for birds that use late-successional forests.

The proposed action, while affecting local individual birds with disturbance from harvesting trees and possibly disrupting the nesting cycle in the year the action occurred, would not affect the persistence of any populations of land birds. Proposed activities would not lead to the need to list any of the migratory birds of concern or game birds below desired condition as T&E.

Cumulative Effects

Harvest actions on adjacent private industrial forest lands would continue and most private lands would remain in early to mid-seral conditions. Private industrial forest lands are managed for timber production and will typically be harvested between 40 and 60 years of age, in accordance with State Forest Practices.

Barred owl distribution has spread in Oregon in recent decades. The recent barred owl expansion is as far south as Marin County, California; the barred owl's range now completely overlaps that of the spotted owl.

A barred owl has been observed at two locations in the Project Area. The barred owl was observed in different years, and it may be the same barred owl. Although the barred owls are rapidly expanding their range in North America, Courtney, et al. (2004) concluded that "habitat loss to timber harvest is often postulated to be a major factor in spotted owl decline, but habitat is still present in the study areas (indeed some areas where spotted owls are in the worst decline, such as Olympic National Park, have never been harvested)." It is unclear what the effect of the proposed action would have on barred owl presence, since barred owls may take advantage of habitat disturbance (Courtney, et al. 2004, 8-18).

Biologists working with owls have varied opinions about the possible negative effects of barred owls on spotted owls. The effects of barred owls on spotted owl occupancy, persistence, and reproductive success have been addressed by several authors (Courtney, et al. 2004, 8-19). The Courtney report indicated that studies on the Olympic Peninsula and in the western Cascades in Washington found no difference in the reproductive success of spotted owls with and without the presence of barred owls within 1.5 miles (2.5 km) of spotted owl activity centers. Other modeling studies found the presence of barred owls was negatively correlated with spotted owl presence in Coastal Oregon (Weins, et al. 2007). 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. Two studies, one in northern California and one in northern Oregon, are currently underway. Results are not available at this time and the effects of timber harvest on the presence of barred owls and the effect of barred owl reproduction on spotted owls are not clearly understood.

RA32 stands would contribute to maintaining forest with large diameter trees with high amounts of canopy cover and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees. RA32 stands would not further exacerbate competitive interactions between spotted and barred owls as would occur if the amount of shared resources were decreased (US Fish and Wildlife Service 2008b).

Activities and events that cumulatively affect wildlife include historical and future timber harvest. 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. Continued harvest in matrix lands would continue toward younger stands.

The ROD/RMP and Northwest Forest Plan require that 15 percent of fifth field watersheds retain late-successional forests conditions. Currently, 62 percent (15,900 acres) of the 25,630 acres of BLM-administered forested land in the Big Butte Creek fifth field watershed is late-successional habitat. Alternative 2 would reduce the late-successional habitat by 66 acres.

Approximately 80 percent of Federal lands within the Northwest Forest Plan area is reserved from regeneration timber harvest (Forest Service and Bureau of Land Management 2004, 111) and would develop into suitable owl habitat. Managed, mid-seral stands on Federal, nonreserved matrix and on private lands would offer dispersal quality habitat to spotted owls and may be used as connectivity between blocks of late-successional habitat contained within the Federal reserves.

Therefore, the proposed project would not incrementally affect the stability of the northern spotted owl population in southwestern Oregon since the rate of habitat loss is substantially reduced, there is substantial in-growth of habitat, and newly identified threats are independent to the proposed action.

The assessment of the Northwest Forest Plan implementation effects on the fisher was there is a 63 percent likelihood of achieving an outcome in which there is sufficient quality, distribution, and abundance of habitat to allow the fisher population to stabilize and be well distributed over Federal lands. The Northwest Forest Plan was designed with a network of reserves of late-successional forests surrounded by younger, managed forests.

Fisher populations are believed to have declined on Federal lands within the range of the NSO, primarily for two reasons, both of which are related to the widespread conversion of old-growth Douglas-fir forests to young plantations: loss of habitat due to forest fragmentation resulting from clearcutting designed in a staggered-setting prescription, and removal of large, downed coarse woody debris and snags from the cutting units (Forest Service and Bureau of Land Management 1994, Appendix J2-469).

Many known fisher locations are outside late-successional reserves (Forest Service and Bureau of Land Management 1994, Appendix J2). The species' range includes 34 percent non-Federal lands. Although the Northwest Forest Plan may provide suitable habitat that is well-distributed on Federal lands, fisher populations may never respond and be well-distributed because of (1) their apparently low rates of recolonization of restored habitats after local extirpation, (2) the lower amount of Federal land at lower elevations, and (3) their natural rareness (Forest Service and Bureau of Land Management 1994, Appendix J2-470).

3.6.4.3 Effects of Alternative 3 on Wildlife

Direct and Indirect Effects

Connectivity/Diversity Blocks

The proposed actions under Alternative 3 meet Medford District ROD/RMP requirements for connectivity/diversity blocks (table 3-16). Late-successional stands specifically reserved from harvest at this time to meet late-successional habitat requirements include 100 acres in the northern spotted owl activity center and 44 acres in a 250-year-old stand.

Alternative 3 proposes density management and selection harvest within 274 acres of late-successional forest. These stands would continue to provide late-successional habitat after harvest. Harvest would not reduce the amount of late-successional habitat in the connectivity/diversity block.

Threatened and Endangered Species

Northern Spotted Owl

Alternative 3 meets Medford District ROD/RMP and Northwest Forest Plan requirements for management on matrix and riparian reserve lands. As provided by the ROD/RMP and the Northwest Forest Plan, connectivity across the landscape and between large LSRs would be maintained through the use of riparian management corridors, dispersal and NRF habitat, connectivity/diversity blocks, and 100-acre northern spotted owl activity centers across the fifth field watershed.

Under Alternative 3, 752 acres are proposed for harvest. Selection harvest and density management treatments in NRF and dispersal habitats would "treat and maintain" those habitats by leaving 60 percent canopy cover after the harvest in NRF habitat and 40 percent canopy cover in dispersal habitat. No NRF or dispersal habitat would be altered to the extent that the habitat no longer contains the elements that met NRF or dispersal habitat requirements prior to the action. Large overstory trees, snags, and down logs (NRF constituent elements) would be retained in the units.

Thinning proposed in 201 acres of RA32 stands would "treat and maintain" the stands. The proposed action would remove some overstory and understory green trees. Thinning would reduce some of the RA32 characteristics (older, structurally complex, and multilayered) but would retain the elements qualifying the stand as NRF habitat. Canopy cover would remain at or above 60 percent and the NRF habitat would not be downgraded to dispersal-only habitat.

Surveys of proposed timber harvest units using 2010 USFWS survey protocol would determine if the spotted owls are present in or near Project Area harvest units. If spotted owls are detected during surveys, a seasonal restriction would be implemented. Harvest treatments would "treat and maintain" spotted owl habitat to avoid harm to a spotted owl. Postharvest, the habitat would still meet the habitat elements and function for NRF or dispersal habitat that were present preharvest (60 percent or greater canopy cover for NRF habitat, 40 percent canopy cover for dispersal habitat, large trees, snags, and down logs).

No regeneration or shelterwood harvest is proposed under Alternative 3. All proposed timber harvest would "treat and maintain" NRF and dispersal habitat within the provincial radius (1.2 miles) of three 100-acre known spotted owl activity centers. There would be no change in the amount of NRF and dispersal habitat within the fifth field watershed. Snags that do not have to be felled for safety reasons would be left in the stand and existing CWD would also remain after the action.

Following the action, spotted owls can continue to use the landscape as they did prior to the action. Spotted owls can disperse across a fragmented mosaic of nonforested areas and a variety of forest age classes (Forsman, et al. 2002, 2).

Fuels treatments proposed under Alternative 3 would leave all activity slash in the forest to be lopped and scattered or hand piled and burned. Piling brush and leaving the piles to dry for a summer and fall would create places for small mammals, birds, and other vertebrates to hide, forage, and raise young for a season. These piles would be burned in the fall or the following spring. Spotted owls could benefit from a small increase in productivity of prey such as deer mice and small invertebrates for the first year.

Bureau Sensitive Species

Pacific fisher

Alternative 3 proposes selection harvest, density management, and riparian thinning on 752 acres. An array of stand ages and structures would remain after completion of the proposed action. All snags that do not need to be felled for safety reasons and existing large CWD would remain in the stands after harvest.

Alternative 3 would leave 40 to 60 percent canopy cover in all proposed harvest units. Timber harvest proposed within dispersal habitat would retain 40 to 60 percent canopy and fisher could continue to den, hunt, rest, and disperse through the stands.

Impacts from roads would be similar to Alternative 2, except only 0.2 mile of temporary spur road would be constructed under Alternative 3. These roads would be constructed and decommissioned after the action. The differences in effects from temporary spur road construction between Alternative 2 (1.1 miles) and Alternative 3 (0.2 mile) would be negligible.

After the units have been logged, slash left in the units would be assessed and piled, if needed. These piles could be left on-site for one to two years. The piles would be burned after the fall rains or the following spring. Fisher prey (mice, squirrel, and small birds) could use the slash piles until the piles are burned. There could be a slight increase in prey as a result of the slash piles, but this would be a temporary benefit.

Most of the forested Federal land in the Big Butte Creek fifth field watershed is considered to be fisher habitat. There are 25,630 acres of forested acres on BLM-administered lands in the fifth field watershed, with 62 percent of these lands in late-successional forest. Contiguous blocks of US Forest Service lands adjacent to BLM lands in the fifth field watershed provide more habitat connectivity for fishers different from the checkerboard ownership of private-BLM lands in the Big Butte Creek fifth field watershed. The late-successional forest generally has the features that fishers use: large overstory trees, hardwoods, high canopy, snags, and CWD. Stands that provide NRF and dispersal habitat for spotted owls also provide fisher habitat. Stands which are not suitable for spotted owls may provide habitat for fisher because they would forage in young stands with high canopy which may not be suitable spotted owl habitat.

During timber harvest, noise disturbance from timber harvest and work activities would occur. Fishers are highly mobile and could move out of the area when the action is occurring. Because the units are scattered throughout the Project Area and surrounded by forests where fishers may be hunting, dispersing, and rearing young, fishers would experience displacement if they are in the area.

Harvest treatments would not remove late-successional forest function, although some larger trees would be removed. Canopy cover would remain high (40 to 60 percent) and large trees, snags, and coarse wood would all be present after the action is completed. Forested acres in the watershed would remain available for foraging, resting, and dispersal. Snags, CWD, and older forest would provide foraging, resting, and denning opportunities.

The proposed project could possibly disturb habitat in one or two fisher home ranges. Fishers have large home ranges and could move away from the activity while it is occurring. The Proposed Action is not expected to substantially affect denning or resting habitat. Although fishers are considered to be naturally rare in the area, the effects to fisher populations of projects proposed in Alternative 3 are not expected to reduce the persistence of fishers in the fifth field watershed.

Neotropical Migratory Birds

Proposed harvest activities may disturb individual birds during tree harvest and could disrupt the nesting cycle in the year the action occurs, but would not affect the persistence of any populations of land birds. There would be more habitat with higher canopy cover, but fewer early seral forbs and shrubs available for species that use these habitats (i.e., rufous hummingbird).

Species such as olive-sided flycatchers that use open forests with open understories would benefit from selection harvest and thinning that opens the understory.

The proposed action is not expected to affect population persistence of any Neotropical or nonmigratory bird species. Proposed activities would not lead to the need to list any of the migratory birds of concern or game birds below desired condition as T&E.

Cumulative Effects

Cumulative effects to wildlife from the actions proposed in Alternative 3 would be the same as those discussed in Alternative 2.

3.6.4.5 Effects of Alternative 4 on Wildlife

Direct and Indirect Effects

Connectivity/Diversity Blocks

The proposed actions under Alternative 4 meet Medford District ROD/RMP requirements for connectivity/diversity blocks (table 3-16). The impact to the connectivity/diversity block would be the same as Alternative 2 because proposed projects in the connectivity/diversity block are the same for both alternatives.

Threatened and Endangered Species

Northern Spotted Owl

Under Alternative 4, 624 acres are proposed for selection harvest, commercial thinning, and riparian reserve thinning. Spotted owl habitat on 255 acres would be downgraded from NRF to dispersal. Harvest in 371 acres of dispersal habitat would “treat and maintain.” All RA32 stands would be deferred from harvest under Alternative 4. Snags that do not have to be felled for safety reasons would be left in the stand and existing CWD would also remain after the action.

Alternative 4 meets Medford District ROD/RMP and Northwest Forest Plan requirements for management on matrix and riparian reserve lands. As provided by the ROD/RMP and the Northwest Forest Plan, connectivity across the landscape and between large late-successional reserves would be maintained through the use of riparian management corridors, dispersal and NRF habitat, connectivity/diversity blocks, and 100-acre known northern spotted owl activity centers across the watershed.

The Twin Ranch project may affect northern spotted owls because proposed timber harvest would reduce suitable owl habitat within the provincial radius (1.2 miles) of three 100-acre known northern spotted owl activity centers. Wildlife biologists would conduct protocol surveys of the known sites and suitable habitat within the project units and 1.2 miles outside the Project Area using the 2010 USFWS

draft spotted owl survey protocol (U.S. Fish and Wildlife Service 2010) to determine if spotted owls are using the area.

The downgrade of NRF habitat to dispersal habitat is not expected to result in harm to individual spotted owls because there are currently no known resident spotted owls in the Project Area vicinity. The proposed action would likely result in the affected areas having a reduced capability to support nesting, roosting, and foraging due to habitat changes caused by timber removal.

Following proposed harvest, spotted owls would be able to disperse through the fifth field watershed. NRF habitat also provides dispersal habitat. Spotted owls can disperse across a fragmented mosaic of nonforest areas and a variety of forest age classes (Forsman, et al. 2002, 2).

RA32 stands would maintain the best spotted owl habitat in the Project Area. Maintaining forest with large diameter trees with high amounts of canopy cover and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees would not further intensify competitive interactions between spotted owls and barred owls as would occur if the amount of shared resources were decreased (U.S. Fish and Wildlife Service 2008b).

Bureau Sensitive Species

Pacific fisher

In Alternative 4, 624 acres are proposed for forest management activities: 558 acres of thinning and 66 acres of selection harvest. Proposed harvest treatments would not remove late-successional forest, although canopy cover would be reduced from 60 percent or greater to a minimum of 40 percent on 255 acres of late-successional habitat. All snags which do not need to be felled for safety reasons and existing large CWD would remain in the stands.

Late-successional forest generally has the features that fishers use: large overstory trees, hardwoods, high canopy, snags, and CWD. Most of the forested Federal land in the Big Butte Creek fifth field watershed is considered to be fisher habitat. There are 25,630 acres of forested acres on BLM-administered lands in the fifth field watershed, with 62 percent of these lands in late-successional forest. Forest Service lands adjacent to BLM lands in the fifth field watershed provide contiguous habitat for fisher.

An array of stand ages and structures would remain after completion of the actions proposed in Alternative 4. Stands that provide NRF and dispersal habitat for spotted owls also provide fisher habitat. Stands that are not suitable habitat for spotted owls may still provide habitat for fisher. Fisher forage in young stands with high canopy which may not be suitable spotted owl habitat. Although there would be loss of overstory and understory trees, the areas would still provide primary constituent elements for fishers (snags, CWD, large overstory trees, prey, etc.). Forested acres in the watershed would remain available for fisher foraging, resting, and dispersal. Areas in younger forests with snags and root wads would provide foraging, resting, and denning opportunities.

Proposed harvest units are scattered throughout the Project Area and surrounded by forests where fishers could hunt, disperse, and rear young. Harvest is proposed in 624 acres and disturbance would occur while the action is ongoing. Fishers have large home ranges and are highly mobile; they could move out of the area when the action is occurring.

The proposed action is not expected to substantially affect denning or resting habitat denning or resting habitat. Although fishers are considered to be naturally rare in the area, the effects to fisher populations from projects proposed in Alternative 4 are not expected to reduce the persistence of fishers in the southern Oregon Cascades.

Neotropical Migratory Birds

Selection harvest, commercial thinning, and riparian thinning that would reduce 624 acres of understory habitat could remove some hiding cover and nesting habitat for Neotropical birds that use older forests. Riparian reserves, unharvested areas, 100-acre known northern spotted owl activity centers, late-successional habitat retention, and connectivity/diversity block late-successional acres would preserve patches of late-successional habitat for cover and nesting birds that use late-successional forests.

Habitat would be improved within selection harvest and commercial thinning units for species that use the open understory. Olive-sided flycatchers forage at the edge of clearcuts, perching on large trees and snags at the edge of the forest. Harvest would not reduce these habitat elements, and would improve foraging for the flycatchers. Snags would be left to provide hunting perches for olive-sided flycatchers.

Proposed harvest and riparian thinning activities that occur during the active nesting period could cause some nests to fail; however, loss of some nests would be unavoidable. The loss of a nest in one nesting season is not expected to reduce the persistence of any bird species in the watershed.

The proposed action is not expected to affect population viability of any Neotropical or nonmigratory bird species. Proposed activities would not lead to the need to list any of the migratory birds of concern or game birds below desired conditions as T&E.

Cumulative Effects

Cumulative effects to wildlife from the actions proposed in Alternative 4 would be the same as those discussed in Alternative 2. Although, 66 acres of dispersal habitat proposed for regeneration harvest in Alternative 2 would not be removed in Alternative 4, this would not change the cumulative effects.

Table 3-18. Northern Spotted Owl Habitat Changes on BLM-administered Lands in the Big Butte Creek Fifth Field Watershed by Alternative

		Alternative 1	Alternative 2	Alternative 3	Alternative 4
NRF Habitat Change by Alternative					
Preharvest	Acres	10,206	10,206	10,206	10,206
	Percent	34.6	34.6	34.6	34.6
Acres removed		0	255	0	255
Acres treated and maintained		0	0	358	0
Postharvest	Acres	10,206	9,951	10,206	9,951
	Percent	34.6	33.7	34.6	33.7
Change in NRF habitat	Acres	0	-255	0	-255
	Percent	0	-2.5	0	-2.5

Table 3-18. Northern Spotted Owl Habitat Changes on BLM-administered Lands in the Big Butte Creek Fifth Field Watershed by Alternative

		Alternative 1	Alternative 2	Alternative 3	Alternative 4
Dispersal Habitat Change by Alternative					
Preharvest	Acres	8,530	8,530	8,530	8,530
	Percent	29.8	29.8	29.8	29.8
Acres added (downgraded NRF)		0	255	0	255
Acres removed		0	66	0	0
Acres treated and maintained		0	299	589	371
Postharvest	Acres	8,530	8,719	8,530	8,785
	Percent	28.9	29.5	28.9	29.8
Change in dispersal habitat	Acres	0	+189	0	+255
	Percent	0	+2.1	0	+3.0
Total BLM-managed lands in Big Butte Creek fifth field watershed: 29,500 acres					

3.7 Fuels

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

canopy base height. The lowest height above the ground with sufficient understory canopy fuel to propagate fire vertically through the canopy. Canopy base height determines whether surface fires can climb into tree crowns.

canopy bulk density. The weight of fine canopy fuels (leaves, needles, smaller branches) divided by the total canopy volume. It determines whether crown fire spread, or the horizontal transfer of fire between crowns, can occur.

fire regime. The natural frequency, severity, and extent of fires occurring in an area. The five natural (historical) fire regime classes are based on the average number of years between fires (fire frequency) combined with the severity (amount of stand replacement) of the fire on the dominant overstory vegetation.

- **Fire Regime I:** 0- to 35-year frequency; low severity to mixed severity. Frequent low intensity surface fires are the norm. Typical climax plant communities include ponderosa pine, dry-site Douglas-fir, mixed conifer, and oak woodlands.
- **Fire Regime II:** 0- to 35-year frequency; moderate to high severity. Typical plant communities include true grasslands and savannahs, ceanothus, and Oregon chaparral.
- **Fire Regime III:** 35- to 200-year frequency; low to mixed severity. This regime usually results in a mixed landscape. Lower severity fire tends to predominate in many events. Typical plant community is mixed conifer.
- **Fire Regime IV:** 35- to 200-year frequency; replacement severity. Plant communities arise from or are maintained by stand-replacement fires. Typical plant communities include lodgepole pine, aspen, western larch, and western white pine.
- **Fire Regime V:** 200+ year frequency; any severity. Natural ignitions are very rare or virtually nonexistent; environmental conditions rarely result in large fires. Typical plant communities include Douglas-fir, noble fir, and mountain hemlock.

3.7.1 Methodology

- The Fuels analysis area is the Big Butte Creek fifth field watershed.
- Data on fire hazard and risk was taken from the Jackson County Integrated Fire Plan assessments.
- Data on FRCC (Fire Regime Condition Class) was taken from LANDFIRE data, using prioritized and stand FRCC.
- Fuels models and expected fire behavior were determined from *Standard Fire Behavior Fuels Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model* by Scott and Burgan.

3.7.2 Assumptions

- Fire regime condition classes were analyzed for only BLM-administered lands because stand age identification for other land ownerships is not available.
- Private industrial forest lands will be intensively managed on commercial economic rotations averaging 60 years (Forest Service and Bureau of Land Management 1994, 4-5), so the actual percentage of FRCC 3 within the fifth field watershed could be higher than the percentage found on BLM-administered lands.

3.7.3 Affected Environment

The Twin Ranch Forest Management Project is located in the Big Butte Creek fifth field watershed. The stands in the Project Area are overstocked and have high densities. Overstocked stands have a greater potential for severe, stand-replacing wildfires. Currently, the proposed treatment stands represent timber-litter and timber-understory fuels types. As fuel loadings increase in these fuel types, resultant fire behavior also increases. See Appendix G, Fuels, for general descriptions of fuels types and expected fire behavior.

Historically, fires are a normal occurrence and have played a key role as a natural disturbance process throughout southwestern Oregon. However, fire suppression and forest management activities have altered the historic vegetative patterns within this fifth field watershed.

3.7.3.1 Fire Regime and Condition Class

Climate and topography combine to create the fire regime found throughout the Project Area. Research suggests that variable fire history, complex geology, land use history, and steep environmental gradients in the Douglas-fir/hardwood forests of the southwest Oregon and northern California Siskiyou Mountains prevent generalizations about fire and its ecological effects (J. Agee 1993). However, plant association groups are a credible link to historical ecological processes, including fire regimes that occurred on sites in the past (Agee and Franklin 2003). Historical fire regimes and the subsequent departure from them are correlated with the change from historical to current vegetative structure. The change in vegetation also helps to describe the difference in fuel loading from historical to current conditions.

All five historic fire regimes are present in the Big Butte Creek fifth field watershed. According to LANDFIRE data, 84 percent of the watershed is Fire Regime 1, 12 percent is Fire Regime 3, and 4 percent is a mixture of Fire Regimes 2, 4, and 5. This data suggests that historically the majority of the Big Butte Creek fifth field watershed burned with frequent low- to mixed-intensity surface fires.

Condition classes are a function of how much the current fire regimes have departed from historical fire regimes, resulting in alterations of components such as species composition, structural stage, stand age, and canopy cover. There are three condition classes:

Condition Class 1 - Fire regimes are within or near an historical range. The risk of losing key ecosystem components is low. Vegetation species composition and structure are intact and functioning within an historical range.

Condition Class 2 - Fire regimes have been moderately altered from their historical range (more than one return interval). This change results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns.

Condition Class 3 - Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. This change results in dramatic changes to fire size, frequency, severity, or landscape patterns.

Within the Big Butte Creek fifth field watershed, 66 percent of the land falls into condition class 2 or 3 (figure 16). Within the Project Area, 71 percent of the land falls into condition class 2 or 3.

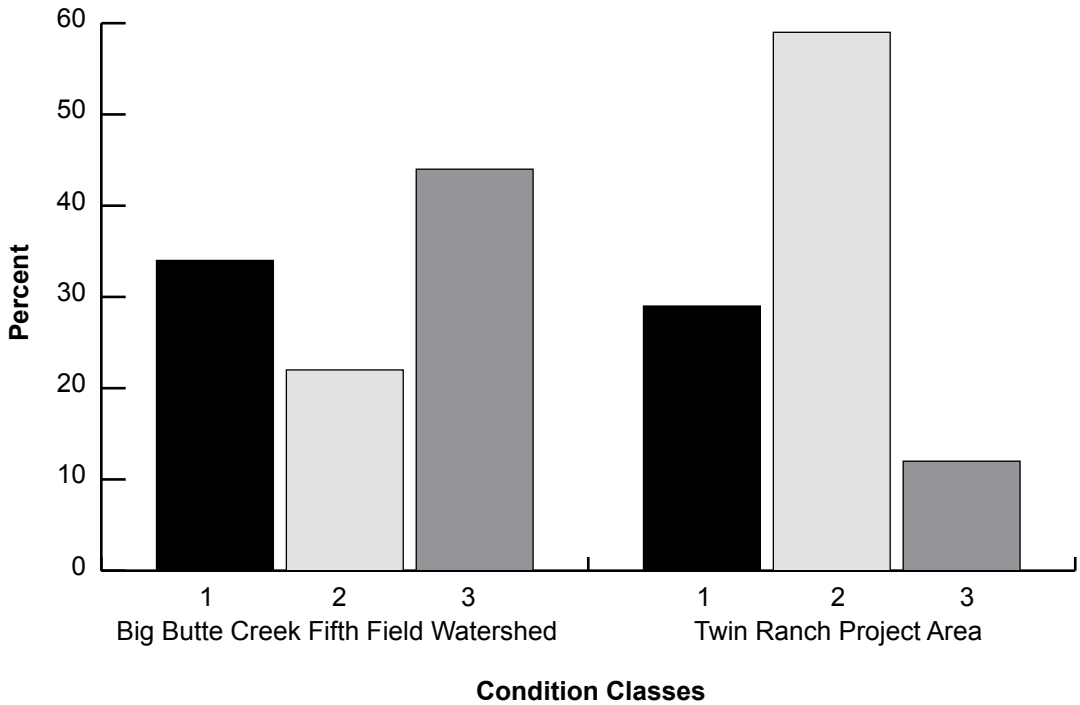


Figure 16. Condition classes in the Big Butte Creek Fifth Field Watershed and Twin Ranch Project Area.

This departure from the historic fire regime is often attributed to fire exclusion, but also includes all human practices that would affect the extent, severity, or frequency of fires compared to historical accounts. These human practices include road building, livestock grazing, forest management practices, and fire suppression.

Changes in vegetation and fuel conditions help to determine the expected change in fire behavior and its effects. This data suggests that fires (which would have historically burned with low to moderate severity) would now burn with higher intensities and greater severities. These numbers indicate the area could benefit from treatment to reestablish the historical fire regime.

3.7.3.2 Fire Hazard

Fire hazard assesses vegetation by type, arrangement, volume, condition, and location. These characteristics combine to determine the threat of fire ignition, the spread of a fire, and the difficulty of fire control. Fire hazard is a useful tool in the planning process because it helps in the identification of broad areas within a watershed that could benefit from fuels management treatment. Hazard ratings were developed for the watershed and Project Area using data from the Jackson County Fire Risk Analysis (figure 17).

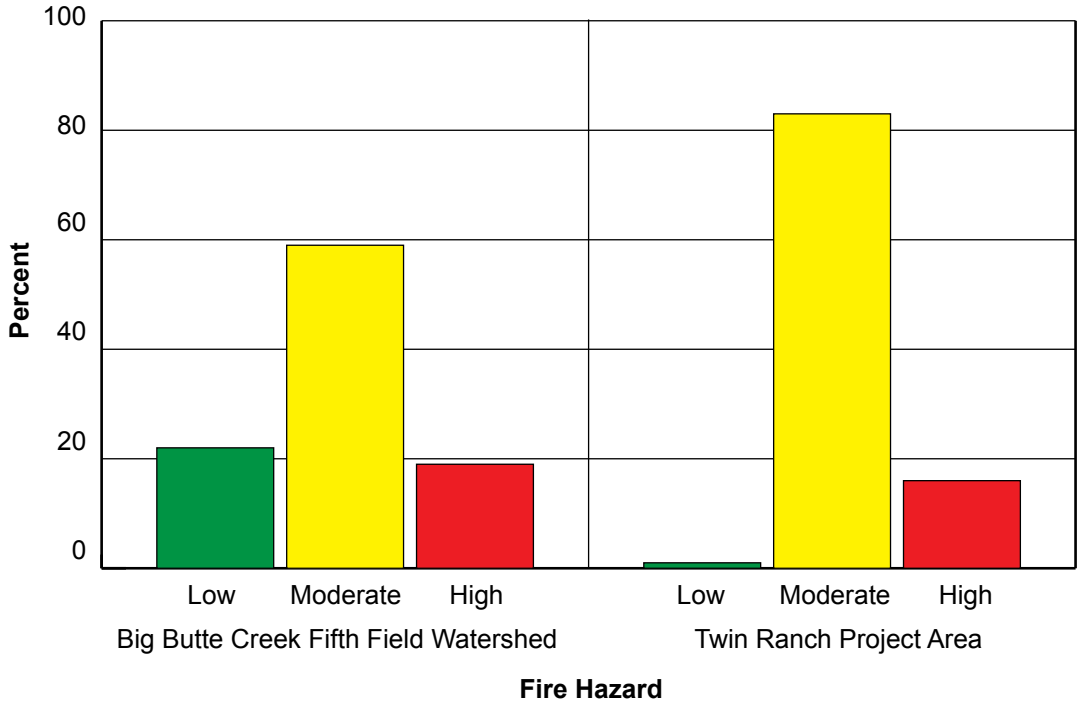


Figure 17. Fire hazard in the Big Butte Creek Fifth Field Watershed and Twin Ranch Project Area.

In general, the existing fuel profile within both the watershed and the Project Area represents a moderate to high fire hazard under average climatic conditions.

3.7.4 Environmental Consequences

3.7.4.1 Effects of Alternative 1 (No-Action) on Fuels

Direct and Indirect Effects

Under the No-Action Alternative, existing surface, ladder, or canopy fuels would not be treated. Fuels would continue to accumulate on the forest floor. Stands would remain in their current fuel type and continue to trend towards increasing fuel loading and increasing fire behavior. The departure from the historical fire regime would continue to trend toward condition classes 2 and 3. The majority of the Project Area would remain in moderate to high fire hazard. Nearby private land would also be at greater risk for high severity fire effects. Tactical opportunities for firefighting resources would be reduced and resultant fire size may increase.

Cumulative Effects

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

3.7.4.2 Effects on Fuels Common to Alternatives 2, 3, and 4

Preliminary fuels treatments were recommended for each unit by alternative (Appendix G). 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. All fuels treatments would begin within 30 days after completion of harvest activities.

Immediately following forest management activities and prior to slash disposal, fire behavior potential would increase from the current potential fire behavior due to increased surface fuels. Following slash disposal treatments, a reduction in potential fire behavior would occur.

Forest management activities generally increase the surface fuels within a stand. However, 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). At the landings, slash could be piled, chipped, removed for biomass, sold for firewood, or burned. Slash remaining within the stands could be lopped and scattered or hand piled and burned. Because a majority of the slash is expected to be removed from the unit, surface fuel loads are anticipated to be light.

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 expected flame lengths, fire duration, and intensity. By 10 to 15 years posttreatment, 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 percent. Fuels greater than 6 inches in diameter would be left on the surface and would contribute to the coarse woody debris load. This treatment would move stands from a slash fuel type into a timber fuel type, which would result in reduced rates of fire spread and flame lengths.

3.7.4.3 Effects of Alternative 2 on Fuels

Direct and Indirect Effects

In Alternative 2, proposed forest management actions are regeneration harvest (northern GFMA and shelterwood), commercial thinning, and riparian reserve thinning. Proposed activity slash treatments under this alternative include slashing damaged conifers, lopping and scattering, hand piling and burning, or removing biomass.

Regeneration harvest (northern GFMA and shelterwood) creates a new stand. For the first one to five years these stands would remain a slash fuel type until the shrubs, grasses, and planted trees become established.

After establishment of regeneration, these units would move into a brush fuel type. Brush fuel types are extremely volatile and are susceptible to high rates of mortality. Stands would exhibit high flame lengths, rates of spread, and intensity. Fires started within these stands could be difficult to initially attack and control. For 5 to 20 years following planting, fire hazard and fire risk would increase in these stands.

Regeneration harvest would move stands into FRCC 3, no matter what fuels treatment takes place. This is due to the conversion of the age class from 80 years and greater back to an age class less than 10 years. Prior to treatment, the majority of these areas fell into FRCC 1 or 2. These areas would likely remain in FRCC 3 for at least 60 to 80 years.

Commercial and riparian reserve thinning promotes the development and maintenance of large healthy trees. Within one to five years of slash disposal treatments, these units would move from a slash fuel type into a timber litter fuel type, which would result in reduced rates of fire spread and flame lengths. Thinning treatments would reduce torching and crowning potential by increasing canopy base heights and decreasing canopy bulk densities. Commercial and riparian thinning units could have a reduction in potential fire behavior and, therefore, an increase in suppression capability. Thinning units could experience a decrease in fire hazard and risk for 5 to 15 years.

The FRCC of commercial and riparian reserve thinning units would remain unchanged after harvest. These units would continue to represent a change in condition characterized by FRCC 2.

Cumulative Effects

The cumulative impact of the proposed action on FRCCs within both the watershed and the Project Area would be minimal. No treatment acres would be returned to FRCC 1. All treatment acres would remain in FRCC 2 or 3. The departure from the historical fire regime would continue to trend toward condition classes 2 and 3.

The cumulative impact of the proposed action on fire hazard and risk within the watershed and the Project Area would be minimal. However, commercial and riparian reserve thinning areas could experience a decrease in fire hazard and risk as they shift into timber litter models.

3.7.4.4 Effects of Alternative 3 on Fuels

Direct and Indirect Effects

In Alternative 3, proposed forest management activities are selection harvest and density management in matrix and commercial thinning in matrix and riparian reserves. Proposed fuels treatments under this alternative include lop and scatter or hand pile and burn. There would be no biomass removal in Alternative 3.

