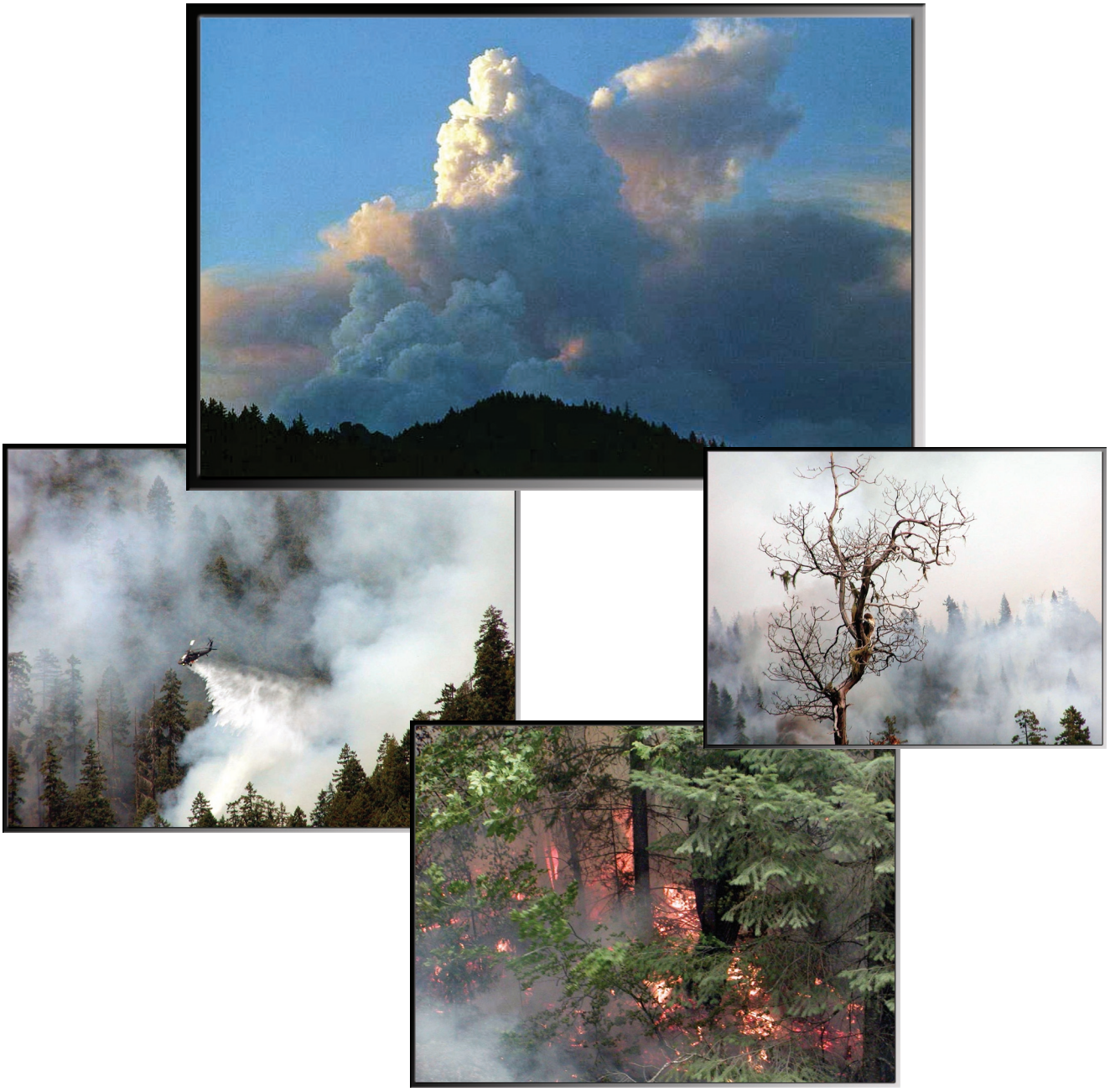
U.S. Department of the Interior
Bureau of Land Management
Medford District Office
Butte Falls Resource Area

March 2004

Timbered Rock Fire Salvage and Elk Creek Watershed Restoration Record of Decision



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Timbered Rock Fire Salvage and Elk Creek Watershed Restoration

Record of Decision

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Acronyms

BLM - Bureau of Land Management
BO - Biological Opinion
CEQ - Council on Environmental Quality
CFR - Code of Federal Regulations
CWD - Coarse Woody Debris
DBH - Diameter at Breast Height
DNA - Determination of NEPA Adequacy
EFH - Essential Fish Habitat
EIS - Environmental Impact Statement
ESA - Endangered Species Act
ESRP - Emergency Stabilization/Rehabilitation Plan
FEIS - Final Environmental Impact Statement
FMZ - Fuel Management Zone
IBLA - Interior Board of Land Appeal
LSOG - Late Seral/Old Growth
LSR - Late-Successional Reserve
LSRA - Late-Successional Reserve Assessment
MMBF - Million Board Feet
MSA - Magnuson-Stevens Fishery Conservation and Management Act
NEPA - National Environmental Policy Act
NFP - Northwest Forest Plan
NOAA Fisheries - National Oceanic and Atmospheric Administration - Fisheries
PDF - Project Design Feature
REO - Regional Ecosystem Office
RMP - Resource Management Plan
ROD - Record of Decision
RRNF - Rogue River National Forest
S&G - Standards and Guidelines
SHPO - State Historic Preservation Office
SONC - Southern Oregon/Northern California
T&E - Threatened and Endangered
UNF - Umpqua National Forest
USACE - United States Army Corps of Engineers
USDA - United States Department of Agriculture
USDI - United States Department of the Interior
USFS - United States Forest Service
USFWS - United States Fish and Wildlife Service
WA - Watershed Analysis