Selection harvest and density management treatments are intended to create multiaged and multilayered stands. Canopy covers would range from 40 to 60 percent following treatment. The lower canopy bulk density could limit crown fire potential. However, the multilayered structure would result in a lower canopy base height (i.e., ladder fuels), which could create more torching potential and increase the difficulty of control during a fire. Because of the multilayer structure, these stands would represent a timber understory fuel type. Timber understory fuel types exhibit higher rates of fire spread and higher flame lengths than timber litter fuel types. These units would have an increase in potential fire behavior

and, therefore, a decrease in suppression capability when compared to commercial and riparian reserve thinning units.

The FRCC of selection harvest and density management units would remain unchanged after harvest. These units would continue to represent a change in condition characterized by FRCC 2 or 3. Thinning treatments would reduce torching and crowning potential by increasing canopy base heights and decreasing canopy bulk densities. Commercial and riparian thinning units could have a reduction in potential fire behavior and, therefore, an increase in suppression capability. Thinning units could experience a decrease in fire hazard and risk for 5 to 15 years.

The FRCC of commercial and riparian reserve thinning units would remain unchanged after harvest. These units would continue to represent a change in condition characterized by FRCC 2.

Cumulative Effects

When compared to the no action alterative, the cumulative impact of the proposed action on FRCC's within both the watershed and the Project Area would be minimal. No treatment acres would be returned to FRCC1. All treatment acres would remain in FRCC 2 or 3. The departure from the historical fire regime would continue to trend toward condition classes 2 and 3.

When compared to the No-Action Alterative, the cumulative impact of the proposed action on fire hazard and risk within the watershed and the Project Area would be minimal. However, when compared to Alternatives 2 and 4, the cumulative impact within the Project Area of Alternative 3 would be an increase in fire hazard and risk.

3.7.4.5 Effects of Alternative 4 on Fuels

Direct and Indirect Effects

In Alternative 4, proposed forest management activities are commercial thinning (matrix and riparian reserve) and selection harvest. Proposed fuels treatments under this alternative include lop and scatter, hand pile and burn, or biomass removal.

Effects in commercial thinning and selection harvest units are expected to be the same as Alternative 2.

Cumulative Effects

The cumulative impact of the proposed action on FRCCs within both the watershed and the Project Area would be minimal. No treatment acres would be returned to FRCC1. All treatment acres would remain in FRCC 2 or 3. The departure from the historical fire regime would continue to trend toward condition classes 2 and 3.

When compared to the No-Action Alterative, the cumulative impact of Alternative 4 on fire hazard and risk within the watershed would be minimal. Alternative 4 would have a decrease in fire hazard and risk compared to Alternative 2, because selection harvest stands would become timber understory fuel types instead of brush fuel types. Also, Alternative 4 would have a decrease in fire hazard and risk compared to Alternative 3, because commercial thinning stands would become timber litter fuel types instead of timber understory fuel types.

3.8 Carbon Storage

This section provides a basis for the decision maker to determine whether the proposed action or alternatives are likely to significantly impact the human environment with respect to greenhouse gas levels (i.e., atmospheric carbon levels). Changes in greenhouse gas levels affect global climate. Forster, et al. (2007), which is incorporated here by reference, reviewed scientific information on greenhouse gas emissions and climate change and concluded that human-caused increases in greenhouse gas emissions are extremely likely to have exerted a substantial warming effect on global climate. Because forests store carbon, they affect the atmospheric concentrations of carbon dioxide, a greenhouse gas. Forest management can change the amount of carbon stored in a forest.

Scientific knowledge on the interrelationship between greenhouse gas levels and climate change is rapidly changing, and substantial uncertainties and several key limitations remain. One limitation is the inability of current science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. This limitation was identified by the U.S. Geological Survey in a May 14, 2008 memorandum to the U.S. Fish and Wildlife Service, which summarized the latest science on greenhouse gases. That memorandum is incorporated here by reference.

Terms used in this section are defined as follows:

disposition of carbon in harvested wood. Defines where the carbon from harvested wood is stored and how it may be emitted (Smith, Heath and Birdsey 2006).

- **products in use** - End use products that have not been discarded or otherwise destroyed, examples include residential and nonresidential construction, wooden containers, and paper products.
- **landfills** - Discarded wood and paper placed in landfills where most carbon is stored long-term and only a small portion of the material is assumed to degrade at a slow rate.
- **emitted with energy capture** - Combustion of wood productions with concomitant energy capture as carbon is emitted to the atmosphere.
- **emitted without energy capture** - Carbon in harvested wood emitted to the atmosphere through combustion or decay without concomitant energy recapture.

forest ecosystem carbon pools. Live trees, standing dead trees, understory vegetation, coarse woody debris, forest floor organic layer, and soil organic carbon (Smith, Heath and Birdsey 2006).

metric tonne. A measurement of weight equal to 2,200 pounds.

pulpwood - Roundwood, whole-tree chips, or wood residues that are used for the production of paper, orientated stand board, particleboard, or biomass for energy production.

sawlog - A log meeting minimum standards of diameter, length, and defect that is used in the manufacture of lumber.

3.8.1 Methodology

- On July 16, 2009, the U.S. Department of the Interior withdrew the Records of Decision for the Western Oregon Plan Revision. The information contained in the Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management (Bureau of Land Management 2008d) remains relevant because it examined recent and applicable science regarding climate change and carbon storage. That analysis concluded that effects of forest management on carbon storage could be analyzed by quantifying the change in carbon storage in live trees, storage in forests other than live trees, and storage in harvested wood. The discussion in Volume I (pages 220-224); Volume II (pages 537-543), and Volume III, Appendices (pages 28-30) are relevant to the effects analysis for this project and are incorporated by reference.
- The analysis of carbon stored in harvested wood in the 2008 FEIS used a factor for converting board feet of harvested wood to mass of carbon from Smith et al. (2006, 35). Based on information developed after the 2008 FEIS, this factor has been refined to better account for regionally specific conditions and the fraction of harvested volume that is typically milled into solid wood products and into processed wood products. Harvest volumes were converted to cubic feet, converted to pounds of biomass, and then to carbon content, yielding an overall conversion factor of 1,000 board feet = 1.326 metric tonnes of carbon. Of this total amount of carbon in harvested wood, 36.2 percent of harvest volume is considered as sawlogs and 63.8 percent as pulpwood (Haynes 1999) for evaluation using the storage rates over time from Smith, et al. (2006, 27). The improved conversion factor is used in this analysis to evaluate the amount of carbon stored in harvested wood. Information on the development of this conversion factor is on file in the BLM office and is available for review upon request and is incorporated here by reference (R. Hardt, personal communication).
- For the Twin Ranch Project Area, the conversion factor has been adjusted further to reflect the mixed species composition of the stands to be treated. Rather than using the Douglas-fir factor of 35 pounds of biomass per cubic foot, 29 pounds per cubic foot was used with a conversion factor of 1,000 board feet = 1.098 metric tonnes of carbon.
- Carbon was converted to carbon dioxide by multiplying the amount of carbon by 44/12 (the ratio of the molecular weight of carbon dioxide to carbon).

3.8.2 Assumptions

- In the absence of large disturbance events (e.g., wildfire, severe blowdown, or insect epidemics), carbon storage on about 70 percent of BLM-administered lands on the Medford District would increase. On the remaining 30 percent of BLM-administered lands designated as matrix, the PRMP/EIS assumes an annual timber harvest of 3,000 acres. On those acres, timber harvest would decrease carbon storage levels at varying rates and for varying lengths of time, depending on the amount of vegetation removed and how quickly regrowth occurs. Because the vast majority of BLM-administered lands are not allocated to intensive or restricted forest management, it is expected that continued vegetative growth on those lands would lead to more carbon capture and storage than the amount of carbon lost from timber harvest, vegetative respiration, or disturbance events.
- Douglas-fir and white fir are the dominant species that would be harvested. Ground-based logging systems (tractors, skidders, feller-bunchers) would be used with sawlogs the primary product.

- The carbon calculations are estimates based on data from a representative stand of each silvicultural system proposed. The values are not absolute, rather they are generalized estimates that allow a comparison between alternatives.
- Future management (regeneration harvest) may occur within the next 20 to 30 years in the proposed thinning and density management stands.
- Shelterwood regeneration stands would be planted with about 400 seedlings per acre with a second entry in approximately 20 years to remove overstory trees (greater than 20 inches DBH) in excess of 6 to 8 trees per acre.
- The carbon storage and emission analysis period is based on current stand age and the planned ROD/RMP rotation age of 100 years for stands in the northern GFMA. For this project, a 20-year analysis period was used for thinning and a 100-year analysis period was used for regeneration harvests.
- Harvest operations (cutting, yarding, and hauling) result in short-term carbon emissions. For the Twin Ranch project, an average harvest volume of 10,000 board feet per acre was used to estimate a total emission of about 45 metric tonnes of carbon from harvest operations (Bureau of Land Management 2009). This value is common to Alternatives 2, 3, and 4.

3.8.3 Affected Environment

The 2008 FEIS (488-490) described current information on predicted changes in regional climate and is incorporated here by reference. That description concluded that the regional climate has become warmer and wetter with reduced snowpack and that continued change is likely. That description also concluded that changes in resource impacts as a result of climate change would be highly sensitive to specific changes in the amount and timing of precipitation, but specific changes in the amount and timing of precipitation are too uncertain to predict at this time. Because of this uncertainty about changes in precipitation, it is not possible to predict changes in vegetation types and condition, wildfire frequency and intensity, streamflow, and wildlife habitat. The analysis in this EA, therefore, does not attempt to predict changes in the Project Area due to existing or potential future changes in regional climate.

In the Project Area, mixed conifer, closed-canopy stands of Douglas-fir, white fir, incense cedar, sugar pine, and ponderosa pine 70 to 250 years old are proposed for treatment. Within these forests, the quantity of stored carbon 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 on-site carbon and is considered the baseline amount that would be affected by management actions.

3.8.4 Environmental Consequences

3.8.4.1 Effects of Alternative 1 (No-Action) on Carbon Storage

Alternative 1 would not implement the Medford District ROD/RMP management direction for general forest management areas and riparian reserves. No timber management actions would occur.

No forest vegetation would be removed; the current amount of on-site carbon would not be affected. In the long-term, it is expected that continued growth of forest vegetation would result in the increase of stored carbon. Limited reductions in carbon would happen as periodic mortality or decomposition from natural processes occurs. In the absence of catastrophic disturbance events, it is expected that continued forest growth would capture and store more carbon than would be lost from natural processes.

Under Alternative 1 (No-Action), 558 acres would not be thinned. This would result in a net carbon storage inc9ease of about 12,834 metric tonnes over the next 20 years (table 3-19).

Table 3-19. Alternative 1 (No-Action): Metric Tonnes of Carbon Emissions and Storage for 20-year Analysis Period–No Thinning

			Live tree storage					
Silvicultural Treatment	Acres	Emissions 2010-2030	Current Conditions 2010	20-year Analysis Period	Net Change	Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
None	558	0	59,148	71,982	12,834	0	12,834	12,834

- The average thinning stand age is about 80 to 90 years old. ROD/RMP direction provides for another entry when the stand reaches CMAI (culmination of mean annual increment). A 20-year analysis provides the time frame until CMAI is reached
- A representative thinning stand (T34S, R3E, section 35, OI 012) was modeled in Organon (Hann 2003) to derive decadal cubic foot volume growth rates. The calculated value is applied as an average for all thinning stands. The thinning stand selected for analysis was the largest at 131 acres and has a current volume of 52,000 board feet per acre.
- The baseline acres (558) for the 20-year analysis period are from the acres proposed for thinning under Alternative 2.

For the 100-year analysis period, no regeneration harvest or density reduction in RA32 stands would occur on 268 acres. This would result in a net carbon storage increase of 25,581 metric tonnes (table 3-20).

Table 3-20. Alternative 1 (No-Action): Metric Tonnes of Carbon Emissions and Storage for 100-year Analysis Period–No Regeneration Harvest

			Live tree storage					
Silvicultural Treatment	Acres	Emissions 2010-2110	Current Conditions 2010	100-year Analysis Period	Net Change	Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
None	268	0	28,513	54,094	25,581	0	25,581	25,581

- A representative stand (T34S, R3E, section 11, OI 010) was modeled in Organon (Hann 2003) to derive decadal cubic foot volume growth rates. The calculated value is applied as an average for all regeneration stands. The stand selected for analysis was the largest regeneration harvest stand at 34 acres and has a current volume of 54,000 board feet per acre.
- For the 100-year analysis period, 66 acres of regeneration harvest from Alternative 2 are combined with 202 acres of RA32 stands proposed for treatment in Alternative 3. The 268 acres represents the maximum number of acres meeting the 100-year analysis criteria that would not be harvested in Alternative 1.

3.8.4.2 Effects of Alternative 2 on Carbon Storage

Alternative 2 applies silvicultural treatments that implement the Medford District ROD/RMP management direction for general forest management areas and riparian reserves (table 3-21).

Structurally complex stands on matrix lands, as defined by RA32 (US Fish and Wildlife Service 2008b), are reserved from management actions.

Table 3-21. Proposed Silvicultural Treatments in Alternative 2

Silvicultural Treatment	Treatment Acres
NGFMA Regeneration Harvest (RH)	10
Shelterwood Regeneration Harvest (RH)	56
Commercial Thinning (CT)	542
Riparian Reserve Thinning (RT)	16
Total	**624**

It is estimated that about 10,000 board feet per acre of harvested wood would be removed by commercial and riparian thinning; 10,000 board feet contains approximately 11 metric tonnes of carbon. Shelterwood harvest would remove about 35,000 board feet as part of a two-entry silviculture system. The 35,000 board feet of harvested wood contains approximately 38 metric tonnes of carbon.

The amount of live tree carbon in thinning stands would be reduced from approximately 106 metric tonnes per acre to 86 metric tonnes per acre, resulting in the transfer of 20 metric tonnes of live tree carbon to other pools (e.g., on-site dead woody debris, lumber, wood products discarded to landfills, biomass, pulpwood). In regeneration harvest, the amount of live tree carbon would be reduced from 110 metric tonnes of live tree carbon to 39 metric tonnes per acre, with 71 metric tonnes transferred to other pools.

Of the total amount of carbon in harvested wood, 36.2 percent of the volume is used as sawlogs and the remaining 63.8 percent as pulpwood (Haynes 1999).

Harvested Wood Carbon Emissions

Harvested wood in thinning stands would have a short-term (postharvest to 10 years) carbon emission of about 2.7 metric tonnes per acre. In the long-term (11 to 20 years), the carbon emitted would be 0.41 metric tonnes per acre. For the 20-year analysis period, carbon emission from the harvested wood is about 3 metric tonnes per acre. The balance of the carbon, about 8 metric tonnes per acre would remain stored in products still in use or in landfills, or would be emitted with energy capture.

In the average regeneration stand, the short-term (postharvest to 10 years) carbon emissions are about 9.4 metric tonnes per acre. In the long-term (11 to 100 years), the carbon emission is about 4.3 metric tonnes per acre. For the 100-year analysis period, carbon emissions from the harvested wood are about 13.7 tonnes per acre. The balance of the carbon, about 24 metric tonnes per acre, would remain stored in products still in use and in landfills, or would be emitted with energy capture.

Carbon Dioxide Emission

The total carbon dioxide emitted during the 20- and 100-year analysis periods is considered negligible in the context of total U.S. carbon dioxide emissions of 6 billion metric tons (Energy Information Administration 2009).

Thinning in Alternative 2 would result in the emission of about 3.1 metric tonnes of carbon per acre or about 11 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Thinning 558 acres

would result in the emission of 6,138 metric tonnes of carbon dioxide. The carbon dioxide emission represents .000001 percent of current U.S. emissions.

Regeneration harvest would result in the emission of about 13.7 metric tonnes of carbon per acre or about 50 metric tonnes of carbon dioxide per acre during the 100-year analysis period. Regeneration harvest on 66 acres would result in the emission of 3,300 metric tonnes of carbon dioxide. The carbon dioxide emission represents .0000005 percent of current U.S. emissions.

Live Tree Carbon Storage

Continued forest growth following thinning would increase carbon storage approximately 700 cubic feet per acre per decade (Hann, 2003), which is equal to about 8.5 metric tonnes of stored carbon per acre per decade or 0.9 metric tonnes per year. Within 4 years after thinning, the carbon emission level (3 metric tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 30 years of tree growth.

The regeneration harvests would retain 6 to 8 trees 20 inches DBH and greater. The majority of the proposed regeneration stands (56 of 66 acres) would initially have a shelterwood harvest that would retain about 20 trees per acre greater than 20 inches DBH. Additionally, 400 seedlings per acre would be planted in the understory. Over the next 20 years, forest growth would increase stand volume about 300 cubic feet per acre per decade, which is equal to about 4 metric tonnes of stored carbon per acre per decade (table 3-22).

Table 3-22. Alternative 2: Metric Tonnes of Carbon Emissions and Storage for 20-year Analysis Period–Thinning

			Live Tree Storage					
Silvicultural Treatment	Acres	Emissions 2010-2030	Current Conditions 2010	20-year Analysis Period	Net Change Live Trees	Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
CT/RT (40%)	558	1,730	59,148	55,242	-3,906	4,464	558	-1,172

After 20 years, another entry would occur to remove overstory trees in excess of 8 trees per acre. Following the harvest, tree growth would increase stand volume about 240 cubic feet (3 metric tonnes) per acre per decade until stand age 50. After age 50, stand growth would accelerate to an average of 1,000 cubic feet (12.2 metric tonnes) per acre per decade until the end of the analysis period (100 years).

Within 40 years after regeneration harvest, the carbon emission level for the 100-year analysis period would be offset by carbon storage in tree growth. After 100 years of growth, the carbon stored in live trees would be about 101 metric tonnes per acre almost equaling the preharvest level of 106 metric tonnes per acre (table 3-23).

Table 3-23. Alternative 2: Metric Tonnes of Carbon Emissions and Storage for 100-year Analysis Period–Regeneration Harvest

			Live Tree Storage					
Silviculture Treatment	Acres	Emissions 2010-2110	Current Conditions 2010	100-year Analysis Period	Net Change Live Trees	Harvested Wood Storage 2110	Total Storage Increase	Net Carbon (Storage or Emission)
RH	66	903	7,260	6,660	-600	1,637	1,037	135

3.8.4.3 Effects of Alternative 3 on Carbon Storage

This alternative applies silviculture treatments that would be neutral or beneficial to spotted owl habitat (table 3-24). 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 is downgraded.

Table 3-24. Proposed Silviculture Treatments in Alternative 3

Silviculture Treatment	Treatment Acres
Selection Harvest (SC) - 40% canopy cover	66
RA32 - Selection Harvest - 60% canopy cover	108
Density Management - 40% canopy cover	292
Density Management - 60% canopy cover	176
RA32 - Density Management - 60% canopy cover	94
Riparian Thinning - 40% canopy cover	16
Total	**752**

Selection harvest (minimum 40 percent canopy cover) would remove about 15,000 board feet per acre. The harvested wood in 15,000 board feet contains about 16.5 metric tonnes of carbon. The average stand treated using the selection harvest system would be reduced from 109 metric tonnes of live tree carbon to 79 metric tonnes per acre, with 30 metric tonnes transferred to other pools. A carbon analysis period of 20 years is used to reflect the potential of another entry after 20 years

Density management (minimum 40 percent canopy cover) and riparian thinning (minimum 40 percent canopy cover) areas would have harvest volumes of approximately 10,000 board feet per acre. The harvested wood in 10,000 board feet contains about 11 metric tonnes of carbon. The average density management or thinning stand would be reduced from 90 metric tonnes per acre to 70 metric tonnes per acre, resulting in the transfer of 20 metric tonnes of live tree carbon to other pools (on-site dead woody debris, lumber, wood products discarded to landfills, biomass, pulpwood). A carbon analysis period of 20 years is used.

The stands proposed for density management with a minimum of 60 percent canopy cover are estimated to have about 7,500 board feet per acre. The harvested wood in 7,500 board feet contains about 8.2 tonnes of carbon. The average density management stand would be reduced from 90 tonnes per acre of live tree carbon to 75 tonnes per acre, resulting in the transfer of 15 tonnes of live tree carbon to other pools (on-site dead woody debris, lumber, wood products discarded to landfills, biomass, pulpwood). A carbon analysis period of 20 years is used.

A portion of the RA32 stands in the Project Area are proposed for either selection harvest or density management. Selection harvest (minimum 60 percent canopy cover) would have an estimated harvest volume of 10,000 board feet. The harvested wood in 10,000 board feet contains about 11 metric tonnes of carbon. Density management (minimum 60 percent canopy cover) would have an estimated harvest volume of 7,500 board feet. The harvested wood in 7,500 board feet contains about 8.2 metric tonnes of carbon. The average RA32 stand would be reduced from 90 metric tonnes per acre of live tree carbon to 70-75 metric tonnes per acre, resulting in the transfer of 15 to 20 metric tonnes of live tree carbon to other pools (on-site dead woody debris, lumber, wood products discarded to landfills, biomass, pulpwood). RA32 stands would most likely be limited to a single entry and therefore have a carbon analysis period of 100 years.

Of the total amount of carbon in harvested wood, 36.2 percent of the volume is used as sawlogs and the remaining 63.8 percent as pulpwood (Haynes 1999).

Harvested Wood Carbon Emissions

20-year Analysis Period

- Selection harvest (40 percent canopy cover):
- Wood harvested from this treatment would have a short-term (postharvest to 10 years) carbon emission of 4.1 metric tonnes per acre. In the long-term (11 to 20 years), the carbon emitted is 0.6 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 4.7 metric tonnes per acre. The balance of the carbon, 12 metric tonnes per acre, would remain stored in products still in use or in landfills, or would be emitted with energy capture.
- Density management and riparian reserve thinning (40 percent canopy cover):
- Wood harvested from this treatment would have a short-term (postharvest to 10 years) carbon emission of about 2.7 metric tonnes per acre. In the long-term (11 to 20 years), the carbon emitted is 0.41 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 3.1 metric tonnes per acre. The balance of the carbon, 8 metric tonnes per acre, would remain stored in products still in use or in landfills, or would be emitted with energy capture.
- Density management (60 percent canopy cover):
- Wood harvested from this treatment would have a short-term (post-harvest to 10 years) carbon emission of about 2.0 metric tonnes per acre. In the long-term (11 to 20 years), the carbon emitted would be 0.31 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be 2.3 metric tonnes per acre. The balance of the carbon, 6 metric tonnes per acre, would remain stored in products still in use or in landfills, or would be emitted with energy capture.

100-year Analysis Period

- Selection harvest (60 percent canopy cover):

  Wood harvested from this treatment would have a short-term (postharvest to 10 years) carbon emission of about 2.7 metric tonnes per acre. In the long-term (11 to 100 years), the carbon emitted would be 1.2 metric tonnes per acre. For the 100-year analysis period, carbon emissions from the harvested wood would be about 3.9 metric tonnes per acre. The balance of the carbon, 7 metric tonnes per acre, would remain stored in products still in use or in landfills, or would be emitted with energy capture.

- Density management (60 percent canopy cover):

  Wood harvested from this treatment would have a short-term (postharvest to 10 years) carbon emission of about 2.0 metric tonnes per acre. In the long-term (11 to 100 years), the carbon emitted would be 0.87 metric tonnes per acre. For the 100-year analysis period, carbon emissions from the harvested wood would be about 2.9 metric tonnes per acre. The balance of the carbon, 5 metric tonnes per acre, would remain stored in products still in use or in landfills, or would be emitted with energy capture.

Carbon Dioxide Emission

The total carbon dioxide emitted during the 20- and 100-year analysis periods is considered negligible in the context of total U.S. carbon dioxide emissions of 6 billion metric tonnes (Energy Information Administration 2009).

Combining all treatments in the 20-year analysis period would result in the average emission of about 3 metric tonnes of carbon per acre or about 11 metric tonnes of carbon dioxide per acre. Under Alternative 3, 550 acres would be treated and would result in the emission of 6,134 metric tonnes of carbon dioxide during the 20-year analysis period. The carbon dioxide emission represents .000001 percent of current U.S. emissions.

A 100-year analysis period was used to calculate the impacts of density reduction (density management and selection harvest) on carbon levels on about 202 acres of RA32 stands. These treatments would result in the average emission of about 3.4 metric tonnes of carbon per acre or about 13 metric tonnes of carbon dioxide per acre. For the 202 acres treated this would result in the emission of 2,532 metric tonnes of carbon dioxide during the 100-year analysis period. The carbon dioxide emission represents .0000003 percent of current U.S. emissions.

Live Tree Carbon Storage

Continued forest growth following selection harvest (40 percent canopy cover), density management/riparian reserve thinning (40 percent canopy cover), and density management (60 percent canopy cover) would increase carbon storage approximately 700 cubic feet per acre per decade (Hann 2003), which is equal to about 9 metric tonnes of stored carbon per acre per decade or about 1 metric tonne per acre per year. All treatments in the 20-year analysis period would result in the emission of about 10 metric tonnes of carbon per acre. Within 10 years after treatment, the carbon emission level for the 20-year analysis period would be offset by carbon storage from tree growth. Total live tree carbon would equal pretreatment levels after about 20 years of tree growth in the density management (60 percent canopy cover) stands, 30 years in the density management/riparian reserve thinning (40 percent canopy cover) stands, and 40 years in the selection harvest (40 percent canopy cover) stands (table 3-25).

Table 3-25. Alternative 3: Metric Tonnes of Carbon Emissions and Storage for 20-year Analysis Period–Selection Harvest (40%), Density Management/Riparian Reserve Thinning (40%), and Density Management (60%)

			Live Tree Storage					
Silvicultural Treatment	Acres	Emissions 2010-2030	Current Conditions 2010	20-year Analysis Period	Net Change Live Trees	Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
SC (40%)	66	310	7,408	6,283	-1,125	779	-346	- 656
DM (40%)	308	955	32,648	30,492	-2,156	2,464	308	- 647
DM (60%)	176	408	18,876	18,717	-159	1,040	881	473
Total	**550**	**1,673**	**58,932**	**55,492**	**- 3,440**	**4,283**	**843**	**- 830**

In the RA32 stands, continued forest growth following selection harvest (60 percent canopy cover) and density management (60 percent canopy cover) would increase carbon storage approximately 600 cubic feet per acre per decade (Hann 2003), which is equal to about 7 metric tonnes of stored carbon per acre per decade or about 0.7 metric tonnes per acre per year. The RA32 treatments result in the emission of about

7 metric tonnes of carbon per acre in the 100-year analysis period. Within 10 years after treatment, the carbon emission level for the 100-year analysis period would be offset by carbon storage in tree growth. Total live tree carbon would equal pretreatment levels after about 20 years of tree growth (table 3-26).

Table 3-26. Alternative 3: Metric Tonnes of Carbon Storage and Emissions for 100-year Analysis Period–RA32 Selection Harvest (60%) and Density Management (60%)

			Live Tree Storage					
Silvicultural Treatment	Acres	Emissions 2010-2110	Current Conditions 2010	100-year Analysis Period	Net Change Live Trees	Harvested Wood Storage 2110	Total Storage Increase	Net Carbon (Storage or Emission)
DM (60%)	94	271	10,561	15,738	5,177	498	5,676	5,405
SC (60%)	108	419	10,734	17,280	6,546	768	7,314	6,895
Total	**202**	**690**	**21,295**	**33,018**	**11,723**	**1,266**	**12,990**	**12,300**

3.8.4.4 Effects of Alternative 4 on Carbon Storage

Alternative 4 proposes commercial thinning and individual tree selection harvest to reduce stand densities (table 3-27). Structurally complex stands, as defined by RA32 in the 2008 Northern Spotted Owl Recovery Plan, are reserved from management actions.

Table 3-27. Proposed Silviculture Treatments in Alternative 4

Silviculture Treatment	Treatment Acres
Selection Harvest	66
Commercial Thinning	542
Riparian Thinning	16
Total	**624**

Commercial thinning and riparian reserve thinning (minimum 40 percent canopy cover) treatment areas would have harvest volumes of approximately 10,000 board feet per acre. The harvested wood in 10,000 board feet contains about 11 metric tonnes of carbon. The average commercial thinning or riparian thinning stand would be reduced from 90 to 70 metric tonnes per acre, resulting in the transfer of 20 metric tonnes of live tree carbon to other pools (on-site dead woody debris, lumber, wood products discarded to landfills, biomass, pulpwood). A carbon analysis period of 20 years is used.

Selection harvest (minimum 40 percent canopy cover) would remove about 15,000 board feet per acre. The harvested wood in 15,000 board feet contains about 16.5 metric tonnes of carbon. The average stand treated using the selection harvest system would be reduced from 109 metric tonnes of live tree carbon to 79 metric tonnes per acre, with 30 metric tonnes transferred to other pools. A carbon analysis period of 20 years is used to reflect the potential of another entry after 20 years

Harvested Wood Carbon Emissions

Harvested wood in thinning stands would have a short-term (postharvest to 10 years) carbon emission of about 2.7 metric tonnes per acre. In the long-term (11 to 20 years), the carbon emitted is about 0.41 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 3.0 metric tonnes per acre. The balance of the carbon, about 8 metric tonnes per acre, would remain stored in products still in use or in landfills, or would be emitted with energy capture.

Selection harvest stands would have a short-term (postharvest to 10 years) carbon emission of about 4.0 metric tonnes per acre. In the long-term (11 to 20 years), the carbon emitted would be 0.7 metric tonnes per acre. For the 20-year analysis period, carbon emissions from the harvested wood would be about 4.7 metric tonnes per acre. The balance of the carbon, 12 metric tonnes per acre, would remain stored in products still in use or in landfills, or would be emitted with energy capture.

Carbon Dioxide Emission

The total carbon dioxide emitted during the 20- and 100-year analysis periods is considered negligible in the context of total U.S. carbon dioxide emissions of 6 billion metric tonnes (Energy Information Administration 2009).

Thinning in Alternative 4 would result in the emission of about 3.1 metric tonnes of carbon per acre or about 11 metric tonnes of carbon dioxide per acre during the 20-year analysis period. Thinning 558 acres would result in the emission of 6,138 metric tonnes of carbon dioxide. The carbon dioxide emission represents .000001 percent of current U.S. emissions.

Selection harvest would result in the emission of about 4.7 metric tonnes of carbon per acre or about 17 metric tonnes of carbon dioxide per acre during the 20 year analysis period. Selection harvest on 66 acres would result in the emission of 1,122 metric tonnes of carbon dioxide. The carbon dioxide emission represents .0000001 percent of current U.S. emissions.

Live Tree Carbon Storage

Continued forest growth following thinning and selection harvest would increase carbon storage approximately 700 cubic feet per acre per decade (Hann 2003) which is equal to about 8.5 metric tonnes of stored carbon per acre per decade or 0.9 metric tonnes per year. Within 4 years after thinning, the carbon emission level (3 metric tonnes per acre) for the 20-year analysis period would be offset by carbon storage in tree growth (table 3-28). Total live tree carbon would equal pretreatment levels after about 30 years of tree growth. For selection harvest stands, approximately 5 years of growth would offset the carbon emission level (4.7 metric tonnes per acre) for the 20-year analysis period (table 3-27). Total live tree carbon would equal pretreatment levels after about 40 years of tree growth.

Table 3-28. Alternative 4: Metric Tonnes of Carbon Emissions and Storage for 20-year Analysis Period–Thinning and Selection Harvest

			Live Tree Storage					
Silvicultural Treatment	Acres	Emissions 2010-2030	Current Conditions 2010	20-year Analysis Period	Net Change Live Trees	Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
CT/RT (40%)	558	1,730	59,148	55,242	-3,906	4,464	558	-1,172
SC (40%)	66	310	7,408	6,283	-1,125	779	-346	- 656
Total	**624**	**2,040**	**66,556**	**61,525**	**5,031**	**5,243**	**212**	**-1,828**

3.8.4.5 Summary–Comparison of Alternatives

20-year Analysis Period

The No-Action Alternative would result in greater net carbon storage over the 20-year analysis period than Alternative 2 by approximately 11,662 metric tonnes, Alternative 3 by 12,004 metric tonnes, and Alternative 4 by 11,006 metric tonnes (table 3-29 and figure 18).

Table 3-29. Twin Ranch Carbon Emissions and Storage in Metric Tonnes for 20-year Analysis Period

Alternative	Acres	Emissions 2010-2030	Live Tree Storage: Current Conditions 2010	Live Tree Storage: 20-year Analysis Period	Live Tree Storage: Net Change Live Trees	Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
1	558	550	59,148	71,982	12,834	0	12,834	12,834
2	558	1,730	59,148	55,242	-3,906	4,464	558	-1,172
3	550	1,673	58,932	55,492	-3,440	4,283	843	-830
4	624	2,040	66,556	61,525	-5,031	5,243	212	-1,828

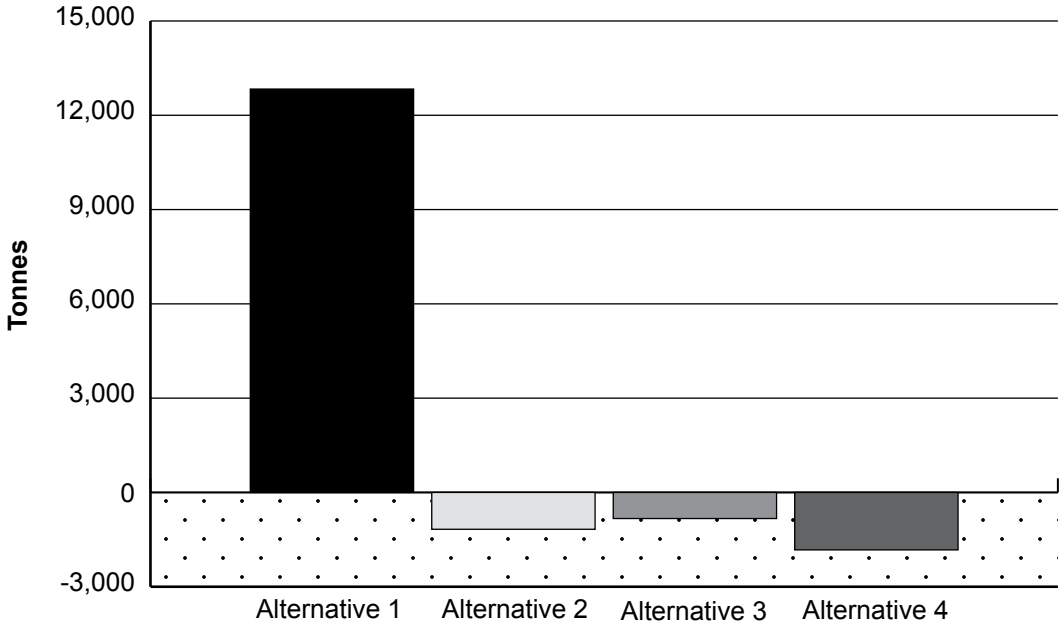


Figure 18. Net carbon storage by alternative for the 20-year analysis period.