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Summary

The decision is to implement projects as described in Alternative G of the Final Environmental Impact Statement (EIS) for the Timbered Rock Fire Salvage and Elk Creek Watershed Restoration Project, as described in Section 1.2 below.

The Draft EIS for this project was published in August 2003, followed by the release of the Final EIS in February 2004. Publication of this Record of Decision (ROD) completes the National Environmental Policy Act (NEPA) process for timber salvage and watershed restoration projects analyzed in those documents, except as noted below.

The decisions outlined in this document are consistent with the Medford District Resource Management Plan (USDI 1995) and the Northwest Forest Plan (USDA and USDI 1994) and, therefore, a plan amendment is not required. Plan consistency was addressed in Section 1.6 of the Final EIS. Review of salvage and restoration projects by the Late-Successional Reserve Working Group, a subgroup of the Regional Ecosystem Office (REO), is included in Appendix A.

The decision on the timber salvage portion of this project will be made when the notices of timber sales are published in local newspapers, expected in April 2004. A portion of the Fuel Management Zones (FMZ) within the fire perimeter will be implemented as part of the timber salvage. Some road maintenance, improvements, renovation, and/or decommissioning will be implemented through the salvage timber sale(s). Some Late-Successional Reserve (LSR) thinnings and pine release projects may also be implemented through timber sales. Decisions on those projects are expected to be through sale advertisements in local newspapers in 2005 or 2006.

Actual implementation of the restoration projects included in this decision will occur as funding and workforce are available. Funding for restoration projects was requested through the Bureau of Land Management (BLM) budgeting system.

Implementation of research included as part of the Selected Alternative is scheduled to begin in 2004. Research funding was requested in a separate funding package for wildlife/snag, wildlife/mammal, and reforestation in late 2003. Research projects will be implemented as described in Appendix B. Except for the activities associated with the expected timber sales resulting from this analysis, the decision is to proceed with Alternative G, as modified. The following modification were made to Alternative G in response to public review of the Final EIS:

- Four acres at high risk of mass wasting were removed from area salvage.
- 158 acres were removed from Pine Restoration and Late-Successional Forest Habitat Restoration projects located within Deferred Watersheds.

1.0 The Decision

1.1 Background

The Timbered Rock Fire began Saturday, July 13, 2002 from a lightning strike near Timbered Rock. The Timbered Rock Fire burned with varying degrees of intensity across approximately 27,100 acres of high elevation (4,600 feet) mixed conifer and low elevation (2,000 feet) mixed conifer/hardwood. About 11,700 acres of BLM-administered land within the Elk Creek LSR were burned. The fire burned across a mixed ownership of federal, private, and industrial forest lands. The fire created extensive areas of dead and dying trees dispersed across a landscape with historically high vegetation densities and high fuel loading.

Prior to the Timbered Rock Fire, the Elk Creek Watershed Analysis (WA) and the South Cascades Late-Successional Reserve Assessment (LSRA) emphasized the need to restore watershed functions,

protect remaining mature and old growth stands from catastrophic loss, accelerate development of late-successional habitats, reduce fuel levels in strategic locations, and create stand conditions to lower the potential for future catastrophic fire.

1.2 Decision

The decision is to implement projects described in Alternative G in the Final EIS for Timbered Rock Fire Salvage and Elk Creek Watershed Restoration, as modified (see Summary). Area salvage operations will be conducted on approximately 961 acres and roadside salvage on approximately 1,188 acres, resulting in about 23.4 million board feet (MMBF) of salvage (see Map 1). The harvest volume produced from the fire salvage timber sale(s) resulting from this decision will be determined by "log scaling" (the estimated gross and/or merchantable volume of a log) and, therefore, the actual volume salvaged may be more or less than the estimated volume. The effects analyses in the EIS were based on acres affected and snag and coarse woody debris (CWD) retention guidelines and not the amount of volume removed.

Multiple decision documents will be issued to implement management actions over the next 10 years, subject to availability of funding and personnel. Appropriate NEPA analysis will be completed prior to implementation of projects. These decisions will be published in local newspapers and mailed to individuals, businesses, organizations, and agencies included in the Butte Falls Resource Area and ROD mailing lists. Decisions can be protested at that time. Timber sale decisions will become effective upon notice of sale in local newspapers.

Projects listed in Table 1 will be implemented without further decision documents. Projects include: Reforestation, Road Maintenance, Road Closures, Seasonal Road Closures, and Log Piles for Wildlife Habitat. These projects may be protested within 15 days after the notice of the ROD in the local newspaper in accordance with 43 CFR Subpart 5003.

Table 1. Projects to be Implemented from the ROD

Project	Description
Reforestation	• Plant 2,152 acres • Approximately 10 foot x 10 foot spacing with microsite emphasis; Mixed species • 430 trees per acre; Replant if stocking level drops below 100 trees per acre • No mulching, tubing, or shading until replant • Remove brush around ½ of seedlings if the stocking level is greater than 250 trees per acre • Remove brush around all seedlings if the stocking level is less than 250 trees per acre **Research Reforestation** • Plant 75-90 acres • Mixed species; Mixed planting densities; Varied vegetation treatment
Road Maintenance	• Maintain or improve 10 miles of road
Road Closures	• Close 4 miles of road by installing 3 gates or barricades
Seasonal Road Closures	• Close 114 miles of secondary and native surface roads from mid-October to April 30
Log Piles for Wildlife Habitat	• Develop 6 sites • Pile logs 16 inch DBH or greater in piles 20 feet x 20 feet and 4-6 feet high

Projects listed in Table 2 will be implemented without further analytical documents. The timber sale notice in the local newspapers constitutes the decision document for salvage projects for purposes of protests under 43 CFR Subpart 5003 for the salvage. Protest of any timber sale must be filed within 15 days of publication of the timber sale notice.

Table 2. Projects to be implemented with a Timber Sale Notice

Project	Description
Area Salvage	• Salvage in high and moderate burn severity areas greater than 10 acres with less than 40 percent canopy closure **Within research units** • 282 acres • Harvest systems: 136 acres cable; 7 acres tractor; 139 acres helicopter • Conduct salvage research in 12, 30-acre units • 3 treatments; 4 repetitions of each treatment ▪ Intensive: Salvage entire unit (includes 11 acres in Riparian Reserves) ▪ Moderate: Reserve 30 percent of unit ▪ Control: No salvage • Coarse Woody Debris and Snags ▪ Leave 6 snags/acre in salvaged portion ▪ Leave minimum 120 feet of CWD greater than 16 inch DBH and 16 feet per acre in salvaged portion **Outside research units** • 675 acres • Harvest systems: 262 acres cable; 106 acres tractor; 272 acres helicopter; 35 acres bull-line • Salvage in high and moderate burn severity patches greater than 10 acres • Salvage in patches less than 10 acres will occur in and adjacent to FMZs • No salvage in Riparian Reserves • Small patch clear cuts or group selection; Openings less than 20 acres • Coarse Woody Debris and Snags ▪ Leave 8 snags/acre and 2.0 percent ground cover in Douglas-fir plant series ▪ Leave 12 snags/acre and 3.6 percent ground cover in white fir plant series ▪ Retain pre-fire CWD and snags
Roadside Salvage	• 1,188 acres bull-line • Salvage hazard trees along BLM roads • Hazard trees in Riparian Reserves and within ¼ mile of active owl sites will not be salvaged unless felled within the road • Retain pre-fire CWD
Road Construction	• No new temporary roads in research units • 0.9 miles temporary roads outside research units • No new permanent roads
Road Maintenance	• Maintain or improve 90 miles of road
Road Decommissioning	• Partially or fully decommission 9 miles of road
Road Closures	• Close 17 miles of road by installing 13 gates or barricades

Projects listed in Table 3 will require NEPA documentation prior to implementation. Projects include: Culvert Replacement, Fish Structures, LSR Thinning, Pine Restoration, Riparian Thinning, Oak Woodland and Meadow Restoration, Fuel Management Zones (areas outside of the salvage), Owl Activity Center Underburns, Eagle Habitat Improvement, Road Reconstruction, Stream-Crossing Upgrades, Road Decommissioning, Pump Chance Restoration, and Rock Quarry Closure and Rehabilitation (see Map 2). These projects will be protestable under 43 CFR Subpart 5003 following publication of a notice of sale or decision record in the local newspaper.