For the Twin Ranch project, 89 percent of the treatment acres in Alternative 2, 73 percent of the treatment acres in Alternative 3, and 100 percent of the treatment acres in Alternative 4 were analyzed for the 20-year analysis period.

100-year Analysis Period

The No-Action Alternative would result in greater net carbon storage over the 100-year analysis period than Alternative 2 by 6,635 metric tonnes, Alternative 3 by metric 13,282 tonnes and Alternative 4 by metric 7,069 tonnes (table 3-30 and figure 19).

Table 3-30. Twin Ranch Carbon Emissions and Storage in Metric Tonnes for 100-year Analysis Period

			Live Tree Storage					
Alternative	Acres	Emissions 2010-2100	Current Conditions 2010	100-year Analysis Period	Net Change Live Trees	Harvested Wood Storage 2030	Total Storage Increase	Net Carbon (Storage or Emission)
1	268	0	29,480	58,156	28,676	0	28,676	28,676
2	268	903	28,513	46,425	17,912	1,637	19,549	18,646
3	202	690	21,295	33,018	11,723	1,266	12,990	12,300
4	202	0	21,253	39,765	18,512	0	18,512	18,512

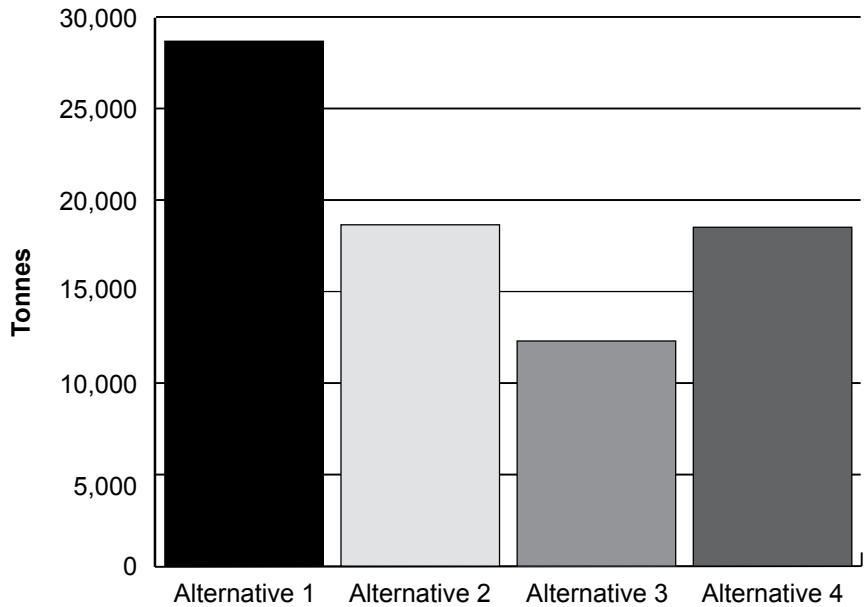


Figure 19. Net carbon storage by alternative for the 100-year analysis period.

3.9 Economics

This section analyzes the potential impacts from the proposed forest management activities on economics.

3.9.1 Methodology

Economics focuses on the project objective of providing a sustainable supply of forest commodities from matrix lands to provide jobs and contribute to community stability (Bureau of Land Management 1995b, 38). In addition to commodity supply, evaluation of the economic feasibility of management actions is a consideration in project design (Bureau of Land Management 1995b, 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 bone dry ton (BDT) for forest biomass that is utilized. The values used per MBF of harvest are based on February 2010 prices for Douglas-fir ($360 per MBF). The values used per BDT of forest biomass utilized are based on a February 2010 quoted price for delivered material to a local biomass plant ($37 per BDT). 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. Utilization of forest biomass over traditional slash treatment is one such activity. Other 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.

3.9.2 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 1994, 3&4-293) .
- Employment levels for forest residue utilization (biomass) are 6 jobs per megawatt of installed electrical generation capacity (Oregon Forests Resources Institute 2006, 2-44). For assessment purposes, 7,500 BDT would produce 1 megawatt and 1,250 BDT would produce 1 full-time equivalent job.
- 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 Twin Ranch Project Area. Assumed harvest levels range from 23 MBF per acre, for more intensive regeneration harvest prescriptions, to 3.5 MBF per acre for lower volume harvest areas such as density management and commercial thinning prescriptions.
- Estimates for biomass utilization from commercial harvest areas are one BDT per MBF of merchantable timber harvested (Forest Service and Bureau of Land Management 2008, 6).

3.9.3 Affected Environment

3.9.3.1 Economic Setting

A regional perspective of the economic setting is provided in the Northwest Forest Plan (Forest Service and Bureau of Land Management 1994, 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 to 2004), the total BLM timber volume offered for the Medford District averaged 77 percent of the planned 571 MMBF levels. Between the years 2005 and 2009, the Medford District BLM has offered 47 percent of the target harvest level of 285 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).

More recently there has been an identified need for increasing the utilization of forest biomass that is created as a by-product of management activities. Agency direction is to develop and supply market infrastructure which utilizes biomass for commercial purposes over more traditional disposal methods such as open burning. Recent legislation and executive policies addressing this include:

- 2000Biomass Research and Development Act
- 2000 National Fire Plan

- 2001 National Energy Policy
- 2003 DOE/DOI/USDA Interagency Memorandum of Understanding (MOU) on Woody Biomass Utilization
- Sections 9006 and 9008 of the 2002 Farm Bill
- 2005 Energy Policy Act
- 2008 Biomass Crop Assistance Program
- 2009 DOI – Renewable Energy Development Order

Historical and current uses of the Big Butte Creek fifth field watershed are described in Section 3.1.3, Other Actions in the Watershed containing the Project Area. Over the past 60 years an estimated 18,849 acres of the 29,521 acres of BLM-administered land in the Big Butte Creek fifth field watershed have had some level of harvest activity. With implementation of the ROD/RMP in 1995, approximately 24,543 acres are currently designated as lands allocated for timber production (matrix).

Merchantable timber on matrix land is highly dispersed and the stocking levels of merchantable-sized trees is variable Individual tracts of BLM ownership within the Twin Ranch 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 20.

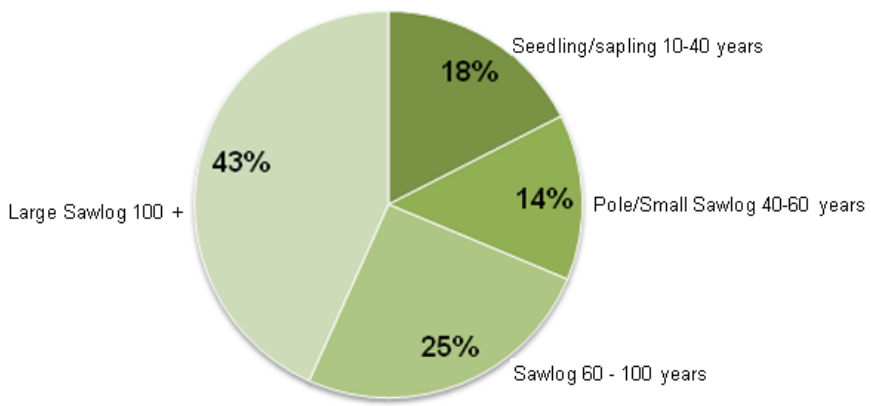


Figure 20. Distribution of matrix land by stage of development.

Figure 20 shows a fairly regulated condition with respect to commodity supply. Approximately one-third 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-aged 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.

3.9.3.2 Economic Factors

Economic factors which affect the supply of 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 will 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 a primary factor affecting actual harvest costs. Tractor yarding is the least-cost method of removal, with cable yarding incurring a higher removal cost, and helicopter yarding the most costly removal method. Removal of associated woody biomass when harvesting sawlog material (trees greater than 8 inches in diameter) is inconsequential with conventional harvest systems (tractor or cable yarding) because leaving tops attached to sawlogs does not significantly affect skidding cycle times. Removal of woody biomass with helicopter harvest systems would increase yarding costs as sawlog payloads are reduced by the biomass weight. 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 the Twin Ranch units. 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.

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 work needed for hauling material, road surface condition with respect to length of 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.

3.9.4 Environmental Consequences

3.9.4.1 Effects of Alternative 1 (No-Action) on Economics

Direct and Indirect Effects

Under the No-Action Alternative, management action would be deferred. There would be no timber volume provided from the Project Area in the fiscal year 2010 timber sale offerings to contribute toward the District's annual allowable sale quantity, no forestry-related jobs would be created, and there would be no return to the Federal Treasury.

Cumulative Effects

Under the No-Action Alternative, there would be no contribution to the Medford District's Allowable Sale Quantity of 18 MMBF for fiscal year 2010. Given the management direction to produce a sustainable supply of timber from matrix lands, the supply and resulting economic affects would fall short of projected levels for fiscal year 2010. 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 to maximize growth potential in mature stands (100 years and older) and in younger stands where densities are high (see Section 3.2, Conifer Growth and Timber Yield).

Known future actions within the Project Area include the Camp Cur timber sale and the Ranch Stew thinning project. These projects are currently under contract with anticipated treatments to occur within the next 3 years. The BLM estimates these projects would provide 7 MMBF of harvest volume from the Project Area. Direct employment as a result of harvest would be approximately 63 full-time equivalent jobs. The BLM also estimates 21,000 BDTs of biomass would be removed in the Ranch Stew project resulting in approximately 17 full-time equivalent jobs.

The only planned timber sale in the Project Area is the Vine Maple timber sale which is scheduled to be offered in 2012. This timber sale has 37 acres being considered within the Twin Ranch Project Area with the remainder of the proposed acres outside the Project Area and the Big Butte Creek fifth field watershed.

3.9.4.2 Effects of Alternative 2 on Economics

Direct and Indirect Effects

Under Alternative 2, approximately 5 MMBF would be harvested on 624 acres resulting in an estimated 8 MBF/acre harvested. Direct employment as a result of timber harvest and processing a commodity would result in approximately 45 full-time equivalent jobs.

The two economic factors which vary by alternative and influence logging costs are volume harvested/acre and average yarding distance/MBF. The proposed 1.1 miles of temporary road construction in Alternative 2 would result in an average yarding distance of 790 feet. Maximum yarding distance within units where temporary road construction occurs would range between 1,000 and 1,400 feet. These factors result in an estimated yarding cost for this alternative of $203 per MBF (table 3-30).

An estimated 4,700 BDTs of biomass would be made available for utilization from commercial timber harvest activities. The estimated employment resulting from biomass utilization would be equivalent to 4 jobs. The estimated return to the Federal Treasury from biomass products would be $1.00 per BDT with a total value of $4,700. Although economic values are assumed to be static for this analysis, positive

net revenue from biomass utilization is sensitive to price fluctuations in the biomass market. These fluctuations in markets could result in a cost to the Federal Treasury because of reduced delivery prices. The estimated return of $1.00 per BDT is based on a February 2010 delivered price of $37 per BDT. For the Twin Ranch Project Area, the BLM estimates removing tree tops and limbs for biomass utilization would result in remaining slash treatment costs of approximately $12,300 dollars. In comparison, costs of slash treatment in this alternative without biomass removal are estimated to be $79,900.

One effect of biomass utilization is a shift in job creation and salary levels. Historically, forest residue has been treated on-site or burned at the log landing. Utilization of forest residue causes employment income typically going to forest workers (who treat logging slash) to shift to employment income for logging equipment operators and processing facilities. Oregon Employment Department figures show average salaries for Forest and Conservation Workers at $30,451 per year and Logging Equipment Operators at $39,874 per year (Oregon Employment Department 2010). Based on an annual salary of $30,451 and the assumption that biomass utilization would reduce slash treatment costs for Alternative 2 by an estimated $67,600 dollars, a reduction of an estimated 2 forest and conservation workers jobs would result.

The estimated return to the Federal Treasury for timber harvest would be $31 per MBF for a total value of $155,000 under Alternative 2.

Cumulative Effects

Alternative 2 would meet ROD/RMP requirements to provide harvest activity on all available timber stands in the Project Area. This would maximize harvest volume and net revenue to the treasury from commercial stands, and improve future timber supply potential in developing stands through thinning treatments. Harvest would contribute 5 MMBF to the Medford District's Allowable Sale Quantity of 18 MMBF for fiscal year 2010 and supply an estimated 4,700 tons of biomass.

Future timber supply from the 66 acres of proposed regeneration harvest would consist of an entry on the 56 acres of planned shelterwood harvests in the next 10 to 15 years to remove shelter trees once reforestation is established. Otherwise, merchantable timber supply would not be provided again from these regeneration treatments until an initial commercial thinning treatment in 40 to 60 years. The 551 acres of commercial thinning on matrix land could be available for harvest again in 10 to 20 years. There would be no additional commercial entry anticipated in the 16 acres of riparian reserve thinning.

In the long-term, volume growth capability would be maximized on areas treated (see Section 3.2, Conifer Growth and Timber Yield). Known future actions within the Project Area include the Camp Cur timber sale and the Ranch Stew thinning project. These projects are currently under contract with anticipated treatments to occur within the next 3 years. The BLM estimates these projects would provide 7 MMBF of harvest volume from the Project Area. Direct employment as a result of harvest would be approximately 63 full-time equivalent jobs. The BLM also estimates 21,000 BDTs of biomass will be removed in the Ranch Stew project resulting in approximately 17 full-time equivalent jobs.

The only planned timber sale in the Project Area is the Vine Maple timber sale which is scheduled to be offered in 2012. This timber sale has 37 acres being considered within the Twin Ranch Project Area with the remainder of the proposed acres outside the Project Area and outside the Big Butte Creek fifth field watershed.

3.9.4.3 Effects of Alternative 3 on Economics

Direct and Indirect Effects

Under Alternative 3, approximately 3.5 MMBF would be harvested on 752 acres resulting in an estimated harvest of 4.6 MBF/acre. Direct employment as a result of timber harvest and processing a commodity would result in approximately 31 full-time equivalent jobs.

The proposed 0.2 mile of temporary road construction in Alternative 3 would result in an average yarding distance of 825 feet. Maximum yarding distance within units where temporary road construction is not proposed would range between 1,100 and 2,100 feet. The estimated yarding cost for this alternative would be $270 per MBF (table 3-30).

Under Alternative 3, biomass utilization is not a part of the project proposal. Slash resulting from harvest activity would be treated on-site or yarded to a log landing and burned. As a result, treatment costs are increased compared to the other action alternatives. For the Twin Ranch Project Area, it is estimated that fuel treatment costs for Alternative 3 would be approximately $109,000 if all slash were treated in the harvest units. Assuming operations occur using the least cost approach, the estimated fuel treatment costs for Alternative 3 would be at $31 MBF compared to $2.50 MBF under Alternative 2. For Alternative 3, this equates to an increased cost of approximately $96,700 for fuels treatment of units compared with Alternative 2.

The BLM estimate indicates there would not be a return to the Federal Treasury at these costs and current timber prices under Alternative 3.

Cumulative Effects

Alternative 3 would contribute an estimated 3.5 MMBF to the Medford Districts Allowable Sale Quantity of 18 MMBF for fiscal year 2010.

Future timber supply from 752 acres of proposed selection harvest and density management could be available for harvest again in 10 to 20 years. There would be no additional commercial entry anticipated in the 16 acres of density management in the riparian reserve. In the long-term, volume growth capability would not be maximized but would be increased on the areas treated (see Section 3.2, Conifer Growth and Timber Yield).

Known future actions within the Project Area include the Camp Cur timber sale and the Ranch Stew thinning project. These projects are currently under contract with anticipated treatments to occur within the next 3 years. The BLM estimates these projects would provide for 7 MMBF of harvest volume from the Project Area. Direct employment as a result of harvest would be approximately 63 full-time equivalent jobs. The BLM also estimates 21,000 BDTs of biomass will be removed in the Ranch Stew project resulting in approximately 17 full-time equivalent jobs.

The only known planned timber sale in the Project Area is the Vine Maple timber sale which is planned for 2012. This timber sale has 37 acres being considered within the Twin Ranch Project Area with the remainder of the proposed acres outside the Project Area and outside the Big Butte Creek fifth field watershed.

3.9.4.4 Effects of Alternative 4 on Economics

Direct and Indirect Effects

Under Alternative 4, approximately 4.5 MMBF would be harvested on 624 acres resulting in an estimated harvest of 7.2 MBF/acre. Direct employment as a result of timber harvest and processing a commodity would result in approximately 41 full-time equivalent jobs.

The proposed 1.1 miles of temporary road construction in this alternative would result in an average yarding distance of 790 feet. Maximum yarding distance within units where temporary road construction occurs would range between 1,000 and 1,400 feet. The estimated yarding cost for this alternative would be $208 per MBF (table 3-30).

An estimated 4,700 BDTs of biomass would be made available for utilization from commercial timber harvest activities. The estimated employment resulting from biomass utilization would be equivalent to 4 jobs. The estimated return to the Federal Treasury from biomass products would be $1.00 per BDT with a total value of $4,700. Although economic values are assumed to be static for this analysis, positive net revenue from biomass utilization is sensitive to price fluctuations in the biomass market. These fluctuations in markets could result in a cost to the Federal Treasury because of reduced delivery prices. The estimated return of $1.00 per BDT is based on a February 2010 delivered price of $37 per BDT. For the Twin Ranch Project Area, we estimate that removing tree tops and limbs for biomass utilization would result in remaining slash treatment costs of approximately $17,100.

As in Alternative 2, there would be a reduction of an estimated 2 forest and conservation workers jobs under Alternative 4 as a result of the shift from historical forest residue reduction to utilization of forest residue.

The estimated return to the Federal treasury for timber harvest would be $26.00 per MBF for a total value of $117,000.

Cumulative Effects

Alternative 4 would meet ROD/RMP requirements to provide for harvest activity on all available timber stands in the Project Area. This would provide a high level of harvest volume and net revenue to the treasury from commercial stands, and improve future timber supply potential in developing stands through thinning treatments. Harvest would contribute 4.5 MMBF to the Medford District's Allowable Sale Quantity of 18 MMBF for fiscal year 2010 and supply an estimated 4,700 tons of biomass.

The 617 acres of commercial thinning and selection harvest on these matrix lands could be available for harvest again in 10 to 20 years. There would be no additional commercial entry anticipated in the 16 acres of riparian reserve thinning.

In the long-term, volume growth capability would be maximized in the thinning units and would be increased but not maximized within the selection harvest units (see Section 3.2, Conifer Growth and Timber Yield). Known future actions within the Project Area include the Camp Cur timber sale and the Ranch Stew thinning project. These projects are currently under contract with anticipated treatments to occur within the next 3 years. The BLM estimates these projects would provide for 7 MMBF of harvest volume from the Project Area. Direct employment as a result of harvest would be approximately 63 full-

time equivalent jobs. The BLM also estimates 21,000 BDTs of biomass will be removed in the Ranch Stew project resulting in approximately 17 full-time equivalent jobs.

The only known planned timber sale in the Project Area is the Vine Maple timber sale which is planned for 2012. This timber sale has 37 acres being considered within the Twin Ranch Project Area with the remainder of the proposed acres outside the Project Area and outside the Big Butte Creek fifth field watershed.

Table 3-31. Comparison of Total Yarding Costs by Alternative

	Alternative 2	Alternative 3	Alternative 4
Harvest Volume	8.0 MBF/acre	4.6 MBF/acre	7.2 MBF/acre
Temporary Spur Road Construction	1.1 miles	0.2 mile	1.1 miles
Average Yarding Distance	790 feet	825 feet	790 feet
Average Yarding Costs/MBF	$203	$270	$208

3.10 Summary of Effects on Other Resources

The following resources did not pertain to the issues identified and analyzed in this EA. Possible effects from the actions proposed in each alternative were included in the appendices for this document. A summary of those effects is included below. See the appendices for a complete discussion.

3.10.1 Effects of Alternatives on Botanical Resources

For a complete discussion of existing conditions and analysis of possible impacts from the proposed project, please see Appendix B, Botanical Resources.

3.10.1.1 Effects of Alternatives on Rare Plants

The Twin Ranch Project Area is outside the ranges of three Federal endangered species (*Lomatium cookii*, *Limnanthes floccosa* ssp. grandiflora, and *Fritillaria gentneri*), no sites have been discovered in the area during past surveys, and the units do not contain suitable habitat for these three T&E plants.

No Special Status or S&M vascular plants were discovered in the units proposed for timber harvest activities. Therefore, the proposed project would not lead to a need to list Sensitive vascular plants or affect the persistence of S&M vascular species.

One Bureau Sensitive/S&M nonvascular plant site was documented in a proposed harvest unit. *Chaenotheca subroscida* is located in section 17, T35S, R3E, in a unit proposed for commercial thinning that would retain 40 percent canopy. A 50-foot radius, no-cut buffer would be established around the tree to prevent direct impacts from logging equipment and to maintain canopy cover and environmental conditions at the site.

Sensitive or S&M fungi species are rare across their ranges and the likelihood that there are populations in the Project Area is small. It is anticipated that protecting known and future found sites of Sensitive and S&M fungi, conducting landscape level strategic surveys 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 and maintain S&M fungi species persistence.

3.10.1.2 Effects of Alternatives on Noxious Weeds

No noxious weed species targeted by the BLM for treatment have been detected in the Twin Ranch Project Area, although populations exist within a few miles of the treatment units. Noxious weeds could be introduced or spread in the Project Area on the tires of vehicles, in plant material used in posttreatment rehabilitation, or in gravel used in roadwork. Weed seed could then spread during activities that disturb soil and remove the existing vegetation. Implementing PDFs would reduce the risk of introducing noxious weeds into the Project Area.

3.10.2 Effects of Alternatives on Air Quality

Air quality and visibility conditions are not monitored within the Big Butte Creek fifth field watershed. The monitoring site closest to the Project Area is located in Shady Cove. Samples taken from Shady Cove indicate the air quality index remains below Federal standards. No permanent sources of emissions exist on BLM lands within the Project Area.

For a complete discussion of existing conditions and analysis of possible impacts from the proposed project, please see Appendix C, Air Quality.

4.0 Consultation

This section describes any public participation and interagency coordination that occurred during the preparation of this EA.

4.1 Public Involvement

4.1.1 Scoping

Scoping is used to promote public involvement in BLM projects. The public includes individuals, agencies, and organizations that might be interested in or affected by the proposal. Public involvement was conducted to identify the desires, expectations, and concerns of interested and affected publics regarding the proposal and the use of available resources.

4.1.1.1 2006 Twin Ranch EA Scoping

- Scoping letter mailed on December 20, 2006 to 31 individuals, landowners, organizations, tribal governments, and government agencies.
- Scoping notice sent to Butte Falls Bulletin.
- Twin Ranch Project listed in Medford Messenger.
- Scoping comments were received from American Forest Resource Council, Klamath Siskiyou Wildlands Center (with signatures from Cascadia Wildlands, Forest Service Employees, for Environmental Ethics, Oregon Wild, and Siskiyou Regional Education Project), Lone Rock Timber Management Company, and Susan Delles.

4.1.1.2 2010 Twin Ranch EA Scoping

On January 30, 2007, the Butte Falls Field Manager decided to combine the Twin Ranch EA with the Bowen Arrow EA. This decision was in response to the concern that the two projects should be analyzed in one document in order to address cumulative effects. These two projects were proposed in the same fifth field watershed and were planned for implementation at the same time. The combined NEPA document, Bowen Arrow/Twin Ranch EA, was being completed when the USFWS withdrew their northern spotted owl Biological Opinion that contained the Bowen Arrow/Twin Ranch project. The project could not proceed without the required ESA consultation and was put on hold. The 2010 Twin Ranch EA is a revision of the original Twin Ranch project.

- Scoping letter mailed January 13, 2010 to 45 individuals, landowners, grazing permittees, organizations, tribal governments, and government agencies.
- Scoping letter posted on the BLM Web site on January 14, 2010.
- Twin Ranch Project included in the Medford Messenger.
- Scoping comments received from American Forest Resource Council, Klamath Siskiyou Wildlands Center, and Oregon Wild.

4.2 Interagency Coordination

4.2.1 ESA Consultation

Section 7 of the ESA requires the BLM to work with the USFWS (T&E plant and wildlife species) or 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 effects would be relatively minor, consultation is informal and the Federal agency submits a written request for informal consultation. If USFWS/NOAA Fisheries agrees with the BLM's determination, then informal consultation concludes with the USFWS/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 USFWS/NOAA Fisheries. During formal consultation, the USFWS/NOAA Fisheries analyzes 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 results of the analysis are explained in a document called a "biological opinion."

4.2.1.1 T&E Wildlife

The northern spotted owl is the only T&E wildlife species in the Twin Ranch Project Area. The project wildlife biologist determined the proposed actions "may affect, likely to adversely affect" the northern spotted owl because of possible habitat removal. The BLM prepared a biological assessment that included the Twin Ranch project and submitted it to the USFWS May 3, 2010. We expect to receive a biological opinion from USFWS in July.

4.2.1.2 T&E Plants

The Twin Ranch Project Area is outside the ranges of the three T&E plant species that may be found in the Butte Falls Resource Area: *Lomatium cookii*, *Limnanthes floccosa* ssp. *grandiflora*, and *Fritillaria gentneri*. No sites have been discovered in the area during past surveys and the project units do not contain suitable habitat for these plants. The project botanist determined the Twin Ranch Forest Management project would have "no effect" on T&E plant species; therefore, consultation with USFWS was not required.

4.2.1.3 T&E Fish

The Twin Ranch Project Area contains one T&E fish species: Southern Oregon/Northern California coho salmon. The project fish biologist determined the Twin Ranch Forest Management project "may affect, not likely to adversely affect" for road relocation and adjacent timber harvest originally proposed in the 2006 Bowen Arrow Forest Management Project. NOAA Fisheries issued a letter of concurrence for that determination. The remainder of the 2010 Twin Ranch Forest Management Project would be a "no effect" determination for Southern Oregon/Northern California coho salmon, coho critical habitat, or essential fish habitat. Therefore, further consultation with NOAA Fisheries was not necessary.

4.2.2 Tribal Coordination

The BLM mailed scoping letters to notify Tribes with an interest in southern Oregon about the proposed Twin Ranch project. Letters were mailed to the Cow Creek Band of Umpqua Tribe of Indians, Confederated Tribes of Siletz, and The Confederated Tribes of Grand Ronde.

4.3 Document Availability

The Twin Ranch Forest Management Project EA is available on the Medford BLM Web site at http://www.blm.gov/or/districts/medford/plans/index.php.

The EA is being mailed to those that submitted scoping comments and those that returned an Interest Response Form indicating an interest in receiving the EA.

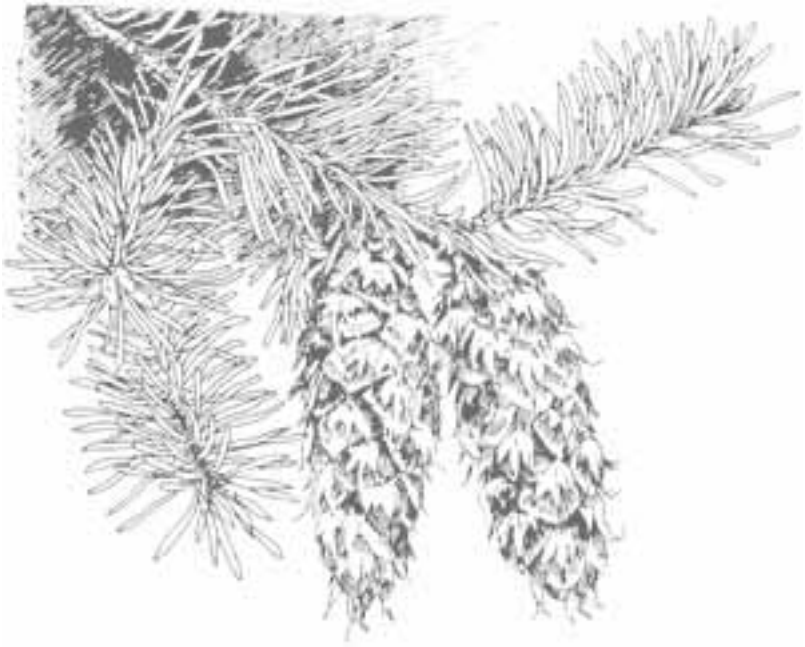
A notice of the EA availability will be published in the *Medford Mail Tribune*. Publication of the notice begins the 30-day public comment period for the Twin Ranch Forest Management Project EA.

5.0 List of Preparers

This section lists the BLM staff who prepared the EA, their job title, and their area of responsibility.

Jon Raby	Butte Falls Field Manager	Authorized Officer/Management Guidance
John Bergin	Forest Manager	Team Lead/Economics
Jean Williams	Environmental Coordinator	NEPA Compliance
John Osmanski	Forester	Conifer Growth and Timber Yield/Carbon Storage
Ken Van Etten	Soil Scientist	Soil
Shawn Simpson	Hydrologist	Water Resources
Angela San Filippo	Fishery Biologist	Fisheries
Linda Hale	Wildlife Biologist	Wildlife/Wildlife ESA Consultation
Jessica Buchanan	Fuels Specialist	Fuels/Air Quality
Marcia Wineteer	Botanist	Botanical Resources
Randy Bryan	Engineer	Transportation
Terry Garner	Forester	Layout Design
Phil Ritter	Forester	Planning
Dianne Keller	Data Steward	Project Data
Robyn Hertz	GIS Specialist	Maps
Ron Gregory	District Archaeologist	Cultural Surveys

Appendices



Appendix A
Twin Ranch Silvicultural Prescription, Marking Guidelines, and Stand Inventory

The following definitions are for terms used in this section:

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 result in 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.

A.1 Management Direction and Objectives

A.1.1 Medford District ROD/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.

A.1.2 Treatment Objectives

To maximize conifer growth potential and to provide a sustainable harvest level.

Silvicultural systems are planned to produce, over time, forests with desired species composition, structural characteristics, and distribution of age classes. To meet this objective and to provide a portion of the allowable sale quantity, stands 100 years old or greater would be converted to younger, more productive age classes. Forest stands less than 100 years old would be commercially thinned or selection harvested to increase or maintain their growth rates.

A.2 Site and Stand Condition

A.2.1 General Site Description

The proposed treatment area is located in Jackson County approximately 20 to 30 air miles northeast of the city of Medford. The area is located in portions of sections 27 and 35 in Township 34 South, Range 3 East; and sections 1, 2, 3, 11, 12, and 17 in Township 35 South, Range 3 East.

A.2.2 Drainage/Watershed

The proposed treatment area is located in the Big Butte Creek fifth field watershed.

A.2.3 Abiotic Conditions

A.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 percent Freezner soils and 35 percent Geppert soils with 5 percent inclusions. Freezner soils are very deep and well-drained, and have clay-loam subsoil. The Geppert soil is moderately deep and is skeletal (greater than 35 percent rock fragments in the subsoil) with extreme cobbly clay subsoil.

A.2.3.2 Site Index

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

A.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 3,580 feet above sea level. Annual precipitation averages 45 inches with approximately 7 inches of dry season precipitation.

A.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 increases 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 percent 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 percent. 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

A.2.4 Biotic Conditions

A.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 is the least common and is generally restricted to dry ridge tops.

All 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 percent crown closure). Vegetative management will be required to insure successful establishment and growth of conifer regeneration. Shrub species which 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.

A.2.4.2 Stand History

Historically, fire was the primary large-scale, natural disturbance event. Both stand-replacement fires and less intense underburns were common prior to fire suppression. High summer temperatures and moderate precipitation provide conditions favorable for fires. Intense stand-replacement wildfires burned every 80 to 200 years or more; less intense underburns were more frequent. The presence of madrone within stands indicates relatively recent fires.

During the past 80 years, 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, modified even-aged and structural retention regeneration harvest, and salvage of dead and dying trees (Thies and Sturrock, 1995).

Since the implementation of the PRMP/EIS in 1994, approximately 5,370 acres of BLM-administered lands have been harvested within the Big Butte Creek fifth field watershed. Density reduction treatments (e.g., commercial thinning, density management, and individual tree selection) occurred on approximately 48 percent of the treatment acres, regeneration harvest on about 4 percent, and mortality salvage on the remaining 48 percent. Density management 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 harvesting 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 has removed scattered individual to large concentrations of wind-thrown or wind-damaged trees. Approximately 43 percent (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. Canopy cover declined from approximately 80-100 percent to less than 30 percent. A mix of conifer seedlings was planted to insure full site occupancy.

A.2.4.3 Structure Description

Stands can be classified as single-layer, even-aged stands or 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 100 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. With decades of fire suppression, stand development has stagnated and stand densities have increased.

Hardwoods occur as clumps or a widely scattered stand component. Hardwoods represent an early, drought-tolerant seral tree component. Competition between adjacent trees and closure of the conifer canopy reduced the vigor and increased the mortality of many large hardwood trees.

A.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 A-14). 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 A-15).

A.2.4.5 Snags

ROD/RMP standards and guidelines require that, over time, 1 to 2 snags per acre will be present to meet the requirement for cavity nesting birds at 40 percent of potential population levels (ROD/RMP, p. 40). All deterioration stages of snags (table A-16) will be retained as part of the silvicultural 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.

A.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, low moisture availability, and wind-damaged trees from 2008 will continue to create environmental conditions favorable to bark beetle infestation of stressed 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 future coarse woody debris.
- Douglas-fir mistletoe is uncommon and is limited to a small area in the southeast corner of BLM-administered lands in T35S, R3E, section 12. 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
- Root rots (armillaria and annousus) are present and are affecting ponderosa pine and white fir in T35S, R3E, section 1. Management options vary depending on the amount of root rot present. In stands where the inoculum is present in 20 percent 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 percent 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 (Thies 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, primarily ponderosa pine.