Table 3. Projects to be Implemented after further NEPA documentation

Project	Description
Fish Habitat Improvement	
Culvert replacement for fish passage	• Replace 4 culverts
Fish structures over 8 miles of stream	• Place 5 rock weirs/mile; add gravel above each weir • Place 20 logs/mile
Vegetation Treatments	
Late-Successional Forest Habitat Restoration • Stands 10-30 years old	• Thin 862 acres • Cut trees less than 8 inch DBH in stands with greater than 70 percent canopy closure
Late-Successional Forest Habitat Restoration • Stands 30-80 years old	• Thin 418 acres • Harvest systems: 93 acres tractor; 140 acres cable; 233 acres helicopter • Cut trees less than 20 inch DBH in stands with greater than 70 percent canopy closure • Coarse Woody Debris and Snags ▪ CWD retention level equals 2 percent ground cover ▪ Harvest thinned trees in excess of CWD levels ▪ Leave pre-fire snags and CWD
Pine Restoration • Stands 10-30 years old with mixed pine	• Thin 16 acres • Cut trees less than 8 inch DBH
Pine Restoration • Stands 30-80 years old • Stands 80+ years old	• Thin 90 acres in stands 30-80 years old • Thin and clear around 577 acres of pines greater than 24 inch DBH in stands 80+ years old • Harvest thinned trees • Harvest systems: 79 acres tractor; 698 acres helicopter • Coarse Woody Debris and Snags ▪ CWD retention level equals 2 percent ground cover ▪ Leave pre-fire snags and CWD
Riparian Reserve Thinning • Stands 10-30 years old	• Thin 225 acres • Perennial streams only • Cut trees less than 8 inch DBH
Riparian Reserve Thinning • Stands 30-80 years old	• Thin 134 acres • Cut trees less than 20 inch DBH in stands with greater than 40 percent canopy closure • Hand pile slash and girdle trees to limit fuel loads to 20 tons/acre or less
Oak Woodland and Meadow	• Thin 1,544 acres • Cut trees less than 8 inch DBH • Underburn
Fuels Treatments	
Fuel Management Zones (FMZ)	• Treat 1,300 acres: 500 acres within fire perimeter; 800 acres outside fire perimeter • 400 feet outside LSR; 200 feet within LSR • Within the fire perimeter, salvage in patches less than 10 acres in size adjacent to FMZs • Commercial thin 62 acres; 150 feet on each side of ridgeline in T33S, R1W, Sec. 14 and 15

Table 3 (cont.). Projects to be Implemented after further NEPA documentation

Project	Description
Fuel Treatments within Owl Activity Centers	• Underburn 425 acres within 4 owl activity centers
Fuels Treatment within old West Branch Fire	• Treat 70 acres • Cut, pile, and burn fire-killed trees less than 8 inch DBH within West Branch Fire area
Wildlife Projects	
Eagle Habitat Improvement	• Thin 50 acres • Thin thickets of younger trees (less than 8 inch DBH) to a spacing of 12-20 feet • Clear 10-15 feet from dripline around existing larger overstory trees
Road Projects	
Road Reconstruction	• Reconstruct 2.6 miles of road • Add drainage structures and rock blankets
Stream-crossing upgrades	• Upgrade 11 sites • Replace culverts to pass 100-year storm event • Replace existing road fill material with rock
Road Decommission	• Partially or fully decommission 26 miles of road
Pump Chance Restoration	• Restore 7 sites • Clean material from pool area • Clean or repair inlets and outlets • Improve access
Rock Quarry Closure and Rehabilitation	• Close and rehabilitate 5 sites • Slope benches and plant vegetation

1.3 Plan Conformance

The Northwest Forest Plan (NFP) (USDA and USDI 1994) addresses management of Late-Successional Reserves in pages C-9 through C-21, as amended. The Medford District Resource Management Plan (RMP) (USDI 1995) later adopted these land use allocations and Standards and Guidelines (S&G). In July 1996, the Elk Creek Watershed Analysis was prepared by Medford District BLM and Rogue River National Forest (USDA and USDI 1996). In February 1998, the South Cascades Late-Successional Reserve Assessment was published by the BLM and USFS (USDA and USDI 1998). Both documents provided management recommendations to accelerate development of late-successional forest conditions, restore pine and oak woodlands, reduce road density, and reduce risk of large fires on BLM- and USFS-administered lands within the Elk Creek LSR. The LSRA also addressed salvage of fire-killed trees. Implementation of the projects in this ROD will contribute to fulfilling many of those recommendations.

Salvage of fire-killed trees within an LSR continues to be a controversial issue. Differing scientific opinions and developing science adds to the controversy. Fire salvage and restoration projects with LSRs do not have clear and concise opinions among the academia. These differing opinions were brought together during development of the Northwest Forest Plan. While these opinions should be considered, the guidance provided in the NFP and RMP remains the basis for management decisions on BLM-administered lands.

Salvage within LSRs is expressly addressed starting on page C-13 of the Record of Decision for the NFP and requires Regional Ecosystem Office (REO) review. Salvage of fire-killed timber is permitted within those LSRs under the S&Gs. When originally proposed in the Draft EIS, both salvage and LSR restoration projects were reviewed by the LSR Working Group, a subgroup of REO. REO's review documentation relating to salvage of fire-killed trees and restoration projects is included in Appendix A. The REO found "all proposed actions are consistent with objectives for managing LSRs" (see Appendix A) and, therefore, are consistent with both the NFP and the Medford District RMP.

This ROD does not change the land use classifications identified in the Medford District RMP. Plan consistency was specifically addressed in Section 1.6 of the FEIS.

1.4 Project Design Features

Project Design Features (PDFs) are included in the design of the salvage and restoration projects (see Appendices C and D). These PDFs are a compilation of the Best Management Practices identified in the Medford District RMP and resource protection measures identified by the EIS Interdisciplinary Team. The PDFs will serve as a basis for resource protection in the implementation of these projects. All PDFs shown in Alternative G in the Final EIS have been carried forward into this ROD.

2.0 Alternatives, Including the Selected Alternative

Seven alternatives were developed to provide different responses to the issues identified in Chapter 1 of the EIS. A No Action Alternative (Alternative A) was included.

The action alternatives contained two major categories of proposed projects:

- Salvage within the fire perimeter (Alternatives C-G).
- Restoration projects located throughout the Elk Creek Watershed (Alternatives B-G).

2.1 Alternative A - No Action or Continuation of Current Management

No restoration projects are proposed, but rehabilitation and stabilization projects identified in the Timbered Rock Fire Emergency Stabilization/Rehabilitation Plan Environmental Assessment (ESRP) will be implemented. Salvage of hazardous trees will be determined through NEPA documentation.

2.2 Alternative B - No Salvage and Focused Restoration

Emphasis is placed on reducing noncommercial-size vegetative competition in overstocked stands through density management treatments, fuels reduction treatments, and pine habitat restoration. Areas proposed for treatment are generally those in most need of a reduction in competing vegetation. Within the fire perimeter, restoration will focus on high priority road work. Restoration actions will focus on noncommercial projects designed to accelerate tree growth to promote late-successional conditions with a variety of size classes. Species diversity will be maintained to promote connectivity between owl activity sites and develop late-successional forest characteristics. Salvage of hazardous trees will be determined through appropriate NEPA documentation.

2.3 Alternative C - South Cascade LSRA Criteria for Salvage and Moderate Restoration

Area salvage emphasis is placed on high and moderate burn severity areas greater than 10 acres with less than 40 percent canopy cover where the fire resulted in a stand-replacement event. Alternative C salvage is based on guidelines from the LSRA for snag and CWD retention. Restoration projects include fish habitat improvement, LSR thinning, pine and oak woodlands restoration, reforestation of stand-replacement areas greater than 5 acres, fuels reduction along ridgelines, wildlife habitat enhancement projects, and road improvement projects.

2.4 Alternative D - LSR Salvage Using DecAID Wood Advisor for Snags and CWD and Moderate Restoration

Area salvage emphasis is placed on high and moderate burn severity areas greater than 10 acres with less than 40 percent canopy cover where the fire resulted in a stand-replacement event. Snag and CWD

retention levels in this alternative are based on the DecAID Wood Advisor. Restoration projects will be the same as Alternative C.

2.5 Alternative E - High Level of Salvage and Extensive Restoration

Area salvage would occur in high, moderate, low, and very low burn severity areas. Snag retention levels within the high and moderate burn severity areas will be 6-14 snags per acre. This level is based on a study by Haggard and Gaines (2001), which found the highest diversity in cavity nesting species and the highest number of nests where snag densities ranged from 6-14 snags per acre. Snag retention will be 4 snags per acre within the low and very low burn severity areas with canopy cover greater than 40 percent. The CWD level in this alternative will be a minimum of 120 linear feet per acre. Extensive restoration will increase the scope of the projects (acres, miles of roads, etc.) and location of treatments identified in Alternatives C and D. In addition, Alternative E also includes a seasonal road closure.

2.6 Alternative F - Salvage Logging and Restoration Actions Focused Only within the Timbered Rock Fire Perimeter

To the extent practical, Alternative F is based on a report entitled *Recommendations for Ecological Sound Post-Fire Salvage Management and Other Post-Fire Treatments on Federal Land in the West* (Beschta, et al. 1995). Area salvage emphasis is based on recommendations to avoid severely burned areas, erosive sites, fragile soils, riparian areas, steep slopes, or sites where accelerated erosion is possible. Existing snags and CWD levels will be retained on all these areas. Salvage will occur in 3- to 10-acre patches of fire-killed trees. Within each of these patches, a minimum of two acres will be reserved from salvage, retaining all snags and CWD. Restoration projects consistent with the Beschta, et al. report will take place within the fire perimeter. Since the Beschta, et al. report does not address actions outside of a burned area, no restoration actions will occur outside the fire perimeter.

2.7 Alternative G (Selected Alternative) - Salvage Based on Research Questions and Salvage in Stand-Replacement Units Greater than 10 Acres and Moderate Restoration

Area salvage emphasis is based on research to study the effects of various snag levels on selected wildlife species. Twelve units were selected to be included in this study. These units are generally 30 acres or greater and will be salvaged at various levels. Four control units will not be salvaged.

Stand-replacement areas (high and moderate burn severity) greater than 10 acres with less than 40 percent canopy closure outside of research units will also be considered for salvage. Snag and CWD levels will meet those recommended by DecAid Wood Advisor, along with the following local and regional recommendations: *Guidelines for Snag and Down Wood Prescriptions in Southwestern Oregon* (White 2001), *Effects of Stand Replacement Fire and Salvage Logging on a Cavity Nesting Bird Community in Eastern Cascades, Washington* (Haggard and Gaines 2001), and *Jenny Creek Late-Successional Reserve Assessment* (USDI 2000).