- 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 A-1). This leads to increased tree stress, particularly during prolonged hot summer days without any precipitation. Decreased tree vigor is magnified during periodic drought years when the cumulative effects of below average amounts of precipitation causes the interruption of basic functional processes (e.g., photosynthesis, transpiration, respiration, translocation, and assimilation) over an extended period of time.

Figure A-1. Current stand conditions.

- 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 range 65 percent. As a point of reference, crowns begin to close when the relative density approaches 15 percent and the mortality of suppressed trees begins after the relative density reaches 60 percent (Perry 1994; Hann and Wang 1990). Maintaining the relative density in forest stands between an upper end of 50 percent and a lower end of 25 percent 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 (figure A-2); 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. The problem is magnified when water becomes a limiting resource in tall trees. Water deficits may cause needle and stem mortality as evidence by snag tops or dead branches and needles in the upper part of the crowns.

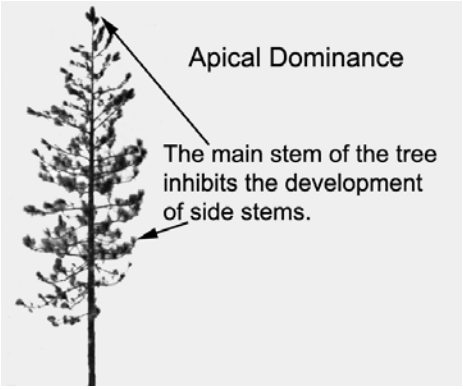


Figure A-2. Apical Dominance

- 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 its ability to maintain basic functional processes.

A.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.

Two types of silviculture treatments are proposed for the Project Area: regeneration harvest and commercial thinning. Individual operational inventory (OI) units have been grouped under one of these categories based on the proposed treatment.

A.3.1 Regeneration Harvest

Two regeneration silviculture methods are recommended: (1) Northern GFMA and (2) Shelterwood Retention. The target stand conditions for each of these methods are the same except for the number of trees per acre greater than 20 inches DBH that will remain (figures A-3 and A-4):

- Northern GFMA: 6 to 8 trees
- Shelterwood Retention: 12 to 25 trees

Figure A-3. Northern GFMA Regeneration Harvest

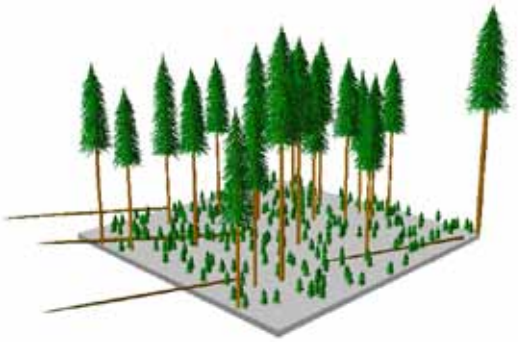


Figure A-4. Shelterwood Regeneration Harvest

In shelterwood harvests, overstory trees greater than 20 inches DBH in excess of 6 to 8 trees per acre may be removed after 15 to 20 years if the planted understory conifer trees are no longer susceptible to damage caused by late growing-season frosts.

A.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-designated 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, serviceberry, 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 chinkapin. 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) of Douglas-fir, white fir, and a lesser amount of incense cedar is present in most of these units, with density levels varying from stand to stand.

A.3.1.2 Target Stand - Regeneration Harvest (table A-1)

The minimum number of remaining large (greater than 20 inches DBH), overstory green trees will vary from 6 to 25 trees per acre, depending on the treatment method (figures 3 and 4). 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 (T35S, R3E, section 12), remove all Douglas-fir. 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 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.

Preharvest 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 will be lopped and scattered, whole-tree yarded, or hand-piled and burned. To promote species diversity within these units where planting is required, a mixture of Douglas-fir, resistant 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 percent Douglas-fir, 20 percent sugar or ponderosa pine, and 10 percent incense cedar. In stands with root rot, no ponderosa pine will be planted. Instead a mix of Douglas-fir, sugar pine, and incense cedar will 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 mistletoe infection of newly planted Douglas-fir seedlings.

Table A-1. Regeneration Harvest Treatment Schedule

Year	Regeneration Harvest Treatment
0	Harvest: Leave target number of green conifer trees per acre greater than 20″ DBH • NGFMA: 6 to 8 • Shelterwood: 12 to 25 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. Hand pile and burn. Limit piling of logging slash to pieces less than 16″ DBH. In T35S, R3E, section 1, unit 1-5 (OI 006), slash all white fir less than 8″ 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 insure 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 and/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 only, 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 closure 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.
100	Assess stand and watershed conditions for possible regeneration harvest.

A.3.2 Selection Harvest

A.3.2.1 Present Condition

In the stands recommended for selection harvest, stand structure and tree condition is highly variable due to past logging activities. Competition between trees for limited site resources is intense. The tree species composition is a mixture of predominantly Douglas-fir and white fir with lesser amounts of ponderosa pine, sugar pine, incense cedar, chinkapin and madrone.

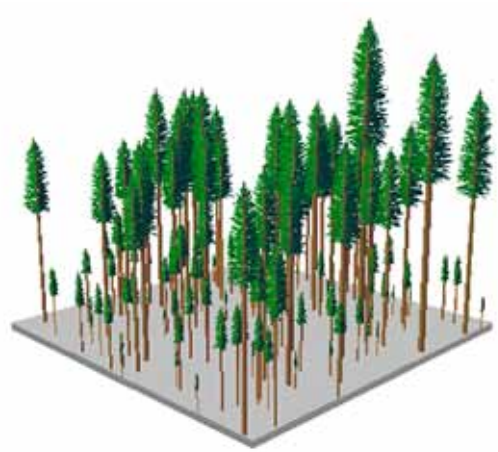


Figure A-5. Selection Harvest

A.3.2.2 Target Stand

Following the harvest entry, these stands will be composed of the healthiest trees of all species and diameter classes (figure A-5). When available, large healthy sugar and

ponderosa pines have been retained to insure their continued presence in the stand. Species composition is 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 will be present through the retention of trees of all ages and size classes.

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

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

Table A-2. Selection Harvest Treatment Schedule

Year	Selection Harvest Treatment
0	Harvest: Reduce stand densities by marking risk trees in all diameter classes; do not mark any trees 50″ DBH or greater. Tree vigor, as defined by crown form and crown condition, is the primary factor to be used in determining risk trees. Thin even-aged pockets where appropriate. Use widely spaced designated skid trails, directional falling, and log length skidding to reduce site impacts. Treat logging slash by lopping and scattering 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 to determine if any additional management treatments are needed.

A.3.4 Commercial Thinning, Density Management, and Riparian Thinning

A.3.4.1 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 these treatments, the average relative density is 65 percent in the Twin Ranch Project Area. At relative density levels greater than 60 percent, 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.

A.3.4.2 Target Stand

The main objective within these stands is to improve individual tree and stand health. Harvesting within these units will be targeted toward reducing the stocking levels in those areas where overstocked conditions of sapling, pole, and mature timber exists. Density levels will be reduced by removing the suppressed crown class trees and increasing the spacing of the intermediate and dominant/codominant crown classes (figure A-6). Remaining trees

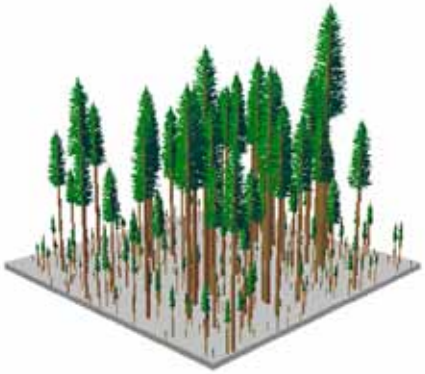


Figure A-6. Commercial Thinning

will have crown ratios greater than 35 percent (figure A-7) and will be the better formed trees. Ponderosa pine, sugar pine, incense cedar, and Douglas-fir will make up the preferred leave species. Large (greater than 20 inches DBH), healthy ponderosa and sugar pine will be favored over equally healthy Douglas-fir. The crowns of the retained pines should be full, with a minimum crown ratio of 35 percent, 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 closure of these stands will range within 40 to 60 percent.

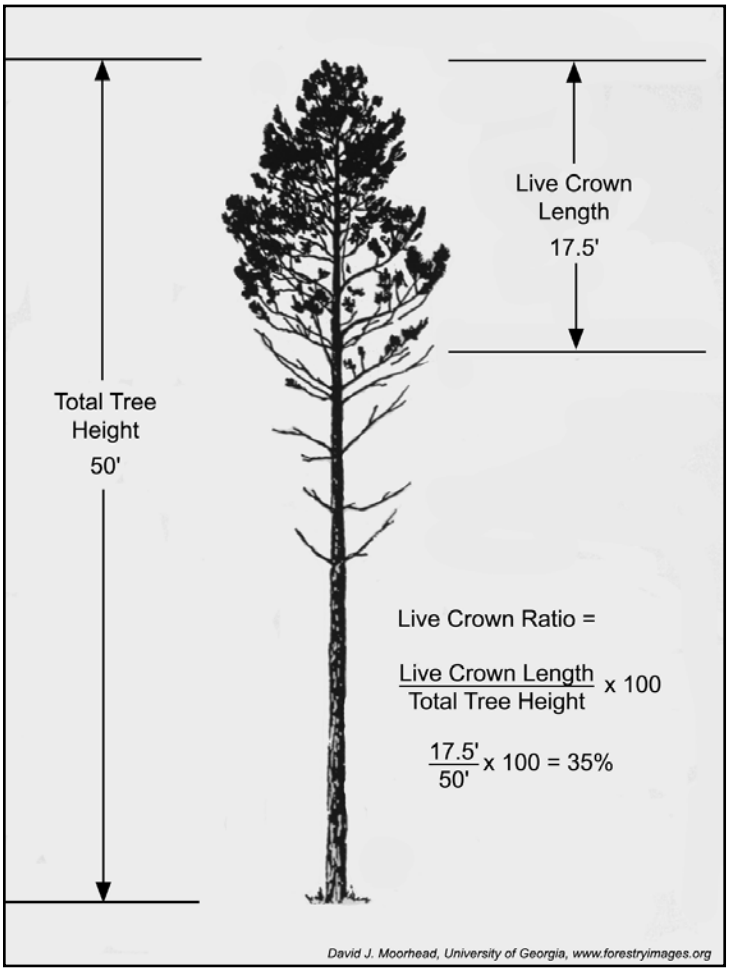


Figure A-7. Crown Ratio

Large (greater than 12 inches DBH), healthy hardwoods (madrone and black oak) will remain as a scattered stand component. Removal of competing trees will 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 will be buffered and protected. These buffer patches will provide for additional structural diversity within stands.

All stage 1 and 2 snags greater than 20 inches DBH will 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 will be left.

Table A-3. Commercial Thinning, Density Management and Riparian Thinning

Year	Treatment
0	Harvest Thin from below first, removing the suppressed component of the stand, followed by the thinning of 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 to 50% or more and crown closures of a minimum of 40 to a minimum of 60%. Favored leave species are ponderosa pine, sugar pine, incense cedar, and Douglas-fir. Reserve ponderosa and sugar pine >20″ DBH to maintain genetic and structural diversity. No logging equipment is allowed within riparian thinning areas. All logs would be cable winched to adjacent upland matrix lands. Use existing and 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. 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.
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 ROD/RMP stand age requirement for a regeneration harvest. Evaluate for regeneration harvest.

A.4 Monitoring

Implementation of the standard and guidelines in the Northwest Forest Plan and management direction contained within the Medford District ROD/RMP require a monitoring system to insure effective on-the-ground results. The Northwest Forest Plan (p. E-1) states, “Monitoring is an essential component of natural resource management because it provides information on the relative success of management strategies. The implementation of these standards and guidelines will be monitored to ensure that management actions are meeting the objectives of the prescribed standards and guidelines, and that they comply with laws and management policy. Monitoring will provide information to determine if the standards and guidelines are being followed (implementation monitoring), verify if they are achieving the desired results (effectiveness monitoring), and determine if underlying assumptions are sound (validation monitoring). Some effectiveness and most validation monitoring will be accomplished by formal research.”

Monitoring of the proposed actions will follow the outline in the Medford District ROD/RMP (p. 225-248). Monitoring will be specific to the land allocations and resources affected in the Big Butte Creek fifth field watershed.

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 which 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 cover). Postharvest monitoring can then be implemented, using the preharvest stand information to determine if the objectives have been met.

A.5 Twin Ranch Marking Guidelines

Table A-4. Summary of Treatment Objectives–ROD/RMP Alternative 2

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-tem site productivity, biological legacies (retained green-trees, snags, and coarse woody debris), and a biologically diverse forest matrix. • In northern GFMA stands 100 years or older, regeneration harvests would be programmed. • In northern GFMA forest stands less than 100 years old, commercial thinning and limited selection harvest would occur in forest stands that have a combination of stem diameter and surplus volume that permits an economic entry (USDI 1995b, 185).
Treatment Objectives
• To regenerate stands 100 years or older that have reached the “culmination of mean annual increment” and to prepare units for seedling establishment and growth by providing suitable site conditions for planting. Within treatment areas, retain coarse woody debris, snags, and large green conifers for long-term site productivity and biological legacies. • In stands less than 100 years old, thin from below to redistribute growth to vigorous dominant and codominant trees to maximize volume growth potential. In selection harvest stands, remove low vigor trees across all diameter classes to reduce intertree competition while maintaining or promoting the development and growth of large healthy trees.

A.5.1 Regeneration Harvest–Alternative 2 ONLY

A.5.1.1 Northern GFMA Regeneration Harvest

The following are minimum requirements for northern GFMA regeneration harvest:

- Leave 1.8 snags per acre. Snags are any standing dead (stage 1 and 2), partially-dead, or defective (conks) tree.
- Maintain 120 linear feet of coarse woody debris (table A-14).

- Retain 6 to 8 green conifers per acre greater than 20 inches DBH (proportionally representing the total range of tree sizes greater than 20 inches DBH). Spatial distribution of leave trees should be based on tree condition (live crown ratio and crown form), as opposed to leaving trees based on a distance grid. Let tree condition dictate where trees are left. Leave trees should have the following attributes: (a) low susceptibility to wind, snow, and ice damage measured by a height to diameter ratio of 70 or below; (b) crown ratio greater than 35 percent with a healthy crown, dark foliage, and dense needles; (c) disease-free (specifically mistletoe-free) Douglas-fir; and (d) healthy seral species such as ponderosa pine, sugar pine, and incense cedar, where possible. Discriminate against white fir.
- Retain all large hardwoods greater than 16 inches DBH.
- Use crown vigor, not tree diameter, as the deciding factor for marking a tree.
- Promote stand diversity and patchiness; units do not have to be uniform in appearance.

Unit 1-5, a 9-acre root rot area, is the only unit proposed for northern GFMA regeneration harvest. Mortality of ponderosa pine is common throughout this unit. To a lesser amount, decline and mortality of white fir is also occurring. Because ponderosa pine and white fir are the species most affected, use Douglas-fir greater than 20 inches DBH to meet the 6 to 8 trees per acre retention requirement. If there are not enough healthy Douglas-fir to meet the 6 to 8 tree count, use any healthy-appearing, full-crown ponderosa pine 20 inches DBH or greater to meet the tree count. Additionally, *all* healthy Douglas-fir less than 20 inches DBH should be reserved. Douglas-fir appears to be resistant to the root rot present and will provide a root zone barrier along with planted incense cedar to minimize the further spread of the disease. Slash all white fir 8 inches and less.

A.5.1.2 Shelterwood Retention Regeneration Harvest

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 CWD (table A-14).
- 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 upon 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 a 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 percent 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 all large hardwoods greater than 16 inches DBH.
- Remove all Douglas-fir with mistletoe in unit 12-2 (T35S, R3E, section 12). 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 can be left as long as they are clumped near the perimeter *and* in the lowest topographic area of the stand.

Table A-5. Shelterwood Retention Regeneration Harvest Units

2-3	11-2	12-2

A.5.2 Selection Harvest–Alternatives 3 and 4 ONLY

- 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 A.6) to determine the trees to mark. See Table A-6 and Table A-7 for the target basal area for each stand.
- Favor drought- and fire-tolerant tree species such as ponderosa pine, incense cedar, Douglas-fir, and sugar pine.
- 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 percent. 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. When available, leave green trees (any diameter) immediately surrounding large (greater than 20 inches DBH and 8 feet in length) 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 (greater than 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 A.6 Alternative 3–Target Basal Area for Selection Harvest Units

Unit	1-5	2-3	2-5	11-1	11-3	11-2	12-2	12-4	35-3
Target Basal Area (square feet/acre)	80	140	120	160	160	130	150	200	150

Table A-7. Alternative 4–Target Basal Area for Selection Harvest Units

Unit	1-5	2-3	11-2	12-2
Target Basal Area (square feet/acre)	80	140	130	140

A.5.3 Commercial Thinning and Riparian Reserve Thinning with a minimum Canopy Cover of 40%–Alternatives 2 and 4; Density Management with a minimum Canopy Cover of 40% or 60%–Alternative 3

1. 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 percent 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 Tables A-8 through A-10 for the target basal area for each stand by alternative.
   - 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 percent. 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.
2. 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.
3. Leave all coarse woody debris, decay classes 1-5 (table A-14). When available, leave green trees (any diameter) immediately surrounding large (greater than 20 inches DBH and 8 feet in length) 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.
4. Minimize the marking of large (greater than 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.
5. Commercial thinning units in Table A-8 with a "#" designation have adjacent riparian reserve areas to be thinned. Within the riparian reserve, a strip 100 feet wide will be treated and a 90-foot wide no-cut area will be established on each side of the stream channel. The marking guidelines for the riparian areas will be the same as the adjacent upland unit (table A-8 and items 1 through 4 above).

A-8. Alternative 2–Target Basal Area for Commercial and Riparian Thinning Units

Unit	1-1	1-2	1-3	1-6	1-7#	2-4	3-1	11-4	12-1	17-1	17-2
Target Basal Area (square feet/acre)	140	140	140	140	130	140	130	140	160	140	130
Unit	**27-1**	**35-1#**	**35-2#**	**35-4**							
Target Basal Area (square feet/acre)	130	140	130	150							

A-9. Alternative 3–Target Basal Area for Density Management and Riparian Thinning Units

Unit	1-1	1-4	1-6	1-8	1-7#	2-4	3-1	11-4	12-1	17-1	17-2	27-1
Target Basal Area (square feet/acre)	140	180	160	170	130	140	130	140	160	140	130	130
Unit	**35-1#**	**35-2#**	**35-4**	**35-5**	**35-7**	**35-8**						
Target Basal Area (square feet/acre)	140	130	170	170	170	170						

A-10. Alternative 4–Target Basal Area for Commercial and Riparian Thinning Units

Unit	1-1	1-2	1-3	1-6	1-7#	2-4	3-1	11-4	12-1	17-1	17-2	27-1
Target Basal Area (square feet/acre)	140	140	140	140	130	140	130	140	160	140	130	130
Unit	**35-1#**	**35-2#**	**35-2**	**35-4**								
Target Basal Area (square feet/acre)	140	130	130	150								

Table A-11. Twin Ranch Stand Inventory Data

Unit	OI	Trees per Acre less than 8″ DBH			Basal Area	Canopy Closure	Aspect	Slope	Relative Density	
		Total	Conifer	Hardwood					Total	Conifers
T34S, R3E, section 27										
27-1	005	21	151	2.9	201	100	South	13%	.61	.41
T34S, R3E, section 35										
35-2	002N	215	135	0	237	100	NA	Level	.70	.54
35-3	002S	252	107	0	214	100	Northeast		.73	.55
35-6	003	733	41	0	177	100	Northwest		.73	.38
35-7	004	964	90	0	241	100			.99	.57
35-1	008	57	100	0	225	100	Southwest		.64	.59
35-4	009	239	72	0	203	100	Level	Level	.68	.46
35-5	010	86	142	0	229	100	Southeast		.69	.60
35-4	012	342	133	4	250	100	Level	Level	.68	.66
35-1	013	2,062	98	0	175	100	Level	Level	.63	.30
T35S, R3E, section 1										
1-1	001N	243	83	0	176	95	Level	Level	.58	.42
1-2	001S	86	74	0	162	68	Level	Level	.48	.40
1-4	004	130	72	2	206	100	West		.55	.43
1-5	006	215	75	0	153	96	Level	Level	.53	.38
1-6	007N	162	95	0	223	100	Level	Level	.68	.54
1-6	007S	301	109	4	199	100	Level	Level	.71	.52
1-7	008	229	79	0	153	86	Level	Level	.54	.38
1-4	009	95	89	7	280	100	West		.78	.64
1-3	011	237	71	0	217	90	Level	Level	.72	.51
T35S, R3E, section 2										
2-1/2/3	001	267	75	0	202	100	West	Level	.69	.47
2-3	003	57	40	0	186	60			.50	.42
2-4	004	158	78	6	190	100	Northwest		.61	.44
2-5/6	005	134	175	0	251	100	East		.80	.68

Table A-11. Twin Ranch Stand Inventory Data

Unit	OI	Trees per Acre less than 8″ DBH			Basal Area	Canopy Closure	Aspect	Slope	Relative Density	
		Total	Conifer	Hardwood					Total	Conifers
T35S, R3E, section 3										
3-1	001	189	88	0	165	100	Level	Level	.56	.39
T35S, R3E, section 11										
11-1	001	262	90	0	272	100	Level	Level	.88	.65
11-3	005	596	86	0	237	100	Level	Level	.90	.55
11-4	007	143	127	0	202	100	Level	Level	.66	.55
11-5	009	96	191	0	215	100	Level	Level	.70	.59
11-2	010	298	150	0	258	100	Level	Level	.88	.67
T35S, R3E, section 12										
12-1/2	102	224	70	3	264	100	West		.83	.60
T35S, R3E, section 17										
17-1	001	286	191	0	234	100	Level	5%	.77	.64
17-2	001	286	191	0	234	100	Level	5%	.77	.64
T35S, R3E, section 19										
19-1	002	420	143	0	213	100	East	10%	.79	.56

(Bradford and Hsiao, 1982; Hann and Scrivani, 1987; Kramer and Kozlowski, 1979; McGaughey, 2004)

A.6 Areas Deferred from Harvest

The Twin Ranch project originally proposed 943 acres for harvest. BLM wildlife biologists and foresters identified 330 acres of the original 943 acres as dense, structurally complex stands. These stands met the definition of RA32 stands and were initially considered for restoration harvest to increase stand vigor and resiliency while still maintaining RA32 stand characteristics. The project forester further screened these stands and determined that 128 acres did not need treatment at this time because current stand densities and tree conditions were satisfactory.

Table A-12. Operational Inventory Units Deferred from Entry

Legal Description	Operational Inventory Unit	Acres
T34S, R3E, section 335	003	7
T35S, R3E, section 1	001	11
T35S, R3E, section 1	004	48
T35S, R3E, section 2	001	15
T35S, R3E, section 2	003	9
T35S, R3E, section 19	001	38

A.7 Characteristics of Low Vigor Trees

A.7.1 Low Vigor Trees

A.7.1.1 Low Vigor Ponderosa Pine

Trees meeting the following criteria:

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

A.7.1.2 Low Vigor Douglas-fir and White Fir

Trees meeting the following criteria:

- Crown has thin appearance when viewed against the sky.
- Short needle length
- Needle color very poor, yellowish.
- Dead or dying twigs or branches in the crown forming holes; sparse and ragged crown appearance.
- Poor crown ratio.
- Mistletoe infected, with a rating of 4, 5, or 6.

A.7.1.3 Trees Affected by Root Disease

Trees have the following visual characteristics:

- Groups of trees affected, with trees showing variable levels of decline.
- Trees have reduced height growth; look at top of trees for reduced increment growth.
- Yellow foliage; decline of the crown is from the top to the bottom.
- Distress cone crop.
- Bark beetles sometimes present because of the stressed trees.
- Windthrown trees common; wood at the base of the downed trees is soft and stringy or has begun to delaminate.

Table A-13. Root Diseases found in Project Area

Root Disease	Severely Affected	Moderately Affected	Resistant
Annosus S-group	White fir	None	Douglas-fir, sugar pine, ponderosa pine, incense cedar
Annosus P-group	Ponderosa pine	None	Douglas-fir, incense cedar, white fir
Armillaria	White fir	Douglas-fir, ponderosa pine, sugar pine	Incense cedar

A.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.

A.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.

A.8 Guidelines–Relative Density (35%)

Estimate the average diameter of potential leave trees and determine the desired spacing in feet by referring to Table A-14. 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 A-14. 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

A.9 Coarse Woody Debris

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). 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 A-15. 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
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

A-16. 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

Table A-17. 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 B–Botanical Resources

Terms used in this section are defined as follows:

crustose. A lichen thallus (vegetative body) that adheres closely to the surface on which it is growing.

ecotone. A transition area between two adjacent ecological communities.

hypha (*pl* **hyphae**). One of the threadlike elements of a mycelium, composed of cells.

intermontane. Situated between mountains.

mesic. Having moderate amount of moisture; neither hydric (humid) nor xeric (dry).

mycorrhizal. Mutually beneficial symbiotic associations of plant roots and fungi

mycelium (*pl* **mycelia**). The vegetative part of a fungus, composed of one or many segments of hyphae.

rare plants. Special Status (Federal and State Threatened and Endangered and Bureau Sensitive) and Survey and Manage vascular plants, lichens, bryophytes, and fungi.

B.1 Botanical Resources

This section analyzes the potential impacts from the proposed forest management activities on botanical resources.

B.1.1 Methodology

- The analysis area for Botanical Resources is the Twin Ranch Project Area. Because the BLM would protect Special Status and S&M vascular and nonvascular plant sites from potential impacts of the proposed activities, the status of these species across their ranges would not change as a result of implementing the action alternatives. Therefore, analyzing the impacts of this project on these species across their ranges would add no additional information about their status.
- The BLM does not survey for fungi at the project level. For this specific project, the project botanist will consider potential effects of the proposed actions on Bureau Sensitive or Survey and Manage fungi if present in the Project Area, but it is protection of species at the landscape level that ensures S&M species will persist and Sensitive species will not trend toward listing.
- In 2006, botanists conducted surveys in the Project Area for Special Status and Survey and Manage vascular and nonvascular plants by following current protocols and management direction (Bureau of Land Management 1995b, 51) (U. S. Fish and Wildlife Service 2008a) (Bureau of Land Management 2008b). Surveyors searched for Special Status plants and category A and C Survey and Manage species from the 2001 list (Forest Service and Bureau of Land Management 2001, S&G 41-51). They documented rare plants and compiled lists of all species observed.

- The BLM documents and treats State of Oregon designated noxious weeds on BLM-managed lands in Oregon. They are detected during preproject botanical surveys or from incidental sightings.

B.1.2 Assumptions

- There are no legal directives for protecting Special Status or S&M plants or fungi on private lands. Although suitable habitat exists on private lands and rare plants may occur there, because they do not receive legal protection, we assume private lands do not contribute suitable habitat or protection for them.
- Because the BLM does not survey for Sensitive or S&M fungi at the project level, it is unknown if populations occur in the proposed treatment units. To disclose potential impacts of the proposed actions on these rare fungi, the project botanist assumes presence and describes potential direct and indirect effects to populations if present. However, these descriptions are only meaningful if Special Status or S&M fungi actually occur in the units. Comparisons of risks between alternatives are based on numbers of acres treated or other quantifiable actions. These do not necessarily reflect the actual risk of one alternative compared with another because impacts would only occur at a specific location if a population was present.
- The BLM assumes that protecting known Sensitive and S&M fungi sites (current and future found) and the presence of suitable habitat in reserves, as well as conducting large-scale inventories throughout the Pacific Northwest, will ensure this project and future projects will vouchsafe the persistence of S&M fungi and not contribute to the need to list Sensitive fungi.

B.1.3 Affected Environment

B.1.3.1 Introduction

The Twin Ranch project is located in the western Cascades physiographic province at the eastern edge of the Butte Falls Resource Area. Elevation ranges from 2,680 to 3,560 feet. Slopes are generally gentle and riparian areas broad, although there are some steeper slopes. The proposed timber harvest units are 80- to 300-year-old conifer stands in the white fir and Douglas-fir plant series. North-facing slopes have moister environmental conditions and more mesic plant associations, while south-facing slopes have drier plant associations. Most proposed timber harvest units were previously harvested and there is evidence of past fire in the form of charring and burn scars on large, older trees. Special habitats include riparian corridors, moist meadows, seeps, ash swales, and rocky openings. The Project Area lies within the Big Butte grazing allotment, except for one small parcel located in the Fredenburg Pasture of the Summit Prairie allotment.

B.1.3.2 Rare Plants

Rare plant categories include Special Status (Federal and State Threatened and Endangered and Bureau Sensitive) and Survey and Manage vascular plants, lichens, bryophytes, and fungi. BLM's policy for Special Status plants is to (1) conserve, protect, and manage T&E and Special Status plants and the ecosystems on which they depend and (2) ensure that actions authorized on BLM-administered lands do not contribute to the need to list Special Status species under the provisions of the ESA (Bureau of Land Management 1995b, 50-53).

The Medford District ROD/RMP direction is to conduct field surveys for Special Status plant species prior to management activities to determine if species are present or if habitat would be affected (Bureau of Land Management 1995b, 51). The programmatic consultation for T&E plants (U. S. Fish and Wildlife Service 2008a; Bureau of Land Management 2008b) also requires surveys prior to vegetation management or ground-disturbing activities if within the range of and in suitable habitat for T&E species.

Three Federal endangered species have ranges within the Butte Falls Resource Area—*Lomatium cookii*, *Limnanthes floccosa* ssp. *grandiflora*, and *Fritillaria gentneri*. The Jackson County populations of *Lomatium cookii* and *Limnanthes floccosa* ssp. *grandiflora* occur strictly in vernal pool habitat. Habitat for *Fritillaria gentneri* is broader, but is generally oak woodlands and chaparral, and the ecotone between these habitats and mixed hardwood-conifer woodlands. The Twin Ranch Project Area is outside the ranges of all three species, no sites have been discovered in the area during past surveys, and the units do not contain suitable habitat for these three T&E plants.

Survey and Manage plants and fungi fall into six categories (table B-1). Predisturbance survey and site management requirements differ by category. Although categories C and D require management of high priority sites only, the BLM and Forest Service have not completed the process to identify high priority sites for the S&M species. The BLM manages all sites of category C and D species, as well as category A, B, and E species, to protect against potential direct or indirect effects of proposed activities.

Survey and Manage fungi documented or potentially occurring in the Medford District BLM are category B species, which do not require surveys prior to habitat-disturbing activities (table B-1). The BLM does not conduct preproject surveys for Special Status or Survey and Manage fungi because they fruit irregularly, some are tiny and difficult to identify except by a few experts, and it would not be possible to reasonably and consistently locate occupied sites prior to habitat-disturbing activities (Forest Service and Bureau of Land Management 2001, 64-65). Landscape-level strategic surveys and sampling were developed as a substitute for preproject surveys to gather information about the distribution and extent of rare fungi.

Table B-1. Survey and Manage Categories

Category	Predisturbance Surveys Required	Protection of Sites
A	Yes	Manage all known sites
B	No	Manage all known sites
C	Yes	Manage high priority sites
D	No	Manage high priority sites
E	No	Manage all known sites
F	No	Not required

Botanical surveys in the Project Area have documented several Special Status/S&M vascular and nonvascular species, including *Cypripedium fasciculatum* (clustered lady-slipper, Sensitive and S&M C), *Cypripedium montanum* (S&M C), *Chaenotheca subroscida* (Sensitive, S&M E), and *Tayloria serrata* (Sensitive). However, just one site of *Chaenotheca subroscida* occurs in a proposed harvest unit. The other species have populations outside the units.

Chaenotheca subroscida (Lemondrop whiskers), a Bureau Sensitive and S&M category E species, is a crustose lichen with tiny pin-like fruiting bodies. It grows tightly compressed to its substrate, which is generally the bark of large, old conifers. It typically occurs on trees with highly textured bark on

the side that lacks mosses and macrolichens, in other words the drier side of the tree that is protected from direct rainfall. Habitat for this species is humid, intermontane old-growth forests at lower and middle elevations. The species is widely distributed in cool temperate and temperate areas of western North American and Eurasia (Forest Service and Bureau of Land Management 2010). The BLM has documented 36 sites in the Medford District BLM. Within the Project Area, one site was documented in T35S, R3W, section 17. Surveyors found the specimen on a 48-inch DBH Douglas-fir snag at 2,700-foot elevation, approximately 30 feet from a natural surface road. The unit is a 100-year old white fir stand with residual old growth conifers that was thinned in 1938.

B.1.3.3 Noxious Weeds

Noxious weeds are plants growing outside their native lands or habitats that are injurious to public health, agriculture, recreation, wildlife, or public or private property (Oregon Department of Agriculture 2009, 3). The Medford District ROD/RMP states the objectives for noxious weeds are to continue to survey for, avoid introducing or spreading, and contain or reduce infestations on BLM-administered land (Bureau of Land Management 1995b, 92-93).

The Oregon Department of Agriculture designates and classifies noxious weeds according to their detrimental effects, reproductive strategies, distribution, and difficulty of control (table B-2).

Table B-2. ODA Noxious Weed Control Rating System

Category	Criteria	Recommended Action
A	Weeds that occur in the state in small enough infestations to make eradication or containment possible; or are not known to occur, but their presence in neighboring states makes future occurrence in Oregon seem imminent.	Infestations subject to eradication or intensive control when and where found.
B	Regionally abundant weed, but which may have limited distribution in some counties.	Limited to intensive control at the state, county, or regional level as determined on a case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the main control approach.
T	A select group of A or B designated weeds.	Identified by the Oregon State Weed Board as a priority target on which the Oregon Department of Agriculture will develop and implement a statewide management plan.
Source: Oregon Department of Agriculture, Plant Division, Noxious Weed Control Program. 2009. http://oregon.gov/ODA/PLANT/WEEDS/docs/weed_policy.pdf		

Weeds spread via seeds, which are carried from one location to another by air, water, animals, humans, or vehicles. Some weeds also spread when roots or other plant parts break off and resprout to create new plants. Most weeds have reproductive and life cycle characteristics that give them an advantage over native plants in establishing quickly. These characteristics include high seed production, good dispersal mechanisms, fall germination and rosette development, production of long taproots that capture water at different levels in the soil profile, and early or late season growth and bloom times to avoid competition with native species. Noxious weeds also have an advantage over natives because they occupy hostile sites with exposed, bare ground; tolerate drought; and form persistent seedbanks that lie dormant until the next disturbance event provides new openings in which to become established. Because they originated from other countries, noxious weeds lack the predators that keep them under control in their native habitats and ecological areas.

Newly disturbed areas are most vulnerable to noxious weed establishment. Roads are common avenues of invasion, as seeds lodge in tire treads and are carried from occupied areas into newly disturbed unoccupied areas. Activities that introduce or spread noxious weeds include road construction, timber harvest, farming, overgrazing, recreation, and residential development. Natural processes, such as wind, seasonal flooding, and migration patterns of birds or animals, also contribute to the spread of noxious weeds.

The BLM treats noxious weed populations on their lands under the *Medford District Integrated Weed Management Plan and Environmental Assessment* (EA #OR-110-98-14) (Bureau of Land Management 1998). The Medford District BLM Noxious Weed list is a subset of the state list. It contains category A and T species that occur in the District and are targeted for detection and control (Bureau of Land Management 1998, 1-2). The BLM treats category B species at high priority sites such as Special Status plant sites or special areas. The BLM treats weeds by manual, mechanical, chemical, or biological means.

The Twin Ranch Project Area is relatively free of the noxious weeds the Medford BLM targets for treatment. Surveyors have reported scattered populations of bull thistle and Himalayan blackberry, mostly along roads and in riparian areas. The BLM does not generally treat these two category B species because they are prevalent across the landscape but does treat them in special areas or areas with sensitive resources. Although few weeds currently occur in the Project Area, ongoing activities present a continual risk of introducing weeds.

B.1.4 Environmental Consequences

B.1.4.1 Effects on Botanical Resources Common to All Alternatives

Threatened and Endangered Plants

The Twin Ranch Project Area is outside the ranges of the Endangered plants *Limnanthes floccosa* ssp. *grandiflora*, *Lomatium cookii*, and *Fritillaria gentneri*. No populations of these species have been documented in the Project Area; therefore, implementing the No-Action Alternative or the action alternatives would be a “no effect” ESA determination.

B.1.4.2 Effects of Alternative 1 (No-Action) on Botanical Resources

Direct and Indirect Effects

Rare Plants

Special Status and Survey and Manage Vascular Plants

There would be no direct or indirect effects to Special Status or S&M vascular plants in the Twin Ranch Project Area under Alternative 1 because no disturbance would occur. BLM-managed late-successional forest stands would continue to provide potential habitat for expansion of existing populations of species that grow in this habitat and occur in the Project Area, such as *Cypripedium fasciculatum* and *Cypripedium montanum*.

Special Status and Survey and Manage Nonvascular Plants

No direct or indirect effects would occur to Special Status or S&M nonvascular species under Alternative 1 because no physical disturbance would occur that could impact them. BLM-managed late-successional forest stands would continue to provide habitat for expansion of existing or establishment of new populations of species associated with late-successional forests that occur in this habitat and in the Project Area, such as *Chaenotheca subroscida* and *Tayloria serrata*.

Special Status and Survey and Manage Fungi

There would be no direct or indirect effects to Special Status or S&M fungi under Alternative 1. No physical disturbance would occur that could impact them if present and there would be no loss of late-successional forest which provides habitat for them.

Noxious Weeds

Under the Alternative 1, the BLM would not implement new management activities that could introduce or spread noxious weeds.

Cumulative Effects

Rare Plants

Special Status and Survey and Manage Vascular and Nonvascular Plants and Fungi

The BLM does not have data on the presence or abundance of rare plants in the Project Area prior to botanical surveys conducted over the past 20 years. It is possible rare plants may have been impacted by past activities on both private and public lands. Activities that altered conditions on the land and may have affected rare plant species include road building, timber harvest, livestock grazing, wildfire, fire suppression, rural development, and diversion dams and other changes to hydrological processes.

The BLM anticipates present and foreseeable future actions in the Big Butte Creek fifth field watershed under the No-Action Alternative would include continued forest management on private industrial lands and timber harvest on BLM-managed and Forest Service lands. The BLM proposes timber harvest on approximately 800 acres in the Camp Cur and Vine Maple timber sales, with 41 acres proposed for regeneration harvest and the rest proposed for thinning. Thinning is also planned on approximately 470 acres in the Ranch Stew project, also located in the Twin Ranch Project Area. The BLM surveys for Special Status and S&M plants prior to these projects and manages sites when discovered. Under the No-Action alternative, late-successional conifer stands on BLM-managed lands in the Project Area would continue to provide suitable habitat for species associated with that habitat. In the Big Butte Creek fifth field watershed, 62 percent of conifer stands on BLM-managed lands are age 80 years or older. Under the No-Action alternative, late-successional stands would drop to 61.9 percent after regeneration harvest in the Camp Cur and Vine Maple timber sales. Mid-seral stands would continue developing toward later seral stages.

Other activities expected to occur in the future on BLM-managed lands in the Project Area include traffic on BLM roads, grazing, and recreation.

Added to past, present, and foreseeable future activities in the Twin Ranch Project Area, the No-Action alternative would not add to the cumulative effects to T&E, Sensitive, or S&M vascular or nonvascular plants or fungi.

Noxious Weeds

Currently, no noxious weed species targeted by the BLM for treatment have been detected on BLM-managed lands in the Twin Ranch Project Area. Present and foreseeable future activities on private or public lands that could introduce noxious weeds into the Project Area include road building, timber harvest, recreation, vehicular traffic, and natural processes (e.g., wind, seasonal flooding, and movement of birds and animals).

Added to past, present, and foreseeable future actions, Alternative 1 would not add to the cumulative effects to noxious weeds in the Twin Ranch Project Area beyond existing conditions because no physical disturbance would occur. The BLM will continue to survey for, document, and treat noxious weeds on BLM-managed lands as part of the Medford District Noxious Weed Program.

B.1.4.3 Effects of Alternative 2 on Botanical Resources

Direct and Indirect Effects

Rare Plants

Special Status and Survey and Manage Vascular Plants

No Special Status or S&M vascular plants were documented in the units proposed for timber harvest in Alternative 2; therefore, implementing timber harvest and associated actions proposed in Alternative 2 would not directly impact Special Status or S&M vascular plants. Proposed regeneration harvest would remove 66 acres of late-successional forest habitat. The amount of late-successional forest habitat in the Project Area that would be available for expansion of existing populations of species associated with late-successional habitat would be reduced, but 61.6 percent of late seral conifer stands would remain in the Big Butte Creek fifth field watershed. Implementing Alternative 2 would not trend Sensitive plants toward listing nor affect the persistence of S&M plants.

Special Status and Survey and Manage Nonvascular Plants

One Bureau Sensitive/S&M nonvascular plant site was documented in a proposed harvest unit. *Chaenotheca subroscida* is located in section 17, T35S, R3E, in a unit proposed for commercial thinning that would retain 40 percent canopy. This lichen grows on larger conifers in humid, intermontane, old-growth forests at lower and middle elevations (Forest Service and Bureau of Land Management 2010, 2-3). A 50-foot radius, no-cut buffer would be established around the tree to prevent direct impacts from logging equipment and to maintain canopy cover and environmental conditions at the site when overstory trees are removed. Because surveys were conducted in the harvest units and the documented site would be protected from direct or indirect effects of the proposed activities, implementing Alternative 2 would not trend Sensitive nonvascular species toward listing nor affect the persistence of S&M species.

Special Status and Survey and Manage Fungi

It is unknown if Bureau Sensitive or S&M fungi are present in the Twin Ranch harvest units because the BLM does not conduct preproject fungi surveys. Suitable habitat exists in the Project Area for Bureau Sensitive and S&M species; however, predicting their presence is difficult because habitat requirements are poorly understood and because they are rare across the Northwest Forest Plan area. The likelihood is small that populations of rare species are present in the treatment units. However, if present, they could be directly or indirectly adversely affected by actions proposed under Alternative 2. Timber harvest, road and landing construction or decommissioning, and burning posttreatment slash create potential risks of impacting rare fungi.

Under Alternative 2, timber harvest would occur on 624 acres. Timber harvest can have varying degrees of adverse effects on fungi, depending on the level of tree removal and ground disturbance. Because of their mycorrhizal association with conifers, removing host trees during timber harvest could indirectly affect fungi. Removing host trees halts the transfer of nutrients produced during photosynthesis to the

fungi. Mycorrhizal associations could reestablish as new conifers grow if the fungal hyphae persist through the period of stress caused from disruption of the mycorrhizal connections and changes in environmental conditions.

Under Alternative 2, the BLM would harvest 10 acres under a northern GFMA prescription and 56 acres under a shelterwood prescription. Removal of the overstory canopy during timber harvest changes environmental conditions that also indirectly affect fungi. Relative humidity drops, light increases, and air and soil temperatures rise. Hotter, drier conditions inhibit sporocarp production and fungal persistence. Regeneration harvest, including northern GFMA and shelterwood, results in greater changes in environmental conditions because it reduces canopy cover to 10 to 30 percent. Thinning prescriptions, including commercial thinning, density management, and selection harvest, reduce canopy cover to minimums of 40 or 60 percent. Potential impacts to rare fungi that grow in late-successional forests, if present, would be greater in the regeneration units than in units that are thinned. Conifer stands that are regeneration harvested would not provide suitable habitat for Bureau Sensitive or S&M fungi associated with late-successional forest for 80-plus years.

Under Alternative 2, the BLM would tractor harvest 624 acres. Activities that remove, disturb, or compact the top layer of organic material and mineral soil negatively impact fungi. The main and most extensive part of a fungus consists of a mycelial network that resides in the top few inches of mineral soil. Mycelial networks are often connected to multiple trees through their root systems. In one study, mycelial networks ranged in size from 16 to 291 square feet (1.5 - 27 square meters) (Dahlberg and Stenlid 1995). During timber harvest, tractors and yarding equipment disturb and compact soil, which could damage fungal mycelia.

Constructing and decommissioning roads and landings also disturbs and compacts soil. Under Alternative 2, the BLM would construct 0.1 mile of permanent road and 1.1 miles of temporary roads and decommission 0.7 mile of existing road. Constructing permanent roads would remove suitable habitat for rare fungi. Construction, use, and decommissioning of temporary or existing roads would also remove suitable habitat for rare fungi, although the area could eventually be suitable for occupation after the canopy cover regrows.

In Alternative 2, the BLM has identified 20 landings for use during timber harvest and to accommodate biomass equipment. Some landings are existing and others would be constructed during the Twin Ranch timber harvest. Each landing would be approximately 0.5 acre; therefore, approximately 10 acres would be impacted. Vegetation would be removed on the landings. Movement of equipment on the landings would compact soil. After use, the landings would be ripped and planted. If rare fungi populations were present, it is unlikely they would persist after harvest activities. Although ripping landings after use would break up the soil and fungal hyphae could eventually recolonize the areas, it would be 80-plus years before trees reestablished and provided suitable habitat for late-successional rare fungi.

In Alternative 2, the BLM would pile and burn posttreatment slash on 32 acres. If rare fungi are present beneath the slash piles, the mycelia and spores would be damaged or destroyed by the intense heat generated during burning. Other detrimental effects to fungi from slash burning include loss of litter and organic matter, resulting in reduced moisture retention capability and a loss of nutrient sources. The effect of these activities on fungi is a loss of species diversity and abundance (Amaranthus, et al. 1996). The total area impacted by burn piles would be an average of 2.5 percent of the unit and a total of 0.17 acres.

Although timber harvest could potentially impact Sensitive or S&M fungi, the species are rare across their ranges and the likelihood that there are populations in the Project Area is small. The Twin Ranch Project Area is on matrix lands, which are lands available for timber harvest. It is anticipated that protecting known and future found sites of Sensitive and S&M fungi, conducting landscape level strategic surveys to locate additional populations, and protecting habitat and sites in a system of reserves (riparian, late-successional, and other special management areas) will prevent Sensitive fungi from trending toward listing and maintain S&M fungi species persistence.

Noxious Weeds

No noxious weed species targeted by the BLM for treatment have been detected in the Twin Ranch Project Area, although populations exist within a few miles of the treatment units. Under Alternative 2, noxious weeds could be introduced or spread in the Project Area on the tires of vehicles, in plant material used in posttreatment rehabilitation, or in gravel used in roadwork. Weed seed could then spread during activities that disturb soil and remove the existing vegetation.

Proposed activities in Alternative 2 that could contribute to the introduction or spread of noxious weeds in the Project Area include regeneration harvest on 66 acres, tractor yarding on 624 acres, construction or decommissioning of 1.2 miles of permanent and temporary spur roads, construction and use of landings on 10 acres, and posttreatment slash pile burning on 32 acres.

Northern GFMA regeneration harvest reduces canopy cover to 10 to 15 percent and shelterwood harvest reduces canopy cover to 20 to 30 percent for 1 to 5 years, leaving stands vulnerable in the short-term to noxious weed invasions. Burning postharvest slash in hand piles would also remove ground cover, leaving areas open to occupation by weeds. Over time (30 years), harvested stands would develop a new canopy layer that would shade out noxious weeds that depend on more light to survive. Some noxious weeds, such as garlic mustard, tolerate canopy cover and persist after trees grow back.

Movement of vehicles and equipment off-road and throughout the Project Area also provides a source for spreading weeds or bringing in new weeds from infected areas where vehicles and equipment last operated. Weed seeds can also be transported into the Project Area in gravel that is applied to roads during road improvement work. The seeds can then easily be picked up on tires and moved into units where the soil has been newly disturbed during timber harvest activities. The BLM treats noxious weeds in BLM quarries, but rock is often brought from non-BLM quarries that do not have weed treatment programs. Mitigation for this risk is to monitor the Project Area after timber harvest and treat noxious weeds as detected.

Implementing PDFs and additional BLM actions (table B-3) would reduce the risk of introducing noxious weeds into the Project Area. These measures are the recommended weed prevention strategies in the action plan developed by the western states BLM weed coordinators, with review and input by 30 individuals from agricultural research services, state agencies, universities, weed societies, and weed advisory councils with backgrounds in weed prevention and control (Bureau of Land Management 1996, 35-40).

Table B-3. BLM Actions and PDFs and Expected Implementation Results

BLM Actions and PDFs	Expected Implementation Result
PDF 21. Pressure wash vehicles and equipment that will travel off system roads prior to entry onto BLM-managed lands.	Remove loose seeds and dirt that may contain viable noxious weed seeds, thereby reducing potential introduction of new noxious weeds into the Project Area and into newly disturbed sites.
PDF 20. Treat noxious weed populations in BLM rock quarries where gravel would be removed for use in road work.	Reduce the risk of introducing noxious weed seed through contaminated rock from BLM quarries.
Seed or plant areas disturbed during project implementation with native plant materials.	Introduce native vegetation to the site prior to noxious weed seed recruitment, allowing native plants an advantageous jump-start in reestablishment and reducing the risk of noxious weed infestation.
PDF 22. Mulch disturbed areas after treatment with weed-free straw or hay.	Prevent introduction of noxious weed seeds from straw or hay into Project Area during post-treatment restoration.
Monitor the Project Area 1-3 years after harvest is complete and treat noxious weeds as detected.	Detect and treat noxious weeds that may become established in disturbed areas after project implementation.

Cumulative Effects

Rare Plants

Special Status and S&M Vascular Plants

The BLM surveyed for rare plants in the Project Area and no populations were discovered in the treatment units, although populations of *Cypripedium fasciculatum* and *Cypripedium montanum* occur within the Project Area. Implementing the proposed timber harvest activities in Alternative 2 would not impact Bureau Sensitive or S&M vascular plant populations. Under Alternative 2, the BLM would remove 66 acres of suitable habitat for rare vascular plants associated with late-successional forest habitat. These stands would return to an early seral stage and would not provide suitable habitat for expansion of *Cypripedium fasciculatum* or *Cypripedium montanum* populations for 80-plus years. The amount of late-successional forest habitat remaining on BLM-managed lands in the fifth field watershed would decrease from 61.9 to 61.6 percent, which remains above the minimum 15 percent set for all Federal lands in the Northwest Forest Plan area (Forest Service and Bureau of Land Management 1994, C-44). Mid-seral stands in the Project Area would continue developing toward later seral stages. Because no Bureau Sensitive or S&M vascular plant sites would be impacted under Alternative 2 and the amount of late-successional habitat would remain high after timber harvest, implementing this alternative would not contribute cumulative effects to rare vascular plants when added to the past, present, and reasonably foreseeable future actions in the Project Area.

Special Status and S&M Nonvascular Plants

The BLM surveyed the Project Area for Special Status and S&M nonvascular plants and the one documented site would be protected from direct and indirect effects during implementation of Alternative 2. *Chaenotheca subroscida* has only been found on large diameter Douglas-fir and incense cedars, mostly on conifers 200-plus years old in late-successional forest stands (Forest Service and Bureau of Land Management 2010, 3). All thinning prescriptions proposed in Alternative 2 would leave some level of larger diameter conifers. Thinning trees that compete for resources would benefit the growth and health of the remaining trees. Regeneration harvest of 66 acres would reduce the amount of late-successional forest habitat and larger diameter conifers available as suitable habitat and substrate for occupation by this species. However, 61.6 percent of BLM-managed forest lands in the Big Butte

Creek fifth field watershed would remain in late-successional habitat after implementation of Alternative 2 and mid-seral stands would continue developing toward later seral stages. Therefore, added to the past, present, and reasonably foreseeable future actions in the Project Area, implementing Alternative 2 would contribute no additional cumulative effects to rare nonvascular species.

Special Status and S&M Fungi

Added to past, present, and reasonably foreseeable future activities in the Project Area, the actions proposed under Alternative 2 would add cumulative effects to Sensitive and S&M fungi, if present in the Project Area. There is not only a risk of impacting them during timber harvest and road and landing construction, but also a risk of negatively affecting populations, if present, by removing suitable habitat. However, all proposed activities would occur on Matrix lands, which are designated for timber production and harvest. Across the Northwest Forest Plan area, approximately 14 percent of the 8 million acres of late-successional forest are designated as matrix and are available for harvest, while 86 percent are designated as late-successional reserves, congressionally reserved areas, administratively withdrawn areas, or riparian reserves. This reserve system across the landscape is intended to provide protection and development of mature and old growth forests for the protection and expansion of late-successional associated rare plants, animals, and other organisms. Under the Northwest Forest Plan, at least 15 percent of late-successional (80 years or more) conifer forest must be maintained on Federal lands in each fifth field watershed (Forest Service and Bureau of Land Management 1994, C-44). Under Alternative 2, the amount of late-successional conifer forest on BLM-managed lands would be reduced from 61.9 to 61.6 percent as a result of regeneration harvest on 66 acres. This figure is above the minimum 15 percent set by the Northwest Forest Plan. In addition to this reserve system that provides habitat for rare fungi, the BLM and Forest Service assume that protecting known sites (current and future found) and conducting large-scale inventories throughout the Pacific Northwest will ensure this project and future projects will not contribute to the need to list Sensitive fungi or affect the persistence of S&M fungi.

Noxious Weeds

Past, present, and foreseeable future activities in the Project Area that could contribute to the introduction and spread of noxious weeds in the Twin Ranch Project Area are the same as those described under the No-Action Alternative. The actions proposed in Alternative 2 could potentially introduce noxious weeds into the Project Area, 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.

The BLM expects that the use of PDFs during timber harvest activities, monitoring the Project Area after project implementation, and continuing to treat noxious weeds will prevent the timber harvest activities proposed in Alternative 2 from contributing cumulative affects to noxious weeds in the Twin Ranch Project Area. Future weed inventories and treatments rely on funding.

B.1.4.4 Effects of Alternative 3 on Botanical Resources

Direct and Indirect Effects

Rare Plants

Special Status and S&M Vascular Plants

The BLM discovered no Special Status or S&M vascular plants in the units proposed for timber harvest in Alternative 3. No regeneration harvest would occur that would remove late-successional forest habitat suitable for expansion of nearby rare vascular plant populations. Implementing Alternative 3 would result in no direct or indirect effects to Special Status or S&M vascular plants. Therefore, no Bureau Sensitive species would trend toward listing and the persistence of S&M species would not be affected.

Special Status and S&M Nonvascular Plants

One Bureau Sensitive/S&M nonvascular plant site is located in a unit proposed for timber harvest in Alternative 3. *Chaenotheca subroscida* is located in a unit proposed for a density management that would retain a minimum of 40 percent canopy. This lichen grows on larger conifers in humid, intermontane old-growth forests at lower and middle elevations (Forest Service and Bureau of Land Management 2010, 2-3). A 50-foot radius, no-cut buffer would be established around the tree to prevent direct impacts from logging equipment and to maintain canopy cover and environmental conditions at the site when overstory trees are removed. Because surveys were conducted in the harvest units and the known site would be protected from direct or indirect effects of the proposed activities, Bureau Sensitive nonvascular species would not trend toward listing and S&M species' persistence would not be affected as a result of implementing Alternative 3.

Special Status and S&M Fungi

Potential direct and indirect effects to Special Status or S&M fungi from the activities proposed in Alternative 3 would be similar to those described in Alternative 2, although the amount of area impacted differs.

Under Alternative 3, the BLM would harvest 128 acres more than in Alternative 2 (752 versus 624 acres). Harvesting more acres would result in more ground disturbance through tractor yarding that could potentially directly impact fungi. However, no regeneration harvest would occur, so the 752 acres of harvested stands would continue to provide suitable habitat for Special Status or S&M fungi.

Under Alternative 3, the BLM would construct 0.1 mile of new road and would construct 0.2 mile of temporary spur roads. This would result in less potential risk to Special Status or S&M fungi, if present, because less area would be impacted. The risk of impacting fungi during 0.7 mile of road decommissioning would be the same as under Alternative 2.

Under Alternative 3, the risk to Special Status or S&M fungi would be greater from burning postharvest slash piles than under Alternative 2. Up to 174 acres would have burn piles versus 32 acres in Alternative 2.

The overall risk to Special Status or S&M fungi under Alternative 3 is similar to that under Alternative 2 because the risks are greater under Alternative 3 for some actions, but less for others. Although timber harvest could potentially impact Sensitive or S&M fungi, the species are rare across their ranges

and the likelihood there are populations in the Project Area is small. The Twin Ranch Project Area is on matrix lands, which are lands available for timber harvest. It is anticipated that protecting known and future found sites of Sensitive and S&M fungi, conducting landscape level strategic surveys 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 and maintain persistence of S&M fungi.

Noxious Weeds

Potential direct and indirect effects from implementing Alternative 3 would be similar to those described in Alternative 2. More acres would be tractor yarded (752 versus 624 acres) and more acres would have postharvest slash pile burning (174 versus 32 acres), so there would be a larger area of ground disturbance where noxious weeds could be introduced or spread. However, no regeneration harvest where canopy cover would be reduced to 10 to 30 percent would occur in Alternative 3; therefore, there would be less open area for noxious weeds to occupy if they were introduced into the Project Area. In addition, fewer acres would be impacted by permanent and temporary road construction (0.1 mile versus 1.2 miles), so the risk of noxious weeds being brought in and spread during road construction and subsequent logging activities would be less in Alternative 3 than under Alternative 2.

However, the differences in amount of areas impacted between alternatives are small. Because there are currently no known noxious weed populations targeted for treatment in the Twin Ranch Project Area, the risk to noxious weeds of implementing Alternative 3 is the possibility of bringing weed seed or parts into the Project Area on equipment coming from an infected area and then spreading the seed around. This risk exists regardless of how many acres are harvested, although the risk of spreading seed increases with numbers of acres harvested and other ground-disturbing and vegetation-removing activities. Implementing PDFs and additional BLM actions (table B-3) would reduce the risk of introducing new noxious weed populations into the Project Area as a result of the timber harvest and associated actions proposed in Alternative 3.

Cumulative Effects

Rare Plants

Special Status and S&M Vascular Plants

Implementing Alternative 3 would not add cumulative effects to Special Status or S&M vascular plant species because the BLM surveyed for rare plants in the Project Area and no populations were discovered in the treatment units. No regeneration harvest would occur under Alternative 3 so thinned stands would continue to provide suitable habitat for expansion of existing rare plant populations in the Project Area. The amount of late-successional conifer forests on BLM-managed lands in the fifth field watershed would remain at 61.9 percent and mid-seral stands would continue developing toward later seral stages.

Special Status and S&M Nonvascular Plants

Implementing Alternative 3 would not add cumulative effects to Special Status or S&M nonvascular plants because the BLM surveyed the Project Area and the one documented site would be protected from direct and indirect effects during project implementation. No regeneration harvest would occur and 61.9 percent of BLM-managed conifer forests would remain in late-successional stages. Mid-seral stands would continue developing toward later seral stages.

Special Status and S&M Fungi

The risk of adding to the cumulative effects to Special Status and S&M fungi under Alternative 3 is similar to that under Alternative 2 because although some impacts are less, others are greater. However, all proposed activities would occur on matrix lands, which are designated for timber production and harvest. No regeneration harvest would occur under Alternative 3 and 61.9 percent of conifer forests on BLM-managed lands within the Big Butte Creek fifth field watershed would remain in late-successional stages. In addition, the BLM and Forest Service assume that protecting known sites (current and future found) and conducting large-scale inventories throughout the Pacific Northwest will ensure this project and future projects will not contribute to the need to list Bureau Sensitive fungi or affect the persistence of S&M fungi.

Noxious Weeds

Past, present, and foreseeable future activities in the Project Area that could contribute to the introduction and spread of noxious weeds in the Twin Ranch Project Area are the same as those described under the No-Action Alternative. The actions proposed in Alternative 3 could potentially introduce noxious weeds into the Project Area, although it is not possible to quantify the amount or to distinguish it from the background risk of introduction from ongoing activities. The risk of introducing or spreading noxious weeds under Alternative 3 is similar to Alternative 2, although it may be slightly less because fewer miles of road would be constructed. New soil disturbance followed by vehicle use is a primary source of new weeds.

The BLM expects that the use of PDFs during timber harvest activities, monitoring the Project Area after project implementation, and continuing to treat noxious weeds would prevent the timber harvest activities proposed in Alternative 3 from contributing cumulative affects to noxious weeds in the Twin Ranch Project Area. Future weed inventories and treatments rely on funding.

B.1.4.5 Effects of Alternative 4 on Botanical Resources

Direct and Indirect Effects

Rare Plants

Special Status and S&M Vascular Plants

No Special Status or S&M vascular plants were discovered in the units proposed for timber harvest activities in Alternative 4. There would be no direct or indirect impacts to rare vascular plants from implementing Alternative 4. No regeneration harvest would occur. The 624 acres proposed for thinning would remain as suitable habitat for expansion of rare plant populations outside the treatment units but within the Project Area. Therefore, implementing Alternative 4 would not lead to a need to list Sensitive vascular plants or affect the persistence of S&M vascular species.

Special Status and S&M Nonvascular Plants

Under Alternative 4, the BLM would commercial thin the unit containing *Cheanotheca subroscida*, which would leave a minimum 40 percent canopy cover. To prevent direct impacts to the populations and maintain environmental conditions at the site, it would be buffered with a 50-foot-radius buffer. Because the Project Area was surveyed and the known site would be protected from potential impacts, implementing Alternative 4 would not trend Sensitive nonvascular plant species toward listing or affect the persistence of S&M nonvascular species.

Special Status and S&M Fungi

Potential direct and indirect effects to Special Status or S&M fungi from activities proposed under Alternative 4 would be similar to those in Alternatives 2 and 3. Under Alternative 4, the BLM would harvest the same number of acres as Alternative 2 (624 acres) and 128 acres less than Alternative 3 (752 acres). All 624 acres would be tractor yarded, which would create a risk of directly impacting Special Status or S&M fungi, if present. However, no regeneration harvest would occur, so all 624 acres would continue to provide suitable habitat for Special Status or S&M fungi.

Under Alternative 4, the BLM would construct the same amount of new and temporary spur roads (1.2 miles) as under Alternative 2, but 0.9 miles more than under Alternative 3. Ten acres would be impacted during construction and use of landings for biomass processing, which is the same as in Alternative 2, but more than in Alternative 3 (2 landings and 0.5 acre). The risk of impacting fungi during road decommissioning would be the same as under Alternative 2, with 0.7 mile of road affected.

Under Alternative 4, the risk to Special Status or S&M fungi from burning postharvest slash piles would be the same as in Alternative 2 (32 acres) and less than under Alternative 3 (174 acres).

Overall, the risk to Special Status or S&M fungi under Alternative 4 may be slightly less than under Alternatives 2 and 3 because no regeneration harvest would occur (as in Alternative 2) and fewer acres would be impacted (compared to Alternative 3). The likelihood of Sensitive or S&M fungi populations occurring in the units is the same across all alternatives, but cannot be accurately predicted. Although timber harvest could potentially impact Sensitive or S&M fungi, the species are rare across their ranges and the likelihood that there are populations in the Project Area is small. The Twin Ranch Project Area is on matrix lands, which are lands available for timber harvest. It is anticipated that protecting known and future found sites of Sensitive and S&M fungi, conducting landscape-level strategic surveys to locate additional populations, and protecting habitat and sites in a system of reserves (riparian, late-successional, and other special management areas) would prevent Bureau Sensitive fungi from trending toward listing and maintain the persistence of S&M fungi.

Noxious Weeds

Potential direct and indirect effects from implementing Alternative 4 would be similar to those described in Alternative 2. The area of ground disturbance where noxious weeds could be introduced or spread is the same under Alternative 4 as under Alternative 2 (624 acres of tractor yarding and 32 acres of postharvest slash pile burning), but less than in Alternative 3 (752 acres and 174 acres respectively). As with Alternative 3, there would no regeneration harvest where canopy cover would be reduced to 10 to 30 percent; therefore, there would be less open area for noxious weeds to occupy if they were introduced into the Project Area. The same number of acres would be impacted by permanent and temporary spur road construction (1.2 miles) as in Alternative 2, but more than in Alternative 3 (0.3 mile), so the risk of noxious weeds being brought in and spread during road construction and subsequent logging activities would be the same as Alternative 2, but more than Alternative 3.

However, the differences in amount of areas impacted between alternatives are small. Because there are currently no known noxious weed populations targeted for treatment in the Twin Ranch Project Area, the risk to noxious weeds of implementing Alternative 4 is the possibility of equipment bringing weed seed or parts into the Project Area from an infected area and spreading the seed. This risk exists regardless of how many acres are harvested, although the risk of spreading seed increases with numbers of acres

harvested and other ground-disturbing and vegetation-removing activities. Implementing PDFs and additional BLM actions (table B-3) would reduce the risk of introducing new noxious weed populations into the Project Area as a result of the actions proposed in Alternative 4.

Cumulative Effects

Rare Plants

Special Status and S&M Vascular Plants

Implementing Alternative 4 would not add cumulative effects to Special Status or S&M vascular plant species because the BLM surveyed for rare plants in the Project Area and no populations were discovered in the treatment units. No regeneration harvest would occur under Alternative 4 so thinned stands would continue to provide suitable habitat for expansion of existing rare plant populations in the Project Area. The amount of late-successional forest habitat on BLM-managed lands in the fifth field watershed would remain at 61.9 percent and mid-seral stands would continue developing toward later seral stages.

Special Status and S&M Nonvascular Plants

Implementing Alternative 4 would not add cumulative effects to Special Status or S&M nonvascular plants because the BLM surveyed the Project Area and the one documented site would be protected from direct and indirect effects during project implementation. No regeneration harvest would occur and 61.9 percent of BLM-managed forest stands would remain in late-successional stages. Mid-seral stands would continue developing toward later seral stages.

Special Status and S&M Fungi

The overall risk of adding cumulative effects to Special Status and S&M fungi under Alternative 4 is similar to those under Alternatives 2 and 3 because although some impacts are less, others are greater. However, all proposed activities would occur on matrix lands, which are designated for timber production and harvest. No regeneration harvest would occur under Alternative 4 and, 61.9 percent of conifer forests on BLM-managed lands within the Big Butte Creek fifth field watershed would remain in late-successional stages. In addition to the reserve system that provides habitat for rare fungi, the BLM and Forest Service assume that protecting known sites (current and future found) and conducting large-scale inventories throughout the Pacific Northwest will ensure this project and future projects will not contribute to the need to list Sensitive fungi or affect the persistence of S&M fungi.

Noxious Weeds

Past, present, and foreseeable future activities in the Project Area that could contribute to the introduction and spread of noxious weeds in the Twin Ranch Project Area are the same as those described under the No-Action Alternative. The actions proposed in Alternative 4 could potentially introduce noxious weeds into the Project Area, although it is not possible to quantify the amount or to distinguish it from the background risk of introduction from ongoing activities in the Project Area. The risk of introducing or spreading noxious weeds into the Twin Ranch Project Area from projects proposed in Alternative 4 is similar to Alternatives 2 and 3.

The BLM expects that the use of PDFs during timber harvest activities, monitoring the Project Area after project implementation, and continuing to treat noxious weeds would prevent the timber harvest

activities proposed in Alternative 4 from contributing cumulative affects to noxious weeds in the Twin Ranch Project Area. Future weed inventories and treatments rely on funding.

Appendix C–Air Quality

The following definitions apply to terms used in the Air Quality section:

biomass. The vegetative material leftover from stand treatments.

fuel loading. Amount of live and dead woody fuels available to burn on a given site. Emissions are measured in tons per acre.

particulate matter (PM). A fine particulate air pollutant that consists of solid particles or liquid droplets less than 10 microns in diameter (PM10) or less than 2.5 microns in diameter (PM2.5).

C.1 Air Quality

This section analyzes the potential impacts from the proposed forest management activities on air quality.

C.1.1 Methodology

- The Air Quality analysis area is the Big Butte Creek fifth field watershed.
- The Oregon DEQ Web site and monitoring station data were reviewed.

C.1.2 Assumptions

- Air and visibility conditions monitored in Shady Cove, OR reflect conditions within the Big Butte Creek fifth field watershed.
- Emissions produced from equipment operations (machines and chainsaws) have very little to no impacts on air quality. Factors considered in this assumption include the relatively short operating times, the large area, and the multiyear time span of the project.
- Burning will not occur on units designated for biomass removal or lop and scatter. Therefore, no emissions were calculated for these acres. Emission calculations are for acres where activity slash is hand-piled.