A reforestation study, also included in this alternative, will evaluate a variety of planting densities, species, and follow-up treatments in both salvaged and unsalvaged areas. Restoration projects will be the same as Alternatives C and D. A seasonal road closure is also included. Additional research will be considered if it contributes to attaining late-successional forest habitat conditions. Required NEPA documentation will take place before new research is implemented.

3.0 Environmentally Preferred Alternative

Council on Environmental Quality (CEQ) regulations [40 CFR 1505.2 (b)] require the ROD to specify the alternative or alternatives considered to be environmentally preferred. Environmental preferability is judged using the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which is guided by the CEQ. "The environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA's Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources" (CEQ, "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations" [40 CFR 1500-1598], *Federal Register* Vol. 46, No. 55, 18026-18038, March 23, 1981: Question 6a.).

Table 4. Comparison of Alternatives to Section 101 Goals

Section 101 Goals	Alternatives						
	A	B	C	D	E	F	G
1. Fulfill the responsibility of this generation as trustee of the environment for succeeding generations;		X	X	X	X	X	X
2. Assure for all Americans productive and aesthetically and culturally pleasing surroundings;			X	X	X	X	X
3. Attain the widest range of beneficial uses of the environment without degradation or other undesirable and unintended consequences;				X			X
4. Preserve important natural aspects of our national heritage and maintain an environment which supports diversity and variety of individual choice;		X	X	X	X	X	X
5. Achieve a balance between population and resource use, which permits high standards of living and a wide sharing of life's amenities; and		X	X	X	X	X	X
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.				X	X		X

NEPA's Section 101 establishes 6 goals (see Table 4). The table depicts the application of the Section 101 goals to projects considered in the Timbered Rock Fire Salvage and Elk Creek Watershed Restoration EIS. Each alternative was compared against these goals to determine the environmentally preferred alternative.

The following rationale was used to determine which alternative best meets NEPA's Section 101 goals as shown above:

Goal 1. All alternatives, with the exception of Alternative A, have some level of restoration which will improve conditions in the watershed to the benefit of future generations. Alternative E, with the highest level of restoration activities proposed, will best meet Goal 1.

Goal 2. Alternatives C-G provide various levels of products while protecting the aesthetically and culturally pleasing surrounding. It is anticipated the greater the harvest level, the greater the amount of disturbance, and associated impacts, would occur. Alternative E has the highest harvest level and will result in the most disturbances. Alternative C will best meet Goal 2 because salvage will disturb fewer acres, compared to other salvage alternatives, and a moderate level of restoration will be implemented.

Goals 3 and 5. The risk of undesirable or unintended degradation is higher in alternatives with higher levels of salvage and restoration activities but these also present the highest potential for beneficial uses. The projects are designed to limit or reduce the risk of degradation and provide a wide range of beneficial uses while balancing population and resource uses within a Late-Successional Reserve.

Alternative A will have no short-term degradation, but the beneficial uses achieved through the restoration and salvage activities proposed in other alternatives will not be provided. Alternative B will provide a lesser range of beneficial uses and, by excluding recovery of timber value, will not provide the balance of population and resource use. Alternative C will recover some of the economic value of the dead timber and provide some moderate restoration benefits. Alternatives D and E have a high range of beneficial uses through the recovery of the value of the dead timber and moderate to high restoration levels. Alternative F will disturb the fewest acres from both a timber salvage and restoration standpoint, but could also result in a longer vegetative recovery period for obtaining old-growth characteristics within the fire perimeter. It is anticipated salvage activities in Alternatives E and F will result in some degradation of late-successional habitat. Alternative G will best meet Goals 3 and 5 by providing the widest range of beneficial uses while balancing population and resource uses, including recovering the value of the dead timber, restoration activities throughout the watershed, and research.

Goal 4. Restoration activities are designed to restore or maintain natural aspects of the environment. Proposed restoration activities designed to reduce the intensity and severity of future fires, improve habitat for fish and wildlife, and reduce potential of degradation from existing conditions will allow for greater protection of natural aspects within the watershed. Alternative A will provide short-term preservation of the existing natural environment but slower recovery of the watershed. Alternatives B, C, D, and G will best meet Goal 4 by providing a moderate level of restoration. While Alternative E will provide a higher level of restoration, the degradation of the late-successional habitat from the salvage will offset some of the restoration benefits. Alternative F will limit restoration to the fire area and current conditions outside the fire will not be altered. Alternative F, with its restoration emphasis based on the report by Beschta, et al., will allow for the most natural recovery of fire-disturbed conditions; however, it does not provide for accelerated development of late-successional forest conditions or enhanced protection of remaining late-successional forests within the LSR.