C.1.3 Affected Environment

The Oregon DEQ is responsible for air quality and monitors air pollutant levels via a network of monitoring and sampling equipment sites throughout Oregon. One critical air pollutant the Oregon DEQ monitors is PM (particulate matter). PM10 and PM2.5 have been identified as the particulate sizes of concern because they can penetrate deep into the aveoli of the lungs, where the body's defense mechanisms are ineffective at removing them (Morgan 1989). Oregon DEQ monitors PM levels at two sites in Medford, one in White City, one in Shady Cove, and one in Grants Pass (Oregon Department of Environmental Quality 2010a).

Currently, air quality and visibility conditions are not monitored within the Big Butte Creek fifth field watershed. The monitoring site closest to the Project Area is located in Shady Cove. Samples taken from Shady Cove indicate the air quality index remains below Federal standards (Oregon Department

of Environmental Quality 2010a). No permanent sources of emissions exist on BLM lands within the Project Area. Occasional sources of emissions include construction and logging equipment, light industrial vehicles, road dust, residential wood burning, campfires, prescribed fires, and wildfires. Overall, based on the samples from Shady Cove and the lack of permanent emission sources, air quality and visibility in the Project Area are considered good.

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 SSRA (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 closest SSRAs 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. The objective of the Smoke Management Plan is to prevent smoke from prescribed burns from entering SSRAs.

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.

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 hand-pile burning. Hand-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 4 mil polyethylene plastic sheeting to facilitate rapid ignition and consumption of fuels to minimize residual smoke.

C.1.4 Environmental Consequences

C.1.4.1 Effects of Alternative 1 (No-Action) on Air Quality

Direct and Indirect Effects

Under Alternative 1, no proposed forest management activities or associated burning would occur. However, the potential of smoke impacts from wildfire events would remain. Impacts to air quality from wildfires are closely related to the amount of biomass material consumed (surface and ladder fuel loads) and atmospheric conditions. A high intensity wildfire with heavy fuel loading could cause a high level of emissions.

Particulate matter produced from wildfires limits visibility and can exacerbate health problems. If a wildfire were to occur, the emissions could present health concerns to those individuals living downwind and in nearby low-lying areas. Symptoms from short-term smoke exposure can range from scratchy throat, cough, irritated sinuses, headaches, and stinging eyes. Persons with asthma, emphysema, congestive heart disease, and other existing medical conditions can have more serious reactions. The elderly and children are high-risk groups (Oregon Department of Environmental Quality 2010c)

Cumulative Effects

No permanent sources of particulate matter production exist on BLM-managed lands within the Project area; air quality and visibility is thought to be good. Activities such as traffic exhaust and road dust on private and public lands throughout the Project Area may have localized impacts of short duration. The largest emission source in the Project Area is most likely smoke from woodstoves and fireplaces during the winter months. Smoke created from wood burning would continue as a source of air pollution and may affect those individuals with asthma, respiratory or heart conditions, or other illnesses, especially during inversions or times of stagnated air. Oregon DEQ has developed a statewide woodstove program to promote the use of cleaner burning woodstoves and help residents burn wood more efficiently and with less pollution.

Private property owners in the Project Area would continue to reduce hazardous fuels under the Oregon Forestland-Urban Interface Fire Protection Act. Burning on private timber lands within the watersheds containing the Project Area would continue under the guidelines of the Oregon Smoke Management Plan.

Impacts from a wildfire event would be dependent on the size, intensity, location, atmospheric conditions, and duration. Emissions from a small wildfire would be localized and short in duration and would affect local drainages. The potential health hazards to individuals living in the vicinity or downwind from a large intense fire could be substantial. The duration and exposure to pollutant emissions would increase, impacting human health and public welfare. This would continue until the fire was out and atmospheric conditions allowed for sufficient dispersion of the smoke. Alternative 1 would have the greatest potential for large-scale smoke events from wildfires because the current surface fuel loading on BLM-administered lands would not be reduced.

C.1.4.2 Effects of Alternative 2 (Proposed Action) and Alternative 4 on Air Quality

Direct and Indirect Effects

In Alternatives 2 and 4, proposed activity slash treatments include slashing damaged trees, lop and scatter, hand-pile and burn, or biomass removal. Biomass removal would occur on approximately 517 acres. Lop and scatter would occur on approximately 76 acres. Hand-piling and hand-pile burning would occur on approximately 32 acres.

Hand-pile burning would affect air quality by the adding carbon monoxide, PM10, and PM2.5 to the atmosphere. The project fuels specialist estimates that hand-pile fuel loading would be less than 20 tons/acre. These alternatives would result in minimal smoke production.

Effects from burning would be short-term and localized. 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.

Cumulative Effects

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, 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). In addition, prescribed burning emissions are not expected to adversely affect annual PM10 attainment within the Grants Pass and Medford/Ashland SSRAs.

Under Alternative 2 and 4, the majority of activity slash would be mitigated without burning. When compared to the no action alternative there would be negligible cumulative effects to air quality.

C.1.4.3 Effects of Alternative 3 on Air Quality

Direct and Indirect Effects

In Alternative 3, proposed activity slash treatments include lop and scatter or hand-pile and burn. There would be no biomass removal under Alternative 3. Lop and scatter would occur on approximately 578 acres. Hand-piling and hand-pile burning would occur on approximately 173 acres.

Hand-pile burning would affect air quality by the addition of carbon monoxide, PM10, and PM2.5 to the atmosphere. The project fuels specialist estimates that hand-pile fuel loading would be less than 20 tons/acre. However, the larger number of acres (173) proposed for hand-piling in this alternative would result in more smoke production and possible air quality effects than in Alternatives 2 or 4.

Effects from burning would be short-term and localized. 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.

Cumulative Effects

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, 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). In addition, prescribed burning emissions are not expected to adversely affect annual PM10 attainment within the Grants Pass and Medford/Ashland SSRAs.

Under Alternative 3, a larger portion of activity slash would be mitigated by burning. When compared to the no action alternative there would be minimal cumulative effects to air quality. When compared to Alternatives 2 and 4, this alternative would produce more smoke and therefore have a higher probability of cumulative effects to air quality.

Appendix D–Northern Spotted Owl Recovery Plan RA32 Draft Guidance

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USDI Bureau of Land Management
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http://www.or.blm.gov/medford

File Code: 2670 **Date:** January 12, 2010
Route To: (BLM File Designation: 5000/6600)

Subject: Northern Spotted Owl Recovery Plan - Recovery Action 32 Draft Guidance

To: BLM Leadership Team, Forest Service Leadership Team

The purpose of this Memorandum is to provide the field units of the Rogue River-Siskiyou National Forest and the Bureau of Land Management, Medford District, draft guidance in the application of procedures for assessing potential Recovery Action 32 (RA32) forest stands when planning forest management projects.

This methodology provides a process for field units planning forest management activities to identify and document the presence or absence of forest stands meeting the RA32 characteristics. The methodology does not address what management actions should or should not be taken within or adjacent to these stands.

This guidance is to be used by all field units on the Rogue River-Siskiyou National Forest and the Bureau of Land Management, Medford District when planning any forest management project that could potentially affect RA 32 forest stands.

The review of forest management projects and RA32 stand identification is intended for those projects that have not yet been submitted to the Fish and Wildlife Service for Biological Opinions or Letters of Concurrence.

This is draft guidance and subject to change. The Fish and Wildlife Service are evaluating the contents of the Recovery Plan and are expected to make changes. Because of the unknown nature of the Service's efforts, the methodology will remain as a draft until the time that a final Recovery Plan is adopted and the need for any refinement of the current methods are evaluated.

In addition, the methodology is being field tested in Fiscal Year 2010. It will be subject to change or refinement as individual field units gain experience in its application and recommend improvements. Standards such as the minimum size of individual RA 32 patches or inclusions are subject to change as more information from field units and the Service are gathered to help

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guide the process. When sufficient information is gathered to determine how the RA 32 methodology is functioning in Southern Oregon, a review process will take place and updates will be made.

Questions on application of the methodology may be addressed to members of the RA32 team.

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Robin Snider	Jon Raby
Cindy Donegan	Edward Reilly

/s/ Scott D. Conroy
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/s/ Timothy B. Reuwsaat
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In an effort to develop a consistent and repeatable methodology for delineating and/or validating "high quality habitat", as defined in the Recovery Plan for the Northern Spotted Owl (USDI FWS 2008), the respective managers of the Medford District Bureau of Land Management (District), the Rogue River-Siskiyou National Forest (Forest) and the Roseburg Field Office of the U. S. Fish and Wildlife Service (Service) assembled an interagency, interdisciplinary team (RA 32 team). Our team considered the recovery plan definition of "high quality habitat," assessed available agency mapping data, and reviewed available scientific data in producing the following work products:

1. A methodology for the identification of forest stands that would meet the definition of "high quality habitat."
2. A field data form for the collection and documentation of pertinent data.
3. A decision tree to assist in moving through the elements of the methodology.
4. A set of photos to aid in the identification of "high quality habitat."

In addition, our team identified and recommends the following next steps:

1. Direct the RA 32 team to develop a list of forest management activities that may appropriately be implemented within forest stands that meet the definition of "high quality habitat."
2. Develop a consistent approach to mapping all spotted owl habitat across agencies.
3. Develop procedures to track RA32 stands in GIS.

We consider our work products preliminary and anticipate potential changes once District, Forest and Service staff have reviewed and considered implementation.

Please review these products with your staff and provide comments and questions to any member of the Recovery Action 32 team.

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RA 32 Habitat Evaluation Methodology
Medford Bureau of Land Management / Rogue River-Siskiyou National Forest
October, 2009

Introduction

The US Fish and Wildlife Service issued a Recovery Plan for the Northern Spotted Owl in 2008. Included in the recovery plan are numerous *Recovery Actions.* Recovery Actions are recommendations to guide the activities needed to accomplish the recovery objectives and ultimately lead to delisting of the species. Within the administrative units of the Rogue-River Siskiyou National Forest and the Medford District BLM, an interagency, interdisciplinary team was created to develop a consistent, repeatable, methodology for delineating and/or validating high quality habitat (Recovery Action 32, structurally complex forest) for project level planning and NSO consultation needs in SW Oregon.

> ***Recovery Action 32:*** *Maintain substantially all of the older and more structurally complex multi-layered conifer forests on Federal lands outside of MOCAs in the Olympic Peninsula, Western Washington Cascades, Western Oregon Cascades, Oregon Coast Range, Oregon and California Klamath, and California Coast Provinces, allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These forests are characterized as having large diameter trees, high amounts of canopy cover, and decadence components such as broken topped live trees, mistletoe, cavities, large snags, and fallen trees.*

The process set forth here relies primarily on field visits to verify the presence or absence of the forest conditions that contribute to meeting the definition for RA 32 forest stands. A field form is provided to document the forest conditions for each stand evaluated. It is recognized that both existing projects and new planning efforts will address identification of RA 32 stands. Projects that are currently being developed have added opportunity to identify and avoid RA 32 stands during initial design stages. Procedures utilizing aerial photos and GIS data to aid in new project planning are offered. For projects already identified in the field, the field forms alone can be completed to document the identification of RA 32 stands.

RA 32 Eco Zone / Site Productivity Discussion

The Team recommends that field units consider adjusting parameters when making determinations for RA 32 based on landscape location and productivity potential. Productivity is largely influenced by precipitation and elevation. Generally elevations above 3500 to 4000 feet and/or areas with greater than 35 inches of rain per year are in the higher productivity class. There are also differences in how owls use high quality habitat among specific areas in the Rogue Basin. For example, in the South Cascades and Coast Mountains, spotted owls are cavity nesters; they use primarily natural cavities in conifer and other tree species to a great extent as nest habitat. In the Siskiyou Mountains however, spotted owl use platforms almost exclusively for nesting. Mistletoe brooms are the primary platform, with other raptor nests or platforms are

used to a lesser extent. This is very likely due to fire history and lower productivity in that area which does not lend itself to large tree production that produces cavities sufficient to provide nest habitat for spotted owls.

Due to these differences in fire history and productivity potential, the team recommends that units consider three Eco Zones when determining RA 32 stands. The Coast and Cascades Eco Zones use the same standards for RA 32 determination; initial screens should include a minimum of 21 inches overstory DBH and 60% canopy closure.

The Interior Eco Zone initial screen allows for somewhat smaller tree size and lower canopy closure to be considered due to the lower site potential factors previously mentioned as well as local knowledge of what habitat spotted owls use in that area. The Interior zone initial screen is recommended to be a minimum of 17 inches overstory DBH and canopy closures of 40-60 percent, **however if overstory canopy is below 60 percent, six trees over 30 inch DBH must also be present in order to qualify those stands for RA 32.** (Zabel et al 2001).

In all Eco Zones, other parameters such as snags, down wood, and multiple tree layers also need to be present, however those may not be present in quantities or configuration in the Interior seen in the Coast or Cascades Eco Zones.

<u>Cascades</u>
High Cascades RD
Higher Elevations Butte Falls RA
Glendale RA
Ashland RA East Side portion

<u>Coast</u>
Gold Beach RD
Powers RD
Wild Rivers RD with the exception of lower elevation ground
Higher elevation Grants Pass RA

<u>Interior Low Productivity</u>
Siskiyou Mountains RD
Ashland RA Applegate Portion
Lower elevations Butte Falls RA
Low elevation Grants Pass RA

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Process

There are typically two steps in this process. The first step involves using GIS or aerial photos to narrow your focus for checking RA 32 stands, and the second step involves field verification to make the final RA 32 determination.

Step 1: Perform a GIS coarse filter to determine the first cut of potential High Quality/ RA 32 habitat within your project area. Various GIS methods or datasets can be used.

A. Use current vegetation or NSO habitat layers (e.g. McKelvey, Ebaseline, Forest Service owl habitat layers, Forest Operations Inventory (FOI), Gradient Nearest Neighbor Vegetation (GNN))

- NRF = Potentially RA 32
- Dispersal = Unlikely RA 32
- Mckelvey 1 = Likely RA32
- McKelvey 2 = Potentially RA 32
- McKelvey 5 = Unlikely RA 32
- McKelvey 3,4 = Unlikely RA 32
- McKelvey 6 = Unlikely RA 32

B. Use GIS data to query on high quality habitat attributes provided in the definition.

High Quality Habitat Elements	GIS
Multiple Layers Present	≥2
Overstory Average Diameter Size	≥17 DBH (Interior) ≥21 DBH (Cascades, Coast)
Canopy Cover	≥40% (Interior) ≥60% (Cascades, Coast)

Step 2: Visit the potential RA 32 unit/ stands identified to determine if necessary components are present to qualify stands as RA 32.

Evaluations are conducted at the project planning unit level. This may be an operational inventory (OI), timber sale, fuels, or other management action unit. Final evaluations are to be documented on the RA 32 habitat evaluation data form. Attach a map with the associated form to show the route surveyed and potential RA 32 inclusions.

Evaluations are conducted in the field by walking in a systematic manner that allows a comprehensive evaluation of forest structure. Evaluators may use aerial photos and

topographic maps to insure survey routes are well distributed and representative of the unit being surveyed.

Evaluations are performed by making both ocular estimates and direct measurements of the stands features, and averaging them across the stand. Canopy closure should be determined using an instrument such as a moose horn or a densiometer. A minimum of one canopy measurement every five acres should be performed. If much variation occurs in the unit, more frequent measurements should be performed. Average stand diameter, coarse wood, snags present should be recorded as the evaluator moves through the stand to aid in determining the final summary. Attributes may be recorded in the comments section of the form and then used for the final determination.

INCLUSIONS
In SW Oregon, project units may include both RA 32 and non-RA 32 stands. Therefore, the evaluator will identify and map RA 32 inclusions within each project unit. The minimum RA 32 area to be delineated in the SW Oregon RA 32 methodology is 1 acre.

When more than 50% of the survey unit includes RA 32 patches scattered throughout the unit, the entire unit will be classified as RA 32. If less than 50% of the stand is RA 32 those individual areas should be delineated separately. When feasible, units may be split into RA 32 and non-RA 32 portions.

In all cases, treatment around and adjacent to mapped RA 32 patches will depend on operational feasibility and how the treatment would affect the ability for the remaining RA 32 stand to serve as refugia for spotted owls.

Additional Tools:

- Aerial Photos
- Stand photo library of RA 32 stands identified in the field
- Google Earth

Data Form Definitions

Top Section
The purpose of this section is to provide basic survey identification information, such as surveyor name, date, and location.

Zone Coast, Cascade or Interior

TRS Township Range Section

Stand # - Unique identifier such as FOI#, Timber Sale #, Setting ID

Acres Acres of the evaluation unit

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Overstory Section
The purpose of this section is to identify if the large tree structure and high canopy cover components of RA 32 stands are present.

Overstory tree diameter - Average diameter breast height of dominant / co-dominant trees.

Total Canopy Cover The proportion of the forest floor covered by the vertical projection of all tree layers. Do not double count overlapping layers. Total Canopy cover rating will not exceed 100%.

Tree Layer Section
The purpose of this section is to estimate various aspects of the individual tree layers and to determine if the stand has the multi-layered component of RA 32 stands.

Number of Layers Present? The total number of distinct layers. Separate layers are identified when there is at least a one-third height difference between layers. Indistinct is defined as a situation with many layers present and no distinct breaks.

Layers Assessment of the canopy cover percent, average DBH and average height for each layer present. Top, middle and bottom layers: Larger trees are assigned to the top layer when a 1/3 height difference is present and canopy cover is ten percent or greater. Shorter trees are assigned to the middle layer when a 1/3 height difference is present and canopy cover is ten percent or greater. Smaller saplings and seedlings are assigned to the bottom layer when a 1/3 height difference is present and canopy cover is ten percent or greater.

Decadence / Nest Structure Section
The purpose of this section is to determine if the stand has various decadence components needed for an RA 32 stands. These habitat features can be used for spotted owl nest structures as well as habitat for spotted owl prey species.

Number of trees per acre over 30 DBH present general estimate of the number of trees greater than 30 DBH present per acre.

Cavities cavities of sufficient size for spotted owls.

Mistletoe Present brooms present of sufficient size for spotted owls.

Broken top trees trees with tops suitable for owls to nest or roost in.

Large snags Measure of dead standing trees over 16 Low is <= 1 per acre, med = 2-3 per acre, high > 3 per acre.

Large CWM Measure of down wood present. Low is $\leq$ 120 linear feet of 16 foot, 16 inch diameter down trees, high is $\geq$ 400 feet of 20 DBH for the Coast and Cascades and $\geq$ 300

feet of 20□DBH for the interior zone. Medium is between the two, approximately 260 linear feet of material in the Coast/Cascade zone and 210 linear feet in the Interior zone.

Final Determination Section

This is where you make your final determination call for your survey unit based on your collected data and Eco Zone RA 32 definition criteria. Follow the RA 32 Decision Guide to assist in your RA 32 determination for the unit.

In order to qualify as an RA32 stand, you must have the three basic elements:

1) Large over story tree size (averaging 21□+ DBH for Cascade and Coast or 17□+ DBH for Interior)
2) High canopy closure (averaging ≥60% for Cascade and Coast or ≥40% for Interior if six or more large trees over 30□are present)
3) Multiple layers.

The addition of two or more decadence components and remnant large over story trees increase the likelihood of the area meeting the RA 32 standard.

RA 32 Inclusions Present? - If the entire stand does not qualify as RA 32 and inclusions are present, then an additional form may be required to document the portion of the stand that is RA 32.

Comments □Describe the presence of RA 32 areas and where they occur throughout the unit. Describe how the conclusion was determined.

RA32 definitions

Zone	Coast		Cascade		Interior	
Tree Size	≥21" DBH		≥21" DBH		≥17 " DB	
Canopy Closure	≥60% +		≥60% +		≥60% / ≥40% *	
Canopy Layers	≥2		≥2		≥2	
TPA > 30" DBH	3		3		3 / 6	
Source	Thomas et al 1990		Thomas et al 1990		Zabel et al 2003 * Stands with lower canopy qualify only if six or more large overstory trees are present	
Decadence Components						
Snags	11-20" 4	20"+ 2	11-20" 4	20"+ 2	11-20" 4	20"+ 2
Down Wood	20"+ 4 @ 107 ft		20"+ 10 @ 20 ft		20"+ 3@97 ft	
Source	Decadence data from Forest Service Ecoplots					

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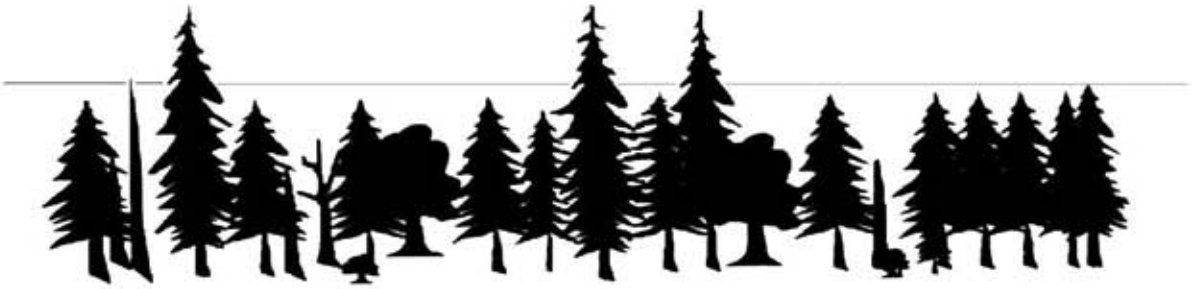
Defining Layers

ONE LAYER STAND - Top Layer: All trees and saplings are assigned to one layer because 1/3 height difference is present but sapling canopy cover is less than 10 percent.



TWO LAYER STAND - Top & Bottom Layers: Larger trees are assigned to the top layer because 1/3 height difference is present and canopy cover is 10 percent or greater. Remaining trees and saplings are assigned to the bottom layer because combined canopy cover is 10 percent or greater while the small sapling canopy cover by itself is less than 10 percent.

THREE LAYER STAND - Top, Middle and Bottom Layers: Larger trees are assigned to the top layer because 1/3 height difference is present and canopy cover is 10 percent or greater. Shorter trees are assigned to the middle layer because 1/3 height difference is present and canopy cover is 10 percent or greater. Smaller saplings and seedlings are assigned to the bottom layer because 1/3 height difference is present and canopy cover is 10 percent or greater.

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Additional documents

Appendix A: Decision tree

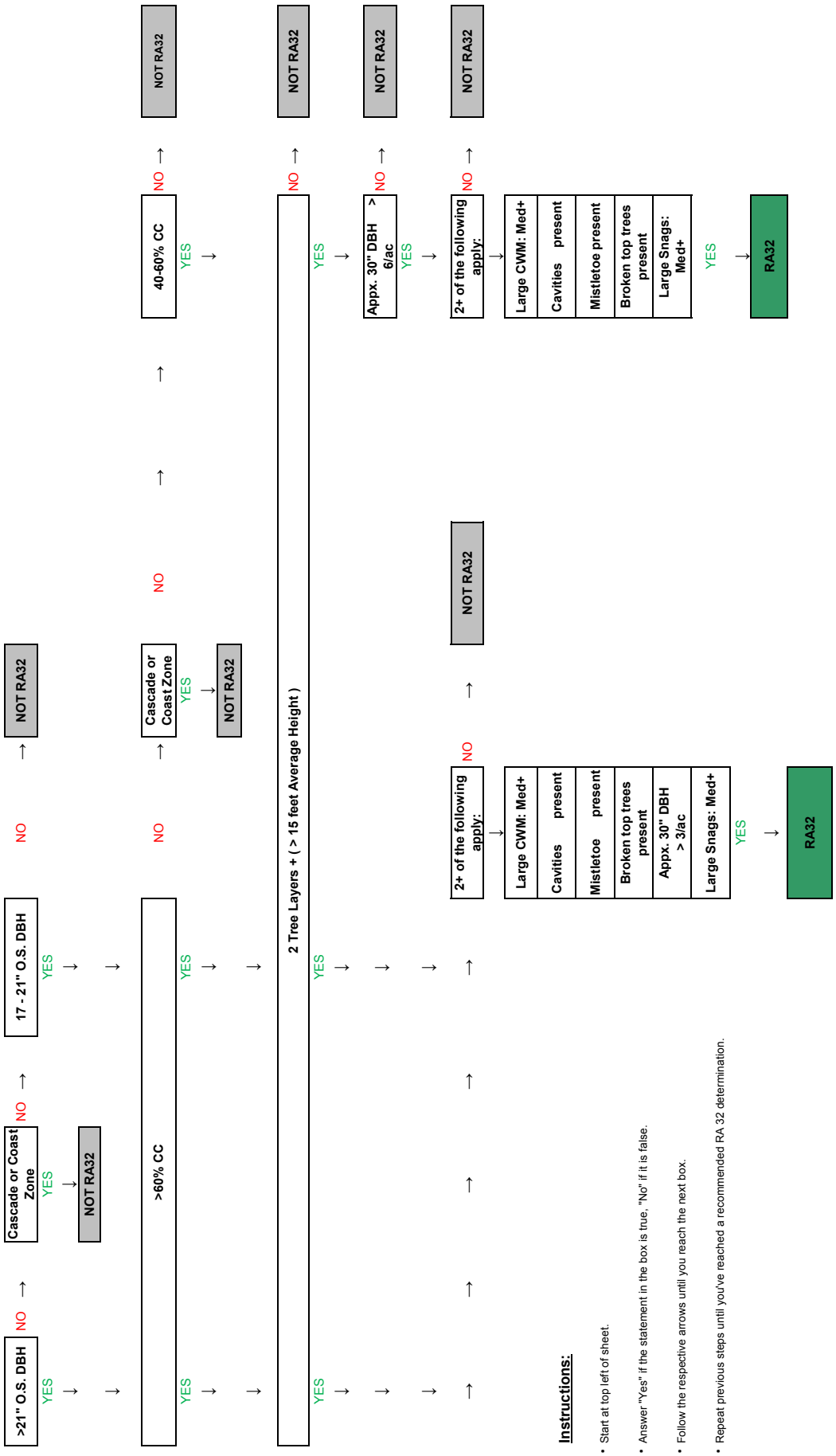
Appendix B: Aerial photo examples

Appendix C: Stand photo examples

Appendix D: Inclusion examples

Appendix E: Eco Zone / Productivity Maps

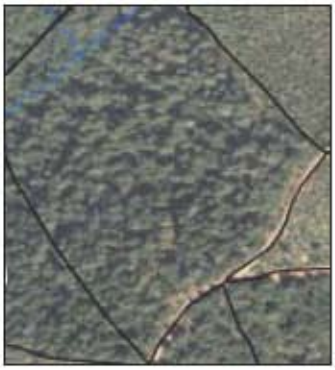
Appendix F: Evaluation Form


>21" O.S. DBH
YES
NO
Cascade or Coast Zone
YES
NO
NOT RA32
17 - 21" O.S. DBH
YES
NO
NOT RA32
>60% CC
YES
NO
Cascade or Coast Zone
YES
NO
NOT RA32
40-60% CC
YES
NO
NOT RA32
2 Tree Layers + (> 15 feet Average Height)
YES
NO
NOT RA32
Appx. 30" DBH > 6/ac
YES
NO
NOT RA32
2+ of the following apply:
YES
NO
NOT RA32
Large CWM: Med+
Cavities present
Mistletoe present
Broken top trees present
Appx. 30" DBH > 3/ac
Large Snags: Med+
YES
RA32
2+ of the following apply:
YES
NO
Large CWM: Med+
Cavities present
Mistletoe present
Broken top trees present
Large Snags: Med+
YES
RA32
Instructions:
• Start at top left of sheet.
• Answer "Yes" if the statement in the box is true, "No" if it is false.
• Follow the respective arrows until you reach the next box.
• Repeat previous steps until you've reached a recommended RA 32 determination.

Appendix B: Visual Aid – Aerial Photo Examples

Aerial photos can be used as an additional tool for determining RA 32 qualification. However, it should be used with GIS or field methods and not alone. The Medford RA 32 team conducted several field trips to test our methodology. The aerial photos provided below are examples of RA 32 and Non RA 32 stands that were identified by the RA 32 team during field reviews.

Interior Zone Examples



Entire unit is RA 32

Patch of RA 32 within larger unit

Entire stand is NRF but NOT RA 32

Cascades Zone Examples

Entire unit is RA 32

Entire unit is RA 32

Entire unit is RA 32

Appendix C: Visual Aid – Stand Photo Examples

Figure 1 - This stand does not meet the RA 32 definition. Canopy closure is adequate but the absence of multiple layers and larger overstory trees leads to a lack of complexity.

Figure 2 – This Cascades forest stand provides the key components of the RA 32 definition. Canopy closure is 60% or greater, average overstory tree size is greater than 21 “, multiple layers are present and decadence components such as snags and down wood are present.

Appendix C: Visual Aid – Stand Photo Examples

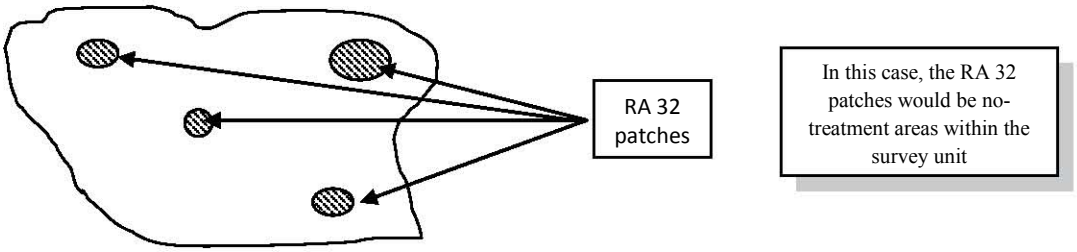
Figure 3 – This stand in the Cascades does not meet the RA32 definition. It lacks structural complexity.

APPENDIX D: Visual Aid – RA 32 Inclusion Examples

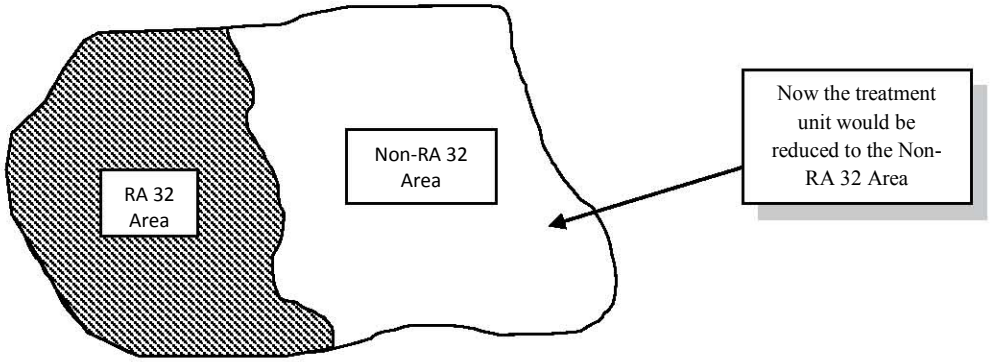
Often in SW Oregon, survey units will include both RA 32 and non-RA 32 stands. Therefore, the evaluator will identify and map RA 32 inclusions within project unit. The minimum RA 32 area to be delineated in the SW Oregon RA 32 methodology is 1 acre.