Goal 6. Salvaging recovers the economic value of some fire-killed trees. If salvage does not occur, this value will be lost over time due to deterioration, as has already occurred to some degree. Alternatives C and F will provide only minimal recovery of the timber value. Alternative E will provide the highest return; however, this alternative could result in greater harm to sensitive resources. Since Alternative E is not consistent with the existing land use allocation, further deterioration of trees will result from the delay necessary to prepare a land use plan amendment. Restoration activities, such as thinning and pine restoration, which utilize the excess thinned material will enhance the quality of renewable resources and recycle the depletable resources. Alternatives B and F will provide some level of restoration but will not utilize the thinned material. Alternative E delivers the highest level of these restoration activities while Alternatives C, D, and G provide moderate levels. Alternatives D and G best meet Goal 6 by providing a high level of recovery of timber value through salvage of the dead timber without degrading late-successional habitat.

Restoration projects are designed to restore, improve, or maintain conditions for future generations. Salvage provides for the recovery of the economic value of some fire-killed trees while balancing other beneficial uses of the environment and still meeting LSR management objectives. Research will provide information to allow future generations to make more knowledgeable decisions. Alternatives D and G provide balanced levels of restoration and salvage; however, the addition of research in Alternative G makes it the more environmentally preferred alternative.

4.0 Rationale for Selected Alternative

Alternative G in the FEIS has been selected as the alternative to be implemented. Rationale is based on how well this alternative meets the Purpose and Need and responds to the following objectives and issues identified during the preparation of the EIS (Chapter 1, FEIS). Alternative G is also the environmentally preferred alternative.

4.1 Objectives

1. Manage to protect and enhance conditions of late-successional and old growth forest ecosystems. Desired future condition identified in LSRA is 55 percent of LSR and 75 percent of Riparian Reserves in late seral vegetation 80 or more years old.
2. Reduce potential amount of sedimentation resulting from the Timbered Rock Fire and any past or future management actions.
3. Manage to create, protect, and improve special habitats within the Elk Creek Watershed.
4. Restore anadromous fish habitat to increase survival rates by improving the abundance and quality of spawning gravels, deep pool habitat, side channels, overwintering habitat (channel structures and log jams which can shelter fish), while maintaining water temperatures and quality that can sustain multiple fish species within the Elk Creek Watershed.
5. Manage the LSR to a level where no more than 28 percent of acres are in a high fire risk condition.
6. Improve existing suppression facilities and reestablish the role of fire to reduce wildfire size and cost, and increase resiliency to site disturbance.
7. Recover some economic value of fire-killed trees, while meeting LSR and watershed objectives.
8. Where possible, conduct scientific investigations that could be implemented within the LSR to respond to controversial issues related to salvage of fire-killed trees or fire effects on critical resources.
9. Analyze effects associated with fire salvage so future efforts can be tiered to this analysis.

4.2 Issues

1. Recovery of the economic value of fire-killed trees.
2. Fuel loading within the Elk Creek Watershed.
3. Coarse woody debris and snag levels.
4. Late-Successional forest habitat.
5. Cumulative effects from the fire and activity on commercial timberlands.
6. Road density and delivery of sediment to streams.
7. Threatened or endangered and other sensitive species.

4.3 Rationale

The following comparisons of the objectives and issues to the alternatives provides rationale for the selected alternative.

Objective 1, Issues 4 and 7: Alternative G does not harvest patches of fire-killed trees less than 10 acres in size, therefore providing for future forest patch development. Also, Alternative G will create additional small patches through the salvage operation.

Objective 1, Issues 4 and 7: Alternatives C, D, and G include restrictions on salvage logging within ¼ mile of owl sites active prior to the fire. Since little is known regarding site tenacity, this will provide an increased level of protection should owls return to those sites .

Objective 2, Issue 6: All action alternatives provide for reduction in road density and reduced delivery of sediments to streams.

Objectives 2 and 4, Issue 7: All action alternatives include habitat restoration or enhancement for coho salmon.

Objective 3, Issues 2, 4, and 7: All action alternatives provide for treatment of oak woodlands to enhance values for wildlife, range, plants, and biological diversity.

Objectives 5 and 6, Issues 2 and 3: All action alternatives will reduce fuel loading by creating fuel management zones (FMZs) along ridges and providing enhanced protection to rural residences, adjacent industrial forest land, and remaining late-successional forest within the LSR. Alternatives C, D, and G are more effective and efficient than the other alternatives.

Objective 7, Issue 1: Alternative G provides for the economic recovery of some fire-killed trees. Delay of harvest for approximately two years has resulted in a loss of volume due to decay. However, harvest of approximately 23.4 MMBF of fire-killed trees will result in about $4.8 million in receipts to the US Treasury, with an increase of about $20.1 million to the local economy and creation of 354 direct and indirect jobs.

Objective 7, Issues 1 and 3: Alternative G provides for a limited harvest of fire-killed trees while still meeting management objectives for Late-Successional Reserves. The levels of snags and coarse woody debris retained across the fire area meet or exceed levels consistent with southwest Oregon's drier climate.

Objective 7, Issues 3 and 4: Implementation of any action alternative will comply with the LSR "area salvage approach that suggests a landscape perspective to determine leave needs for large dead wood." This is consistent with the EIS design that focuses on recovering some economic value of fire-killed trees while meeting LSR and watershed objectives. The alternatives analyze leaving various levels of snags and CWD to meet this landscape objective.