Below are some examples of RA 32 inclusions within evaluation units:

Scattered 1+ acre RA 32 patches within a large evaluation unit

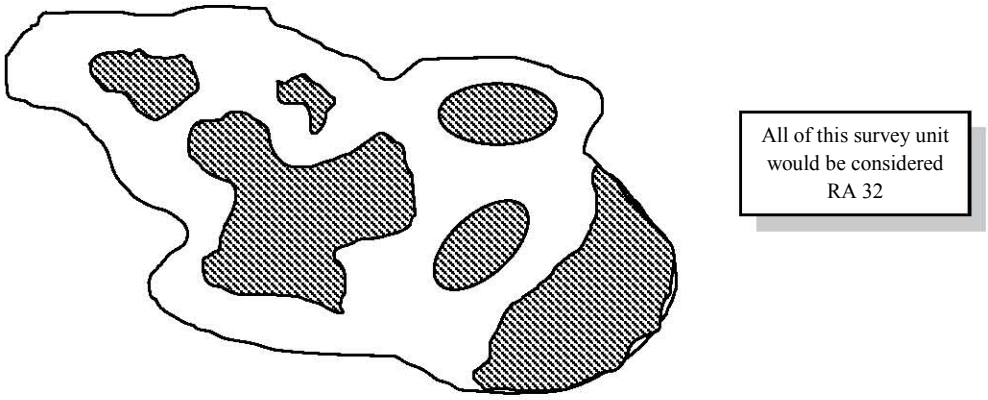


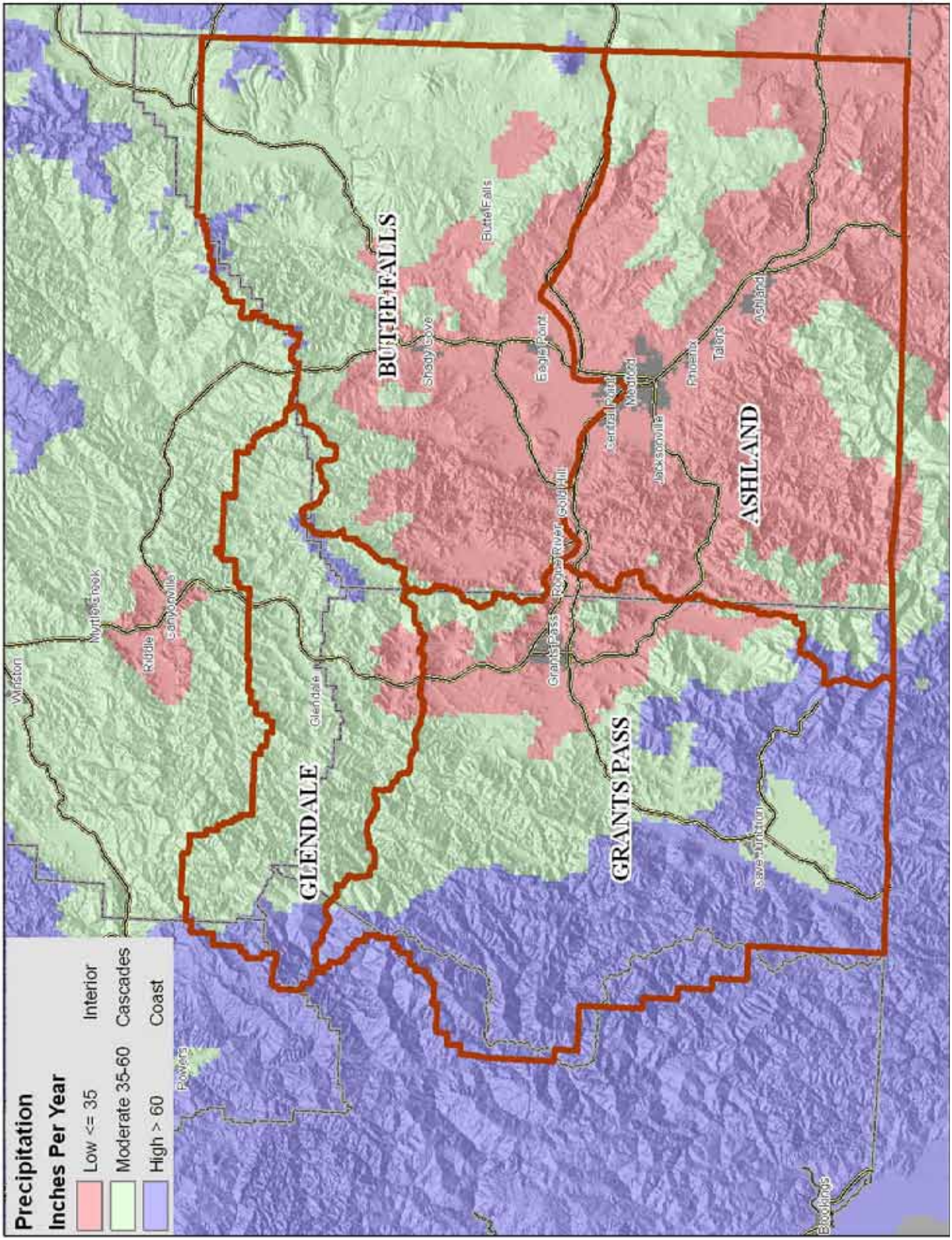
Large enough RA 32 patch to split large treatment unit

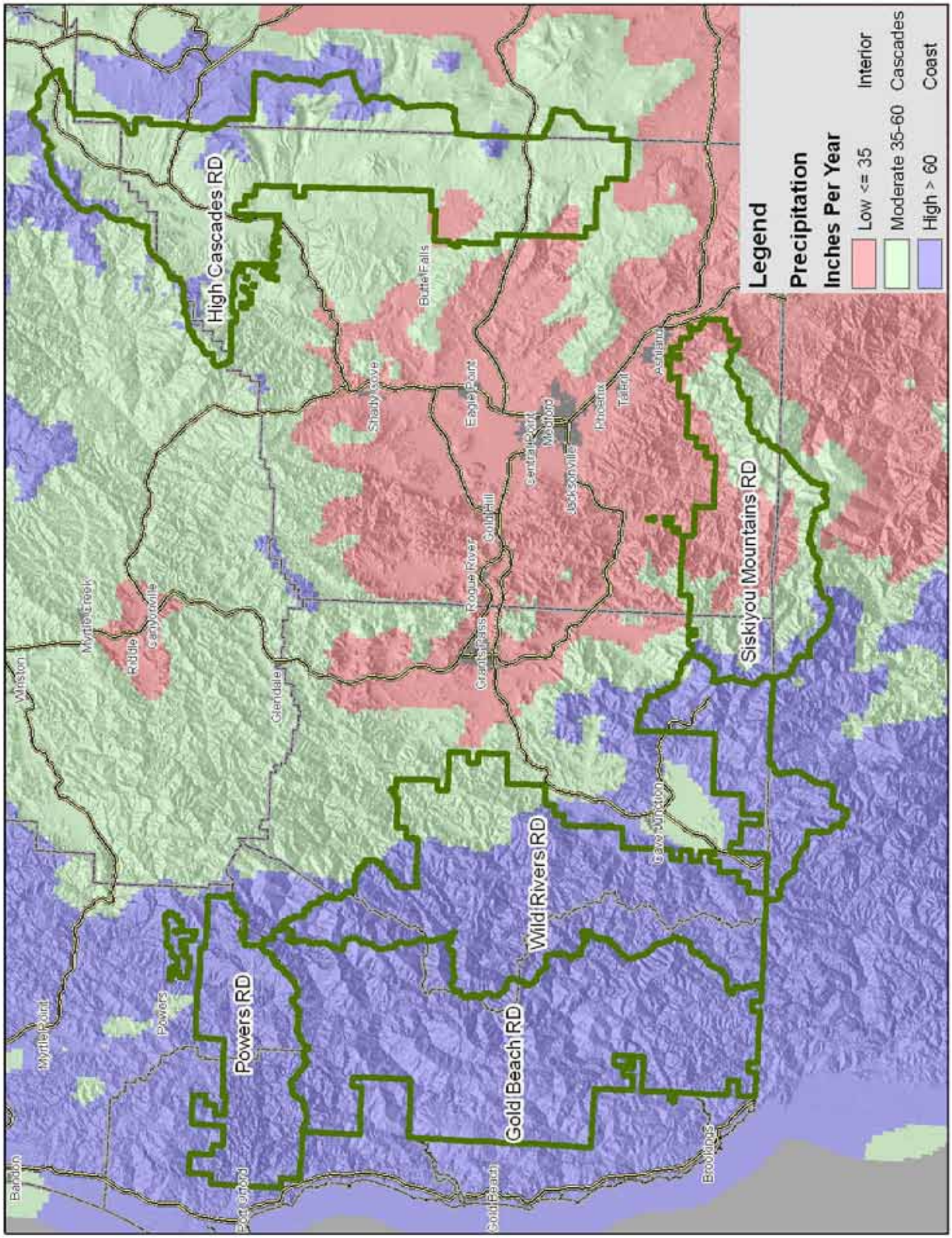


Multiple RA 32 patches equaling more than 50% of the survey unit

When more than 50% of the survey unit includes RA 32 patches scattered throughout the unit, the entire unit will be classified as RA 32. If less than 50% of the stand is RA 32 those individual areas should be separately delineated. A one acre minimum size will be used.




Precipitation
Inches Per Year
Low <= 35
Moderate 35-60
High > 60
Interior
Cascades
Coast
GLENDALE
BUTTE FALLS
GRANTS PASS
ASHLAND
Winston
Myrtle Creek
Riddle
Canyonville
Glendale
Powers
Shady Cove
Butte Falls
Eagle Point
Central Point
Medford
Jacksonville
Phoenix
Talent
Ashland
Grants Pass
Rogue River
Gold Hill
Cave Junction
Brookings


Legend
Precipitation
Inches Per Year
Low <= 35
Moderate 35-60
High > 60
Interior
Cascades
Coast
High Cascades RD
Siskiyou Mountains RD
Wild Rivers RD
Gold Beach RD
Powers RD
Butte Falls
Shady Cove
Eagle Point
Central Point
Medford
Jacksonville
Phoenix
Talent
Ashland
Gold Hill
Rogue River
Grants Pass
Glendale
Winston
Riddle
Canyonville
Myrtle Creek
Powers
Myrtle Point
Bandon
Bot ondo
Gold Beach
Brookings
Cave Junction

RA 32 Habitat Evaluation Form

Project Name:		**Date:**	**Surveyor Name:**
Zone:	**TRS:**	**Stand #:**	**Acres:**

OVERSTORY SECTION				
Average Overstory Tree Diameter: <17" DBH 17-21" DBH >21" DBH			**Canopy Cover:** <40% 40-60% >60%	
TREE LAYER SECTION				
Top Tree Layer	CC%	DBH average:	Height average:	**Number of Layers:** 1 2 3 Indistinct
Middle Tree Layer	CC%	DBH average:	Height average:	
Bottom Tree Layer	CC%	DBH average:	Height average:	
DECADENCE SECTION				
Number of trees per acre over 30" DBH present:				
Cavities: Y/ N	**Mistletoe:** Y/N	**Broken top trees:** Y / N	**Large Snags:** low med high	**Large CWM:** low med high
Recovery Action 32 rating: Y / N			**RA 32 Inclusions Present?** Y / N	

Comments:

Comments:

Appendix E–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 NWFP 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).

E.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.

E.1.1 Riparian Reserves

The 1995 Medford District ROD/RMP 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" (1995 ROD/RMP, 27).

E.1.1.1 Management Actions/Directions–Timber Management (ROD/RMP, p. 28-29)

Apply silviculture 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.

E.1.2 Key Watersheds

The Big Butte Creek fifth field watershed is not a key watershed.

E.1.3 Watershed Analysis

The relevant watershed analysis for this project is the Central Big Butte Creek Watershed Analysis (Bureau of Land Management 1995a)

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).

E.1.4 Watershed Restoration

The Northwest Forest Plan Record of Decision (p. B-31) listed the most important components of a watershed restoration program as "control and prevention of road-related runoff and sediment production, restoration of the condition of riparian vegetation, and restoration of instream habitat complexity."

The Twin Ranch project incorporates road renovation on about 25 miles of road and full decommissioning on 0.7 mile of road. Riparian thinning is proposed on 16 acres of riparian reserves to promote growth of large diameter conifer trees. There is no restoration of instream habitat complexity proposed with this project.

E.2 Project Summary

The BLM is proposing forest management activities on 608 acres of matrix lands and 16 acres of riparian reserves. Forest management activities could include regeneration harvest, shelterwood harvest, selection harvest, commercial thinning, density management, riparian thinning, and slash disposal activities such as piling and burning and biomass utilization. Road projects proposed to support forest management activities are road renovation, road decommissioning, temporary spur road construction, and road realignment.

E.2.1 Project Design Features (PDFs) that would Maintain or Restore ACS Objectives

PDF 7. Restrict harvest activities within 300 feet of meadows.

PDF 8. Store all hazardous materials and petroleum products in durable containers placed outside of riparian reserves so an accidental spill will be contained and not drain into the stream system.

PDF 9. Refuel equipment in locations outside riparian reserves.

PDF 10. Stack hand piles more than 60 feet from fish-bearing, perennial streams and more than 35 feet from non-fish-bearing, intermittent streams.

PDF 11. Designated riparian reserves will be treated in areas up to 100 feet wide adjacent to upland thinning units.

PDF 12. No mechanized equipment is allowed in riparian reserves; all logs felled within riparian reserves will be cable winched to adjacent matrix land or existing roads.

PDF 13. To limit access to OHVs, barricade with debris, such as rocks, logs, and slash, the first 100 feet of skid trails leading off system roads in all tractor units upon completion of yarding.

PDF 14. Construct new landings outside riparian reserves.

PDF 15. Install drainage structures where temporary roads cross intermittent streams. Remove structures after use and before fall rains begin.

PDF 16. Use erosion-control techniques on temporary roads located inside riparian reserves. Techniques may include applying native grass seed and weed-free mulch, scattering chipped material, or scattering limbs and other fine material.

PDF 19. Protect known Special Status and Survey and Manage vascular plant, lichen, bryophyte, and fungi sites. Buffers will be determined based upon species, proposed treatment, site-specific environmental conditions, and available management recommendations (Special Status Species Conservation Assessments and Survey and Manage Management Recommendations).

PDF 20. Use weed-free gravel and fill for road work. BLM sources of rock and fill material need to be free of noxious weeds. Survey BLM rock quarries for noxious weeds prior to use. If noxious weeds are found, they will be treated by the BLM prior to quarry use.

PDF 21. Wash vehicles and equipment that will travel off system roads to remove mud, dirt, and plant parts prior to entry onto BLM-administered lands.

PDF 22. Seed and mulch ripped temporary roads, decommissioned roads, and landings using native seed and weed-free straw after final disturbance.

PDF 24. Restrict rock hauling, timber hauling, and landing operations on native surface or inadequately 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.

PDF 25. Restrict rock hauling, timber hauling, and landing operations on adequately rocked roads whenever soil moisture conditions or rain events could result in road damage or the transport of sediment to nearby stream channels, especially between the dates of October 15 and May 15. Allow road or landing use between those dates only during periods of dry weather.

PDF 26. Restrict all road renovation and closure work from October 15 to May 15, or when soil moisture exceeds 25 percent.

PDF 27. Block or barricade identified roads after use and before beginning of rainy season (generally by October 15).

PDF 28. 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).

PDF 29. Place waste stockpile and borrow sites resulting from road construction or reconstruction in a location where sediment-laden runoff can be confined, at least one site-potential tree length (190 feet) from a stream.

PDF 30. Seasonally restrict (generally October 15 to May 15) 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.

PDF 31. To prevent the potential for runoff from quarry operations into nearby stream channels, construct silt fences or other preventative structures (diversion ditches, settling ponds) as needed.

PDF 34. Apply native seed and mulch to all disturbed or exposed soils during stream culvert removal, replacement, and installation in the same operational season the work is completed.

PDF 35. To reduce sediment input into streams, remove all possible excess sediment from stream channels during stream culvert removal, replacement, and installation activities in the same operational season the work is completed.

PDF 36. To minimize the movement of sediment downstream, dewater perennial streams during culvert replacement.

PDF 37. Rip, seed, mulch and block all temporary spur roads in same season after use.

PDF 42. Minimize the total number of skid trails in commercial thinning and selection harvest units by designating skid trails at an average spacing of 150 feet. In order to minimize ground disturbance, avoid creating new skid trails and use existing roads where feasible. Where new skid trails may be needed to access unharvested areas, maintain average 150-foot spacing between trails.

PDF 43. Use existing skid trails in regeneration harvest units where practical.

PDF 44. Locate skid trails to minimize disturbance to coarse woody debris. Where skid trails encounter large coarse woody debris, cut out a section for equipment access. The remainder will be left in place and not disturbed.

PDF 45. Rip skid trails in all tractor-yarded regeneration harvest units.

PDF 46. Waterbar all skid trails and firelines during the same operating season as constructed. Use spacing for high erosion class soils (see ROD/RMP, Appendix D-Best Management Practices, and Erosion Control for Timber Harvest, p.167).

PDF 47. Use ridge tops wherever possible for temporary spur road construction.

PDF 48. Restrict all tractor yarding and soil ripping operations from October 15 to May 15, or when soil moisture exceeds 25 percent.

PDF 49. Restrict tractor and mechanical operations to slopes generally less than 35 percent.

PDF 50. Operate all ground-based mechanized equipment on designated skid trails.

PDF 51. Rip areas identified for ripping (e.g., skid trails, landings, decommissioned roads) to a depth of 18 inches using a subsoiler or winged-toothed ripper.

PDF 52. Limit landings to 0.5 acre or less.

E.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 Twin Ranch project would maintain the distribution, diversity, and complexity of the watershed and landscape-scale features. PDFs will ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted. PDFs will include no-cut buffers on all streams, lakes, wetlands, ponds, and springs; no new landing construction in riparian reserves; wet season restrictions on hauling and construction; no mechanized equipment in riparian reserves; blocking and decommissioning temporary spur roads in the same season as used; and using erosion-control techniques on the temporary spur road located inside the riparian reserve.

Long-Term: Long-term impacts from the Twin Ranch project are expected to maintain watershed features. About 0.1 mile of permanent road construction would occur in support of relocating an existing road out of a stream channel and no-cut buffers will be implemented on all streams, wetlands, ponds, lakes, and springs. Riparian reserves would continue to function. Relocation of BLM road 35-3E-8.1 out of the stream channel would help restore the riparian area, and the 16 acres of proposed riparian reserve thinning would have increased LWD recruitment.

Watershed Scale

Short-Term: Riparian reserves are expected to maintain the distribution, diversity, and complexity of watershed- and landscape-scale features primarily because project activities would be limited to 16 acres of the outer 100 feet of designated riparian reserves; no-cut buffers would be implemented on all streams, lakes, ponds, wetlands, and springs.

Long-Term: There will be no long-term impacts from this project at the watershed scale because of the implementation of no-cut riparian buffers, 0.1 mile of permanent road construction in support of relocating a road out of a stream channel, and project activities would occur in approximately 16 acres of the outer 100 feet of riparian reserves, with no mechanized equipment operation in riparian reserves.

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. Approximately 0.1 miles of permanent road construction in support of relocating an existing road out of a stream channel would occur. All temporary spur roads and landings associated with temporary spur roads will be decommissioned and planted in the same season as used.

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-cut buffers would be in place on all streams, wetlands, ponds, lakes, and springs; therefore, all banks and stream configurations would remain unchanged. The Twin Ranch project would not affect the physical integrity of the aquatic system in the short- or long-term at either the site 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-cut buffers on riparian thinning units 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. PDFs 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. There would be a slight improvement in water quality at the project scale as a result of the adding crushed rock to 3.65 miles of road and relocating an existing road out of a stream channel.

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 to local stream channels but would have little effect at the watershed scale.

Water quality would be maintained as riparian reserves continued to grow large conifers. Road work would help maintain water quality; although, the effect at the watershed scale would be small because of the 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 function and protect aquatic systems from additional sediment loads that may result from management actions. The sediment regime would be maintained through road renovations over approximately 25 miles.

The current sediment regime would be improved as a result of proposed road renovation. The volume of sediment would be reduced as a result of adding crushed rock to 3.6 miles of road within the watershed.

Watershed Scale

Short Term/Long Term: The current sediment regime would be maintained during implementation of the Twin Ranch project because, with the exception of riparian reserve thinning, timber harvest would occur outside of riparian reserves. Riparian reserve thinning would maintain the sediment regime through the use of no-cut buffers. The sediment regime would be maintained through 25 miles of road renovation.

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 16 acres, no mechanized equipment would enter riparian reserves, 0.7 mile of road decommissioning would have no hydrologic connectivity to stream channels, and 0.1 mile of new road construction would occur in support of relocating an existing road out of a stream channel. Therefore, this project would have no causal mechanism to alter flows.

Long-Term: In the long-term, it is expected that large wood recruitment would increase within the 16 acres of riparian reserves being treated due to reducing stand densities and promoting large diameter conifer trees. In the riparian reserves within the Project Area not being treated, large wood recruitment and patterns of sediment and nutrient routing would remain unchanged. It is also expected that in the long-term sediment transport off of relocated road 35-3E-8.1 would decrease.

Watershed Scale

Short-Term/Long-Term: Riparian reserves throughout the Upper South Fork Big Butte Creek, Lower South Fork Big Butte Creek, and North Fork Big Butte Creek sixth field subwatersheds 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 because PDFs would be implemented to ensure instream flows are maintained. PDFs include no-cut riparian buffers, no new landings in riparian reserves, no mechanized equipment within riparian reserves during riparian reserve thinning, wet season hauling and construction restrictions, using erosion control techniques on one temporary spur road within a riparian reserve, and blocking temporary skid trails 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 Twin Ranch 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-cut buffers would be applied to all streams, wetlands, ponds, and springs. Project activities will be restricted within 300 feet of meadows. Therefore, there would be no disturbance within meadows or wetlands.

Watershed Scale

Short-Term/Long-Term: The Twin Ranch 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-cut 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 Twin Ranch project would maintain species composition and structural diversity of plant communities in riparian areas and wetlands because no-cut buffers would be in place on all streams, wetlands, ponds, and springs. Project activities in riparian reserves would be limited to 16 acres in the outer 100 feet of designated riparian reserves. Temporary spur road construction would use the existing footprint of an old skid trail. 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 Twin Ranch 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 that 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 Twin Ranch project is not expected to affect species composition and structural diversity in riparian areas or wetlands at the watershed scale because riparian reserve thinning would occur on only 16 acres in the outer 100 feet of two designated riparian reserves.

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 Twin Ranch project would maintain populations of native plant, invertebrate, and vertebrate riparian-dependent species because no-cut buffers would be implemented on all streams, wetlands, ponds, lakes, and springs. PDFs such as wet season restrictions, no mechanized equipment in riparian reserves during riparian reserve thinning, no new landings in riparian reserves, blocking temporary spur roads in same season of use, using erosion-control techniques on the temporary spur road within a riparian reserve, and ripping and planting new landings and skid trails associated with regeneration harvest will be implemented. PDFs 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 Twin Ranch project is not expected to affect populations of native plant, invertebrate, and vertebrate riparian-dependent species at the watershed scale because there will be no-cut buffers on all stream, wetlands, ponds, and springs. Treatment of riparian reserves will be limited to 16 acres in the outermost 100 feet of riparian reserves and no mechanized equipment will be used within riparian reserves during riparian reserve thinning; felled trees will be bull-lined out of riparian reserves to the adjacent upland unit.

E.4 ACS Summary

The Twin Ranch project will maintain all ACS objectives in the short-term and long-term at both the site and watershed scales because of the small amount of permanent road construction (0.1 mile in support of relocating an existing road out of a stream channel); no-cut buffers on all stream channels, lakes, ponds, springs, and wetlands; no mechanized equipment within the 16 acres proposed for riparian reserve thinning; limiting riparian reserve thinning to the outer 100 feet of the designated riparian reserves; and implementing additional PDFs to limit effects to soil, water, and plants. This project is not expected to affect the aquatic environment. It is expected to 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 Upper South Fork Big Butte Creek, Lower South Fork Big Butte Creek, and North Fork Big Butte Creek sixth field subwatersheds.

Appendix F–Wildlife

Special Status Species Assessment (FY 2010)
Butte Falls Resource Area—Twin Ranch Project

The following table shows the Butte Falls Resource Area special status species assessment. The list is compiled from the BLM OR/WA Special Status Species List, updated in January 2008, based on information from the Oregon Natural Heritage Program and BLM site-specific information. The table contains only the Bureau Sensitive Species known or suspected to be present in the Butte Falls Resource Area boundaries. The method(s) used to assess and review the potential effects to these species followed the techniques described in the OR/WA Special Status Species Policy (IM OR-2003-054). The list includes USFWS Neotropical Migratory Birds of Concern which have been identified as possibly being present in the Butte Falls Resource Area. The species considered are taken from a list of Western BLM Bird Species of Conservation Concern, (source USFWS Migratory Bird Program Strategic Plan 2004-2014; list updated December 2008) and includes birds listed by USFWS as Game Birds below Desired Condition.

Table F-1. Butte Falls Resource Area Special Status Species Twin Ranch Forest Management Project Assessment

Species	Status	Range	Presence in Project Area	Conclusions
Amphibians				
Foothill yellow-legged frog	BS	Yes	Absent	Yellow-legged frogs are generally found in permanent slow-flowing streams from sea level to about 1,800 feet (Corkran and Thoms 1996). They are closely associated with permanent streams and are most common in, and near, streams with rocky, gravelly, or sandy bottoms (Leonard, et al. 1993). The units in the proposed action are higher than 2,500 feet. Riparian reserves would not be entered. Because the Project Area is above the elevation foothill yellow-legged frogs generally occur and riparian reserves would not be entered, there are no detectable impacts from proposed actions.
Reptiles				
Northwestern pond turtle	BS	Yes	Present	Northwestern pond turtles live in freshwater environments with abundant aquatic vegetation, basking spots, and terrestrial surroundings for nesting and overwintering. Western pond turtles may move up to 0.5 mile from the nearest source of water for egg laying, but most nests are within 100 yards of water (Brown, Bury, et al. 1995). Northwestern pond turtles were observed in a pond in a former rock pit in the Project Area approximately 500 feet from a proposed unit. Surveys of other ponds in the watershed were negative for turtles. It is unknown if the turtles in the pond represent a breeding population. Only two individuals have been observed. The proposed action would not affect the persistence of western pond turtles in the Big Butte Creek fifth field watershed.
Birds				
Bald eagle	BS	Yes	Present	Bald eagles nest in large trees at the edges of openings, on ridges, and along larger rivers and streams in the Butte Falls Resource Area. Two bald eagle nests are known to be present within the Big Butte Creek fifth field watershed. One nest is 10 miles from any proposed harvest unit. The second site is located near Medco Pond, 4 miles from the nearest proposed Twin Ranch unit. Eagles can be observed occasionally perched at Medco Pond and may forage in the meadows nearby. Because foraging habitat would not be disturbed and no known nest or perch trees would be removed under the proposed action, there would be no impacts from proposed project.

Table F-1. Butte Falls Resource Area Special Status Species Twin Ranch Forest Management Project Assessment

Species	Status	Range	Presence in Project Area	Conclusions
Band-tailed pigeon	GBBDC	Yes	Suspected; transient	Band-tailed pigeons inhabit coniferous forests (Marshall, Hunter and Contreras 2003) (Sanders 2008). They generally nest in Douglas-fir, but will also nest in hardwoods and shrubs, within closed-canopy conifer or mixed hardwood/ conifer stands. Band-tailed pigeons are often found near mineral springs or seeps. Band-tailed pigeons are classified as an upland game bird by ODFW. The proposed action would not impact any mineral springs or seeps. Conifer forest landscape with a variety of forest stand age and structure would be available adjacent to the proposed units and throughout the Big Butte Creek fifth field watershed. There is no evidence band-tailed pigeons use the proposed Project Area for nesting. Past breeding bird surveys in the area did not detect them. There would be no detectable impacts to species persistence in the fifth field watershed from the proposed project.
Great gray owl	Formerly S&M	Yes	Yes	Great gray owls forage for voles, mice, and gophers in open areas such as meadows, recent clearcuts, and oak woodlands. Most great gray owl nests located by BLM biologists on the Medford District were found in the broken tops of snapped out snags. One great gray owl nest was located in a large, broken-top snag in a 20-year-old clearcut. Some nests were in fairly open (thinned) stands. They also use other raptor nests, such as abandoned goshawk nests. About half the Project Area provides potential nesting habitat for great gray owl. Great gray owls are no longer on the Medford District Special Status Species List and surveys are no longer required under S&M. However, the project was surveyed to S&M protocol standards, with 2 years of protocol surveys (6 visits per year for 2 years) (Quintana-Coyer, et al. 2004, 5). No great gray owl nests were found in any proposed harvest units. One historic nest was checked, but was abandoned. This nest tree will be protected with a buffer. The nest is next to a 100-acre spotted owl activity center and, with RA32 set-aside, 125 acres will be protected from harvest near the historic nest. No impacts to any known great gray owl nest.
Lewis' woodpecker	BS	Yes	Absent	Lewis' woodpeckers winter in the lower elevation oak savannahs in the Rogue Valley. They are associated with open woodland habitat, primarily white oak, ponderosa pine, and riparian communities. They are not present in the Project Area. The Twin Ranch project would not occur within Lewis' woodpecker habitat. No impacts from proposed action.

Table F-1. Butte Falls Resource Area Special Status Species Twin Ranch Forest Management Project Assessment

Species	Status	Range	Presence in Project Area	Conclusions
Northern spotted owl	FT	Yes	Present	There are two historic NSO sites within 1.2 miles of proposed project units. One site has not been active since 1993. An active pair was last detected in the other site in 2005. A single male was detected in 2006 and surveys in 2007-2009 were negative for NSO. Known sites will be surveyed prior to action. Suitable habitat adjacent to known sites would be checked if NSO are not found in historic locations. Project "May Affect, Likely to Adversely Affect" due to habitat removal. The BLM submitted a Biological Assessment to USFWS and expects to receive an opinion in July 2010.
Olive-sided flycatcher	NBC	Yes	Present	Breeding habitat for olive-sided flycatchers is conifer habitat, especially within forest burns where snags and scattered tall, live trees remain, and at the juxtaposition of late- and early-seral forests such as open or semi-open forest with a low percentage of canopy cover (Marshall, Hunter and Contreras 2003). Conifer forest landscape with a variety of forest stand age and structure would be available adjacent to proposed harvest units and within the Big Butte Creek fifth field watershed. The Twin Ranch project proposes thinning and shelterwood or NGFMA regeneration harvest. Overstory trees for perching and foraging would be available after the action. NGFMA harvest would leave 6-8 large trees per acre. Snags would only be cut if they are a safety hazard. Since olive-sided flycatchers forage in the open, thinned stands would continue to provide foraging space. Snags would be left in the stands proposed for treatment, unless they present a safety hazard. Thinning and shelterwood harvest would retain scattered tall, live trees throughout the Project Area. Units proposed for regeneration harvest would retain at least 6 large trees per acre. Because olive-sided flycatchers use open or semi-open forests with a low percentage of canopy cover, impacts from the proposed action would be inconsequential to the persistence of the species in the section.
Oregon vesper sparrow	NBC	Yes	Absent	Habitat for the Oregon vesper sparrow is the dry grassy foothills of the Rogue Valley. Habitat is elevated perches for singing and a grass-dominated understory for foraging and nesting. They may use open habitats of mixed-conifer forest (Marshall, Hunter and Contreras 2003). Twin Ranch proposed units would not occur within Oregon vesper sparrow habitat. No impacts from proposed action.
Peregrine falcon	BS, NBC	Yes	Absent	Primary peregrine falcon nesting habitat is tall cliffs. No cliff habitat is present in the Project Area. No impacts from proposed action.

Table F-1. Butte Falls Resource Area Special Status Species Twin Ranch Forest Management Project Assessment

Species	Status	Range	Presence in Project Area	Conclusions
Streaked horned lark	BS	No	Absent	Habitat is open low elevation grasslands and farmlands. They have been observed during fall migration near Lost Creek Lake. They are not present in the Project Area. No impacts from proposed action
Purple finch	NBC	Yes	Suspected	Purple finch mainly breed in moderately moist, open conifer forests, and edge habitat at low to mid-elevations. They use a variety of habitats including deciduous woodlands, riparian corridors, and edge habitat. They also nest in vigorously regenerating clearcuts and forests with partial stand retention, deciduous forests, orchards, pastures and lawns with scattered conifers and shrubs, hedgerows, and developed areas. The proposed timber harvest would occur in mixed-conifer forest and could remove some potential nesting habitat on BLM-administered lands. Regenerating clearcuts and forests with partial stand retention would remain throughout the fifth field watershed. Riparian corridors, 100-acre spotted owl activity centers, and other forested lands within the fifth field watershed would be retained to provide nesting habitat. Impacts from proposed action would be inconsequential to the persistence of the species in the watershed
Rufous hummingbird	NBC	Yes	Present	Rufous hummingbirds are found in a wide variety of habitats. They appear to have a preference for wooded areas with a fairly high canopy and well-developed understory. They build nests between the ground and 16 feet in understory foliage or low branches of evergreen trees. They feed on flowering plants, such as current, salmonberry, and pacific madrone. Larger trees would be removed under the proposed action. These trees do not provide nesting substrate for hummingbirds. There could be some disturbance in the understory from the action, but the trees less than 16 feet would not be removed as part of the proposed harvest. Foraging and nesting habitat would remain in the proposed units as well as within the Big Butte Creek fifth field watershed. The proposed project could possibly disrupt one nesting season, causing loss of young for one year. The birds could nest the following year. The possible loss of one or two nests in one year would not change the persistence of the species in the fifth field watershed.
Streaked horned lark	BS	No	Absent	Horned lark mainly occur in open fields with short herb-dominated ground cover, including fallow fields. Streaked horned larks are considered extirpated in the Rogue Valley, but may migrate through the Butte Falls Resource Area in the spring and fall (Marshall, Hunter and Contreras 2003). The proposed action would not occur in habitat. No impacts from proposed action.

Table F-1. Butte Falls Resource Area Special Status Species Twin Ranch Forest Management Project Assessment

Species	Status	Range	Presence in Project Area	Conclusions
Tri-colored blackbird	BS	No	Absent	Oregon breeding colonies occur in hardstem bulrush, cattail, nettles, willows, and Himalayan blackberries. They forage in irrigated pastures and lightly grazed rangelands and hay fields. Habitat present in the Project Area does not provide habitat used by tri-colored blackbirds. No impacts from proposed action.
White-headed woodpecker	BS	No	Absent	White-headed woodpeckers are an occasional visitor to Dead Indian Plateau. They may be vagrant in the Butte Falls Resource Area at higher elevations. Adequate levels of snags would be retained within and adjacent to the Project Area. The Proposed action would be inconsequential to the species and/or habitat in the fifth field watershed.
White-tailed kite	BS	No	Absent	White-tailed kites are present in the Rogue Valley agriculture lands near Medford and Ashland. The Project Area is outside the known range. No impacts from proposed action.
Mammals				
Fisher	FC	Yes	Present	Fishers use a variety of forested habitats. They use late-successional forests for denning and rearing young. Fishers are wide-ranging individuals and could occur in the Project Area. A radio-telemetry study on the ecology of fishers in the southern Oregon Cascade Range was conducted in the Prospect area with field work from 1995 through 2002. (Aubry and Raley 2006). Fishers were found approximately 1.5 miles from the north timber sale boundary in 2002. Fisher surveys by BLM were conducted 2008 in T35S, R2E and R3E, south of the Project Area. A fisher was located approximately 7 miles south of the south timber sale boundary in 2008. Project analysis indicates that habitat would remain after the action and they are expected to persist in the watershed. The proposed action is not expected to lead to the extirpation of fishers in the watershed.

Table F-1. Butte Falls Resource Area Special Status Species Twin Ranch Forest Management Project Assessment

Species	Status	Range	Presence in Project Area	Conclusions
Fringed myotis (bat)	BA	Yes	Suspected	Fringed myotis appear adapted to live in areas with diverse vegetative substrates from British Columbia to Mexico. They are not commonly caught in great numbers, but may be widely dispersed (Bat Conservation International 2010). They use caves, mines, and abandoned buildings and have been captured along a willow-bordered creek in a sagebrush vegetation community. They also use oak and pinion-juniper vegetative associations (Marshall, Hunter and Contreras 2003). Fringed myotis were not captured in mist-net bat surveys over two ponds in the vicinity of the project. However, they were captured in mist-net pond surveys in the Big Butte Creek fifth field watershed over 7 miles from the Project Area. Snags and coarse woody debris would be retained after the proposed action is completed. Riparian reserves would provide snag and large tree habitat. Proposed activities would not affect persistence of the species in the Big Butte Creek fifth field watershed.
Pallid bat	BA	Yes	Present	West of the Cascade Range, pallid bats are restricted to the drier interior valleys of the southern portion of the state. Pallid bats are crevice dwellers. Rock crevices and human structures are used as day-roosting sites. Recent radio-telemetry studies indicate these bats also use interstitial spaces in the bark of large conifer trees and snags with holes as roost sites. A pallid bat was captured in a mist-net survey of a pond approximately 500 feet from a proposed harvest unlit. Large trees would be retained in all units after the action. Large trees are also present in the adjacent stands that will not be harvested. Adequate potential habitat exists within and adjacent to the Project Area. Impacts from proposed activities are negligible to species and /or habitat at the watershed scale.
Townsend's big-eared bat	BS	Yes	Present	Townsend's big-eared bats roost in mines, caves, cavities in trees, snags with holes, and buildings. A Townsend's big-eared bat was captured in a mist-net survey of a pond approximately 500 feet from a proposed harvest unit. Large trees would be retained in all units after the action. Large trees are also present in the adjacent stands that will not be harvested. Adequate potential habitat exists within and adjacent to the Project Area. Impacts from proposed activities are negligible to species and /or habitat at the watershed scale.
Red tree vole	Former S&M	No	Absent	The area is outside the range of red tree vole and surveys are not required east of the Rogue River (Biswell, et al. 2002).

Table F-1. Butte Falls Resource Area Special Status Species Twin Ranch Forest Management Project Assessment

Species	Status	Range	Presence in Project Area	Conclusions
Mollusks				
Chace sideband (snail) (Monadenia)	BS	Yes	Absent	Protocol mollusk surveys were completed in the proposed harvest units in fall 2006 and spring 2007. All surveys were negative for chase sideband snails. No impacts from proposed actions.
Crater Lake tightcoil (snail) (Pristiloma)	BS	No	Absent	Protocol surveys mollusk surveys were done in the proposed harvest units in fall 2006 and spring 2007. All surveys were negative for former Survey and Manage snails. No riparian reserves within 50 feet of streams would be entered. No impacts from proposed actions.
Oregon shoulderband (snail) (Helminthoglypta)	BS	Yes	Absent	Protocol mollusk surveys were done in the proposed harvest units in fall 2006 and spring 2007. All surveys were negative for Oregon shoulderband snails. No impacts from proposed actions.
Insects				
Siskiyou short-horned grasshopper	BS	Unknown	Absent	No habitat information is available. They may be associated with elderberry and grasslands. No known effects identified from project. They have not been documented in the Butte Falls Resource Area.
Crustaceans				
Vernal pool fairy shrimp	FT	No	Absent	The project is outside the range of the species.

STATUS:

FT (Federally Threatened) - likely to become endangered species within the foreseeable future.

FC (Federal Candidate) - proposed and being reviewed for listing as threatened or endangered

BS [Bureau Sensitive] – eligible for addition to Federal Notice of Review, and known in advance of official publication. Generally these species are restricted in range and have natural or human-caused threats to their survival.

BA [Bureau Assessment] - not presently eligible for official Federal or state status, but of concern which may at a minimum need protection or mitigation in BLM activities.

NBC (Neotropical Birds of Concern) – appear on USFWS Birds of Conservation Concern list published in 2008 to identify species and populations of migratory and non-migratory birds which may need consideration in management actions.

GBBDC – Game Bird Below Desired Conditions

Birds in the Big Butte Creek Watershed

American crow
American goldfinch
American robin
Bald eagle
Barred owl
Belted kingfisher
Black-headed grosbeak
Black-throated gray warbler
Brown creeper
Bushtit
California quail
Cassin's (formerly solitary) vireo
Cedar waxwing
Chestnut backed chickadee
Common nighthawk
Common raven
Cooper's hawk
Dark-eyed junco
Downy woodpecker
European starling
Evening grosbeak
Flammulated owl
Golden-crowned kinglet
Gray jay
Great gray owl
Great horned owl
Hairy woodpecker
Hammond's flycatcher
Hermit thrush
Hermit warbler
House wren
Hutton's vireo
Lazuli bunting
McGillivray's warbler
Mountain chickadee
Mountain quail
Mourning dove
Nashville warbler
Northern flicker
Northern goshawk
Northern spotted owl
Northern pygmy owl
Olive-sided flycatcher
Pacific-slope flycatcher
Pileated woodpecker
Pine siskin
Purple finch
Red-breasted nuthatch
Red-breasted sapsucker
Red crossbill
Robin
Ruby-crowned kinglet
Red-tailed hawk
Ruffed grouse
Rufous hummingbird
Sandhill crane
Sharp-shinned hawk
Spotted towhee
Steller's jay
Swainson's thrush
Townsend's solitaire
Tree swallow
Turkey vulture
Western flycatcher
Western tanager
Western wood peewee
Wilson's warbler
Winter wren
Yellow-rumped warbler

Appendix G–Fuels

Fuel Models

Expected fire behavior predictions for the Twin Ranch Forest Management Project were determined using the 40 fuels models from *Standard Fire Behavior Fuels Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model* (Scott and Burgan). Fuel Models in this set are grouped by fire-carrying fuel type. There are currently seven identified fuel types. Within each fuel type, individual fuel models are ordered by increasing heat per unit area.

Listed below are the seven fuel types and a generalized description of expected fire behavior.

Nonburnable (NB) - No fuel load, wildland fire will not spread.

Grass (GR) - Primary carrier of fire is grass. All grass models are dynamic and fire behavior can range widely from low to extreme depending on fuel conditions.

Grass-Shrub (GS) - Primary carrier of fire is mixture of grass and shrubs. All grass-shrub models are dynamic and fire behavior can range from low to extreme depending on fuel conditions.

Shrub (SH) - Primary carrier of fire is shrubs. Some shrub models are dynamic and fire behavior can range from low to extreme depending on fuel conditions.

Timber-Understory (TU) - Primary carrier of fire is 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 (TL) - 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.

Slash Blowdown (SB) - Primary carrier of fire is activity slash or blowdown. Slash blowdown models are not dynamic. Fire behavior ranges from moderate to extreme.

Recommended Fuels Treatments

The project fire and fuels specialist recommended preliminary fuels treatments for each unit by alternative (table G-1). After harvest activity, the BLM will conduct a follow-up fuels assessment to determine the actual fuels treatment for each unit. All fuels treatments would begin within 30 days after completion of harvest activities.

Table G-1. Activity Slash Fuels Treatments by Alternative

Unit Number	Alternative 2		Alternative 3		Alternative 4	
	Harvest System	Fuels Treatment	Harvest System	Fuels Treatment	Harvest System	Fuels Treatment
1-1	Commercial Thin 40%	Biomass Removal	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
1-2	Commercial Thin 40%	Biomass Removal	No Treatments		Commercial Thin 40%	Biomass Removal

Table G-1. Activity Slash Fuels Treatments by Alternative

Unit Number	Alternative 2		Alternative 3		Alternative 4	
	Harvest System	Fuels Treatment	Harvest System	Fuels Treatment	Harvest System	Fuels Treatment
1-3	Commercial Thin 40%	Biomass Removal	No Treatments		Commercial Thin 40%	Biomass Removal
1-4	No Treatments		Density Management 40%	Lop/Scatter	No Treatments	
1-5	NGFMA Regeneration	Slash Damaged/ Hand Pile/Burn	Selection Harvest 40%	Hand Pile/Burn	Selection Harvest 40%	Hand Pile/Burn
1-6	Commercial Thin 40%	Biomass Removal	Density Management 60%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
1-8	No Treatments		Density Management 60%	Lop/Scatter	No Treatments	
1-7	Commercial Thin 40%	Biomass Removal	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
1-7	Commercial Thin 40%	Biomass Removal	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
2-3	Shelterwood Regeneration	Slash Damaged/ Hand Pile/Burn	Selection Harvest 40%	Hand Pile/Burn	Select Cut 40%	Hand Pile/Burn
2-4	Commercial Thin 40%	Lop/Scatter	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Lop/Scatter
2-5	No Treatments		Selection Harvest 60%	Hand Pile/Burn	No Treatments	
3-1	Commercial Thin 40%	Lop/Scatter	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Lop/Scatter
11-1	No Treatments		Selection Harvest 60%	Hand Pile/Burn	No Treatments	
11-2	Shelterwood Regeneration	Biomass Removal	Selection Harvest 40%	Hand Pile/Burn	Selection Harvest 40%	Biomass Removal
11-3	No Treatments		Selection Harvest 60%	Hand Pile/Burn	No Treatments	
11-4	Commercial Thin 40%	Biomass Removal	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
12-1S	Commercial Thin 40%	Lop/Scatter	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Lop/Scatter
12-1N	Commercial Thin 40%	Biomass Removal	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
12-4	No Treatments		Selection Harvest 60%	Hand Pile/Burn	No Treatments	
12-2	Shelterwood Regeneration	Slash Damaged/ Hand Pile/Burn	Selection Harvest 40%	Hand Pile/Burn	Select Cut 40%	Hand Pile/Burn
12-2	Shelterwood	Slash Damaged/ Hand Pile/Burn	Selection Harvest 40%	Hand Pile/Burn	Select Cut 40%	Hand Pile/Burn
17-1	Commercial Thin 40%	Biomass Removal	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
17-2	Commercial Thin 40%	Biomass Removal	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
27-1	Commercial Thin 40%	Biomass Removal	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Biomass Removal

Table G-1. Activity Slash Fuels Treatments by Alternative

Unit Number	Alternative 2		Alternative 3		Alternative 4	
	Harvest System	Fuels Treatment	Harvest System	Fuels Treatment	Harvest System	Fuels Treatment
35-1	Commercial Thin 40%	Biomass Removal	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
35-1	Commercial Thin 40%	Biomass Removal	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
35-1	Commercial Thin 40%	Biomass Removal	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
35-2	Commercial Thin 40%	Lop/Scatter	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Lop/Scatter
35-2	Commercial Thin 40%	Lop/Scatter	Density Management 40%	Lop/Scatter	Commercial Thin 40%	Lop/Scatter
35-3	No Treatments		Selection Harvest 60%	Hand Pile/Burn	No Treatments	
35-4	Commercial Thin 40%	Biomass Removal	Density Management 60%	Lop/Scatter	Commercial Thin 40%	Biomass Removal
35-5	No Treatments		Density Management 60%	Lop/Scatter	No Treatments	
35-7	No Treatments		Density Management 60%	Lop/Scatter	No Treatments	
35-8	No Treatments		Density Management 60%	Lop/Scatter	No Treatments	
35-8	No Treatments		Density Management 60%	Lop/Scatter	No Treatments	

Appendix H–Hydrology

The following analysis describes the low risk for peak flows in the Water Resources analysis area based on the low amount of transient snow zone in the area, the low amount of BLM forested lands with canopy covers less than historic levels, and maintaining the majority of the canopy cover above 40 percent (Watershed Professionals Network 2001)in all action alternatives.

The Water Resources analysis area is located within two ecoregions: Southern Cascades and High Southern Cascades Montane Forest. Forested lands make up approximately 97 percent of the overall analysis area (table H-1). No projects are proposed in the High Southern Cascades Montane Forest ecoregion.

Table H-1. Forested Land in the Twin Ranch Water Resources Analytical Areas by Ecoregion

Analytical Area	Total Area (acres)	Forested Land[1]		
		Southern Cascades	High Southern Cascades Montane Forest	Total Forested Land
Fourbit Bowen[2]	3,340	3,319	0	3,319
Friese Creek	1,404	1,404	0	1,404
Misfit Twincheria	6,010	5,203	709	5,912
Rancheria Creek	1,772	1,772	0	1,772
Twin Ranch	2,368	2,002	0	2,002
Totals	**14,894**	**13,703**	**709**	**14,412**

[1]Forested Lands were determined from 2005 aerial photographs.

[2]For the Appendix, the Fourbit Bowen analytical area is a combination of 2 seventh field watersheds. In the EA section 3.4, Water Resource s, the Fourbit Bowen analytical area conists of only the 1 seventh field watershed that contains proposed harvest units.

"Forested Land" refers to all land containing trees (of any species, canopy cover, or stand age). Land which has had timber completely removed (no canopy cover) is still considered "forested" in the analysis due to its site potential and historic condition.

Forest types within the Southern Cascades ecoregion historically had 40 to 45 percent canopy cover (Watershed Professionals Network 2001, A-83). For analysis purposes, the project hydrologist assumed the historic canopy cover to be approximately 40 percent for forested lands in the Southern Cascades ecoregion. Using 2005 aerial photographs, the BLM estimated the acres of forest stands with canopy covers less than the historic level (40 percent) for all ownerships (table H-2).

Table H-2. Forested Lands in the Twin Ranch Project Area with Canopy covers less than Historic Levels (40%)

Analysis Areas	BLM		USFS		Private		Total	
	acres	percent	acres	percent	acres	percent	acres	percent
Fourbit Bowen	133	4	0	0	2,900	87	3,033	91
Friese Creek	485	34	0	0	591	42	1,076	76
Misfit Twincheria	0	0	1,229	20	539	9	1,768	29
Rancheria Creek	83	5	19	<1	859	48	961	54
Twin Ranch	0	0	0		1,790	76	1,790	76
Totals	**701**	**5**	**1,248**	**8**	**6,679**	**45**	**8,628**	**58**

For Forest Service lands in the Upper Rogue fourth field subbasin, the Forest Service estimated the range of natural variability for early successional vegetation with snags to be 10 to 40 percent (Forest Service 1993). This means that within the Upper Rogue fourth field subbasin, 10 to 40 percent of the forest lands would have less than historic crown closure levels (40 percent) at any given time due to natural disturbances such as wildfire, drought, insect infestations, and forest pathogens. Using this range for the analysis areas would provide a conservative estimate since the drier, lower elevation BLM-administered lands would have experienced a higher fire frequency. This would have resulted in more early successional stands on BLM lands than on the higher elevation Forest Service lands. Also, if the range is applicable to the entire fourth field subbasin, the range of natural variability would likely be wider at the smaller analysis area level.

The percent of forested lands below the historic canopy cover is outside the conservative range of natural variability (10 to 40 percent) for all but two of the analysis areas. More than 40 percent of the forested lands have less than historic canopy cover in all but one analysis area: Misfit Twincheria. In the remaining analysis areas, the majority of the forested lands with less than historic crown closure are on private lands. While 5 percent of BLM lands have canopy covers less than 40 percent, there are no cases where BLM-administered lands are outside the range of natural variability (table H-2)

The OWAM (Oregon Watershed Assessment Manual) provides a method for assessing the potential risk for peak flow increases from runoff originating in the transient snow zone. This risk assessment method indicates that drainages with more than 25 percent of the area in the transient snow zone may be at risk for possible peak flow increases due to reductions in crown closure. One analytical area (Misfit Twincheria) has more than 25 percent of its area in the transient snow zone (table H-3).

Table H-3. Amount of Each Analytical Area by Precipitation Zone

Analysis Area	Acres by Precipitation Zone			Percent in Transient Snow Zone
	Rainfall Zone	Transient Snow Zone	Snow Zone	
Fourbit Bowen	3,340	0	0	0
Friese Creek	1,404	0	0	0
Misfit Twincheria	1,704	3,669	637	61
Rancheria Creek	1,770	2	0	<0.01
Twin Ranch	2,263	105	0	0.04
Totals	**10,481**	**3,776**	**637**	**25**

The OWAM peak flow risk assessment method uses the percent of transient snow zone that currently has less than 30 percent crown closure. We used 2005 aerial photographs to estimate the amount of transient snow zone with 30 percent or less canopy cover within the Water Resources analytical areas. Canopy openings due to roads in the transient snow zone were also included (table H-4). Road miles were converted to acres based on the following conversion factors: 13-foot width for jeep roads, 30-foot width for natural or unknown road surfaces, 35-foot width for rocked road surfaces, and 38-foot width for paved roads.

Table H-4 includes only the analytical area (Misfit Twincheria) with more than 25 percent of its total area in the transient snow zone. This analytical area was divided by transient snow zone with a 30 percent canopy cover or less. The percentage was calculated based on the total area of the analytical area.

Table H-4. Amount of Transient Snow Zone with 30 Percent or less Canopy Cover for the Misfit Twincheria Analytical Area

	Acres	Percent of Analytical Area
BLM Land in TSZ		
30% or less canopy cover	0	0
Road openings	0	0
USFS Land in TSZ		
30% or less canopy cover	190.0	3.2
Road openings	18.6	0.3
Private Land in TSZ		
30% or less canopy cover	19.0	0.3
Road openings	0.8	<0.1
Total amount in TSZ with 30% or less canopy cover	**228.4**	**3.8**

Using the OWAM peak flow enhancement assessment graph (figure H-1) to determine the risk of peak flow enhancement, the current canopy cover for the Misfit Twincheria analytical area does not indicate there is a potential risk of peak flow increases from forestry-related impacts during rain-on-snow events.

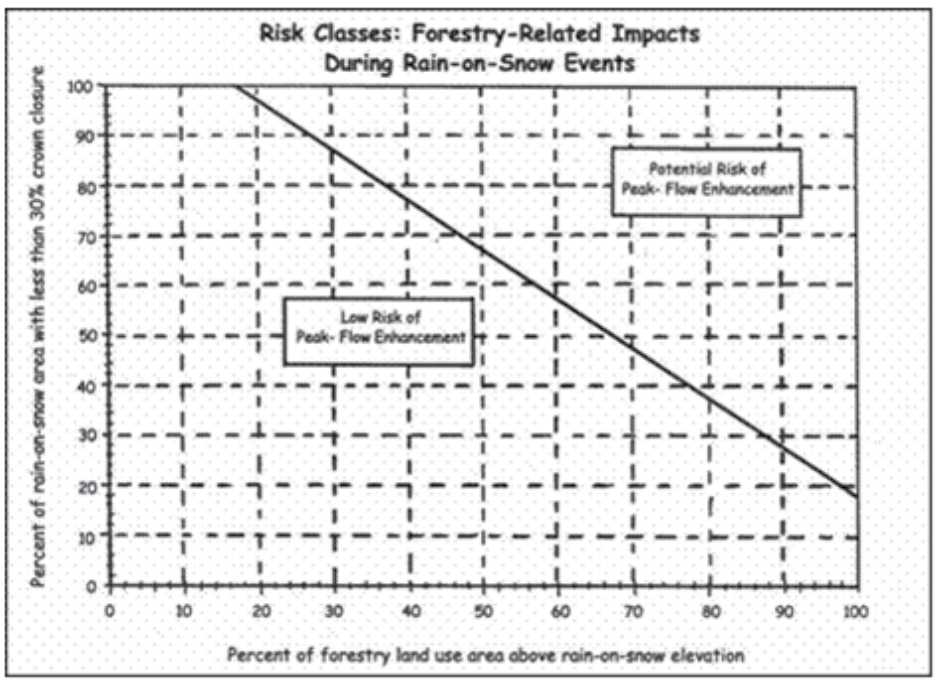


Figure H-1.Peak flow enhancement risk assessment from forestry-related impacts during rain-on-snow events (Watershed Professionals Network 2001, IV-11).

Consequently, the risk of management actions in the transient snow zone increasing peak flows is low under current conditions (table H-5).

Table H-5. Peak-Flow Enhancement Risk from Forestry-Related Impacts during Rain-on-Snow Events for All Ownerships

Analysis Area with less than 25% in the TSZ	Boundary Value[1] % of TSZ with less than 30% Canopy Cover	Current[2] % of TSZ with less than 30% Canopy cover	Current Risk Class (Low or Potential)
Misfit Twincheria	56	4	Low

[1]This value represent the diagonal line in the OWAM graph. If the current percent of transient snow zone with less than 30 percent crown closure is less than this value, the analytical area is in the low risk of peak-flow enhancement category. If the current percent of rain-on-snow zone with less than 30 percent crown closure is greater than this value, there is a potential risk of peak-flow enhancement in the analysis area.

[2]Current percent transient snow zone with less than 30 percent crown closure is the total of all columns in Table H-3 (all ownerships and including road openings).

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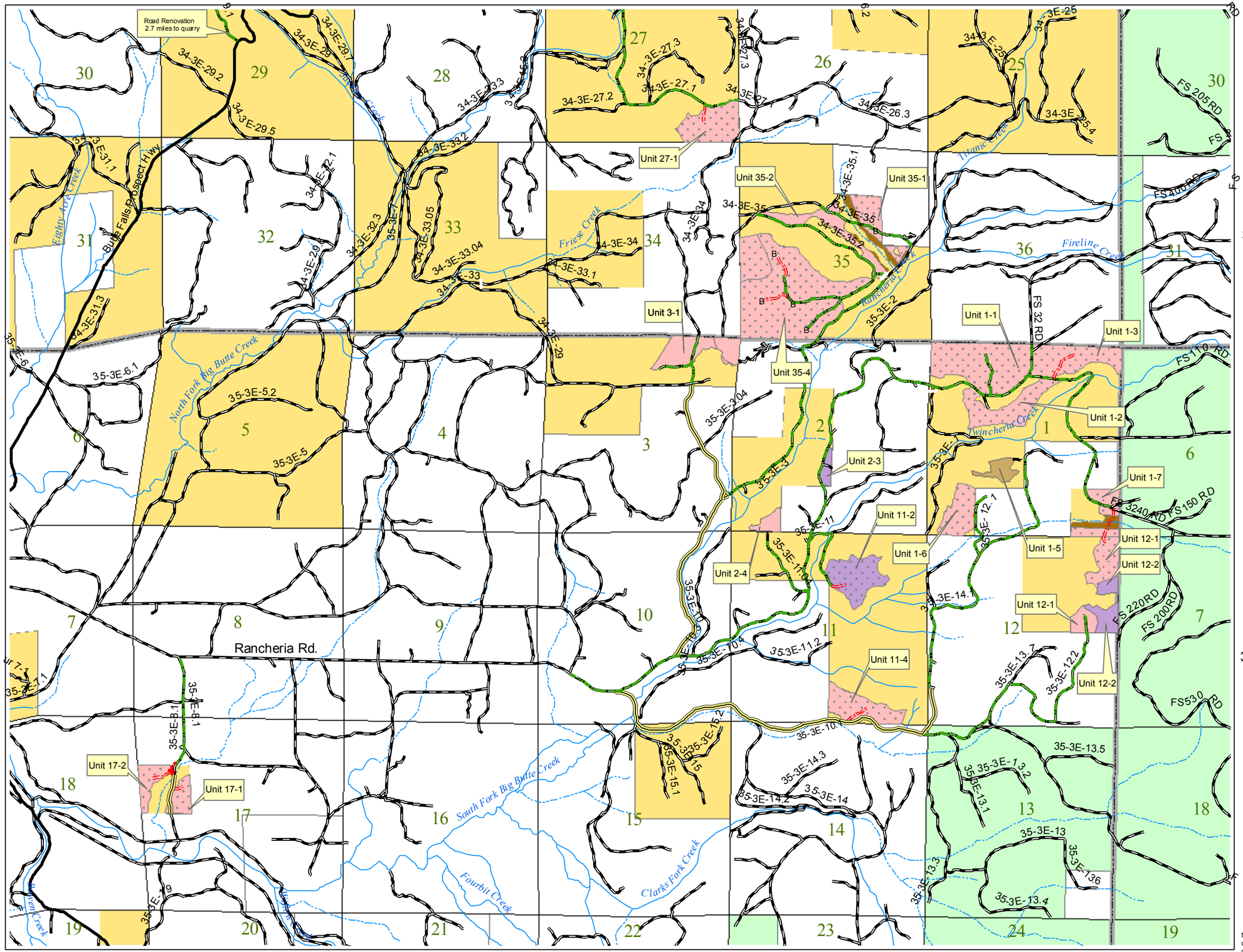
Acronyms

ARPA - Archaeological Resources Protection Act
BLM - Bureau of Land Management
BMP - Best Management Practice
CAA - Clean Air Act
CCH - coho critical habitat
cfs - cubic feet per second
CMAI - culmination of mean annual increment
CWA - Clean Water Act
CWD - coarse woody debris
DBH - diameter at breast height
DEQ - Department of Environmental Quality
DMA - designated management agency
EA - environmental assessment
EFH - essential fish habitat
ESA - Endangered Species Act
ESU - evolutionarily significant unit
FLPMA - Federal Land Policy and Management Act
FRCC - fire regime condition class
GFMA - general forest management area
GIS - geographical information system
ID Team - interdisciplinary team
MBF - thousand board feet
MFP - Management Framework Plan
MMBF - million board feet
NEPA - National Environmental Policy Act
NMFS - National Marine Fisheries Service
NRF - nesting, roosting, and foraging
O&C - Oregon and California Railroad and Coos Bay Wagon Road Grant Land Act
ODF - Oregon Department of Forestry
ODFW - Oregon Department of Fish and Wildlife
OHV - off-highway vehicle
PDF - project design feature
PRMP/EIS - Proposed Resource Management Plan/Environmental Impact Statement
RA32 - Recovery Action 32
ROD/RMP - Record of Decision/Resource Management Plan
SEIS - supplemental environmental impact statement
SO/NC - Southern Oregon/Northern California
T&E - threatened and endangered
TMDL - total maximum daily load
TSZ - transient snow zone
USGS - United States Geological Survey
WQRP - water quality management plan

Map 2. Alternative 2



- Commercial Thinning
- Regeneration Harvest
- Shelterwood Harvest
- Riparian Thinning
- Biomass Unit
- Biomass Landing
- Log Landing
- Barricade
- Gate
- Quarry
- Pump Chance
- Temporary Spur
- Designated Skid
- Full Decommission
- New Construction and Surface
- Renovate
- Renovate and Surface
- Paved Road
- Road

Streams

- Perennial Stream
- Intermittent Stream
- Township
- Private
- Forest Service
- BLM-administered

N W E S

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Miles

Twin Ranch Forest Management Environmental Assessment

NATIONAL SYSTEM OF PUBLIC LANDS

MEDFORD DISTRICT
May 2010

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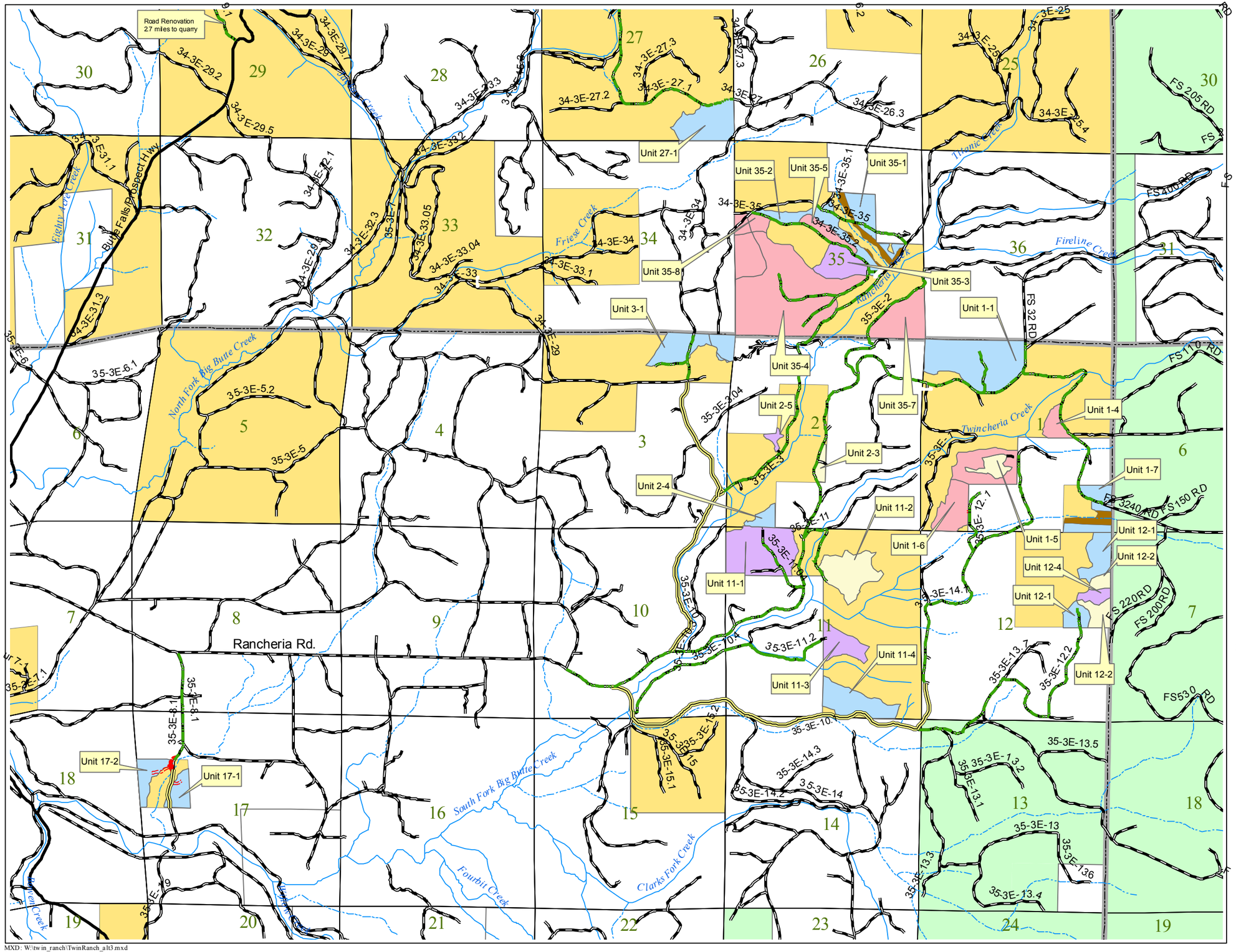
Map 3. Alternative 3



Density Management
- 40% Canopy Closure
- 60% Canopy Closure

Selection Harvest
- 40% Canopy Closure
- 60% Canopy Closure
- Riparian Thinning
- Log Landing
- Gate
- Barricade
- Quarry
- PumpChance
- Temporary Spur
- Designated Skid
- Full Decommission
- New Construction and Surface
- Renovate
- Renovate and Surface
- Paved Road
- Road

Streams
- Perennial Stream
- Intermittent Stream
- Township
- Private
- Forest Service
- BLM-administered

N W E S

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Twin Ranch Forest Management Environmental Assessment

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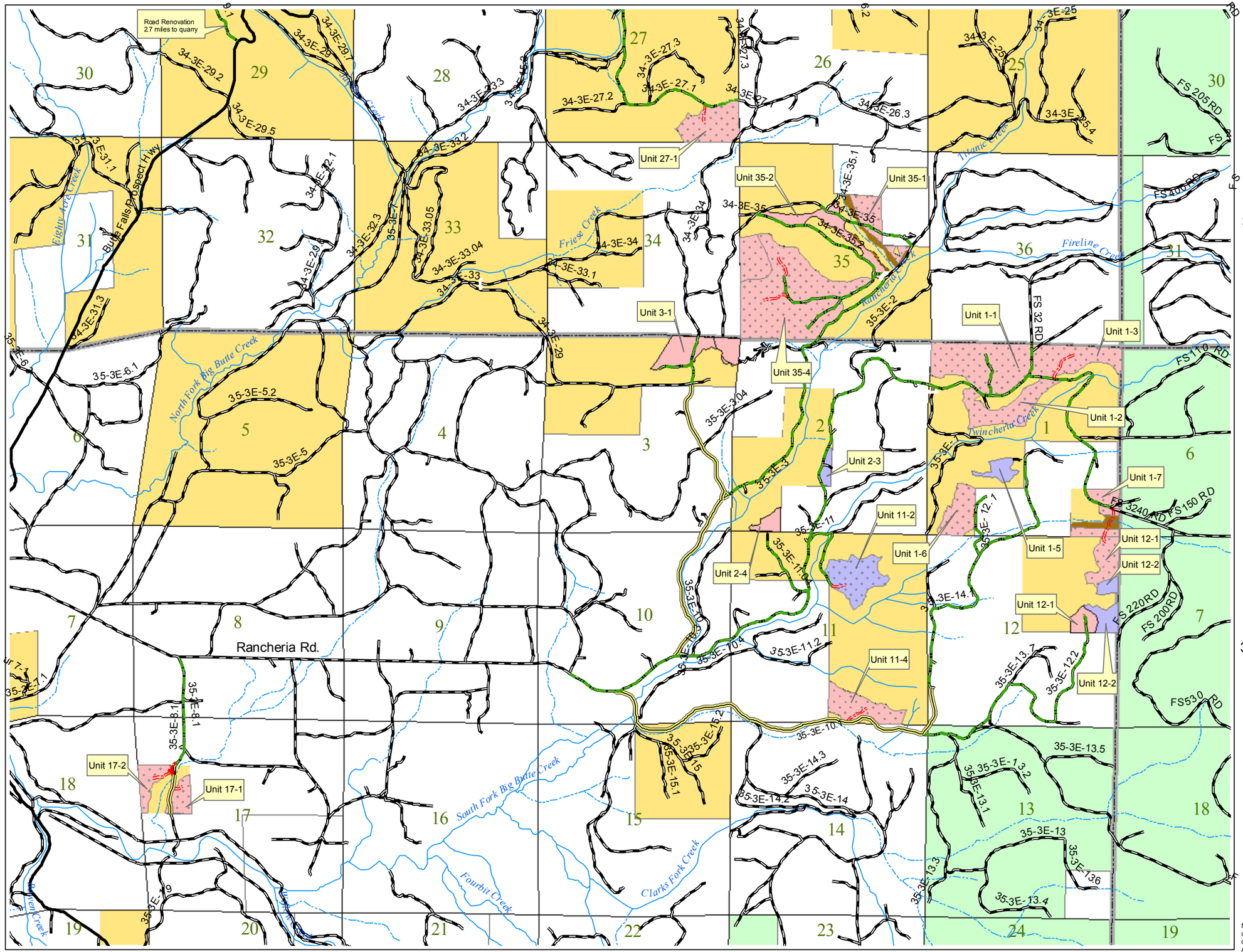
Map 4. Alternative 4



- Commercial Thinning
- Selection Harvest
- Riparian Thinning
- Biomass Unit
- Biomass Landing
- Log Landing
- Gate
- Barricade
- Quarry
- PumpChance
- Temporary Spur
- Designated Skid
- Full Decommission
- New Construction and Surface
- Renovate
- Renovate and Surface
- Paved Road
- Road

Streams

- Perennial Stream
- Intermittent Stream
- Township
- Private
- Forest Service
- BLM-administered

N W E S

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Miles

Twin Ranch Forest Management Environmental Assessment

NATIONAL SYSTEM OF PUBLIC LANDS

MEDFORD DISTRICT
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