Objective 8: Alternative G provides for research related to some of the controversial issues surrounding the salvage of fire-killed trees. Researchers were involved in the design of the research from the beginning of the project, rather than grafting research onto an existing project. While the research design results in a decrease in salvage volume, the long-term benefits outweigh the economic loss.

Other Issues Identified and Addressed: Alternative G is consistent with the Records of Decision for both the Medford District RMP and the Northwest Forest Plan. Salvage and restoration projects have been coordinated with the Regional Ecosystem Office, as required by the Northwest Forest Plan. Alternatives C-G addresses hazard reduction along roads, but at varying degrees. Alternative G also implements many of the restoration actions recommended in the Elk Creek WA and the South Cascades LSRA.

Objective 9 and Issue 5 were not specifically addressed because they are part of the environmental analysis process. The EIS was designed to specifically evaluate cumulative effects from the fire and those associated with salvage logging on intermingled private industrial forestlands (Issue 5). The EIS prepared for these projects can be used for tiering (see 40 CFR 1508.28) when wildfires occur in the future (Objective 9).

Selection of Alternative G relates directly to meeting the Purpose and Need presented in Chapter 1 of the EIS as enumerated by the above objectives and issues. Alternative G includes a moderate level of restoration which can reasonably be expected to be implemented over the next 2-10 years. Restoration actions implement many of the recommendations included in the South Cascades LSRA and the Elk Creek WA. Alternative G produces a moderate level of salvage of fire-killed trees while still meeting LSR objectives. Research incorporated into Alternative G will provide data to respond to controversy associated with post-fire salvage logging.

5.0 Monitoring

The monitoring plan is shown in Appendix E. Three types of monitoring are discussed: implementation, effectiveness, and validation monitoring. All projects will be monitored to ensure they are implemented consistent with objectives identified in the FEIS and PDFs outlined in this ROD. The monitoring plan includes components identified in the LSRA Monitoring (USDA and USDI 1998). Proposed projects have been reviewed by REO and determined to be consistent with objectives for managing LSRs. Effectiveness and validation monitoring will occur as funds and personnel are available.

6.0 Public Involvement

6.1 Summary of Public Involvement

Public involvement was sought to identify the desires, expectations, and concerns of interested and affected publics regarding this project and the use of available resources. The "public" included all individuals, agencies, businesses, and organizations interested in, or affected by the project.

The Notice of Intent to prepare an Environmental Impact Statement and conduct public scoping was published in the Federal Register on January 24, 2003. A letter seeking input on the EIS was mailed to 780 individuals, landowners, organizations, tribal governments, and government agencies. A website specific to the Timbered Rock EIS was published on the Internet. Two public meetings, attended by about 40 people, were held during the scoping period. A total of 50 comments were received at the meetings and by e-mail, telephone, and fax.

The public comment period for the Timbered Rock Fire Salvage and Elk Creek Watershed Restoration Draft Environmental Impact Statement (DEIS) began August 15, 2003 and ended October 15, 2003. The DEIS was mailed to 112 individuals, businesses, groups, organizations, libraries, elected officials, and government agencies. The DEIS was available at local and university libraries and on the BLM Timbered Rock website. Two public meetings were held and a total of four individuals attended those meetings. Twenty-three comment letters were received in the form of e-mails, postcards, faxes, and letters.

The public review period for the Timbered Rock Fire Salvage and Elk Creek Watershed Restoration Final EIS began when the Environmental Protection Agency published the Notice of Availability on February 6, 2004.

6.2 Responses to Comments on the Final EIS

Eleven comment letters were received during the public review period for the Final EIS, including the Jackson County Board of Commissioners. The BLM took a hard look at all comments received. Comment review looked for the presence of new information that has not already been considered in the Final EIS or would justify a modification to the document. Comments resulted in two modifications to the Selected Alternative. Comments containing new information or requiring clarifications are addressed below.

Comment: Please incorporate and address the findings contained in Franklin and Agee, 2003, "Forging a Science-Based National Forest Fire Policy," *Issues in Science and Technology*, Fall 2003.

Response: The article by Franklin and Agee calls for the development of a comprehensive national fire policy that covers all aspects of wildfire management. Analysis or creation of the suggested policy is beyond the scope of this EIS. We are familiar with the issues and concerns raised in this paper about post-fire treatments and have addressed those thoroughly in the Final EIS. The proposed research is intended to aid our understanding of these processes.

Comment: Please consider and incorporate the findings of the attached draft paper (in review) by Robert Pearson entitled *Spotted Owl Habitat Considerations with Regard to Barred Owl Presence*.

Response: This article is a summary of available literature regarding the exclusion of Spotted Owls by Barred Owls from suitable Spotted Owl habitat. Barred Owls were addressed in the FEIS and no new information was presented that would change the Spotted Owl analysis.

Comment: The US Fish and Wildlife Service supports efforts to conduct prescribed burns in a manner that mimics natural events, including the initiation of frequent, low intensity fall burns. While fall burns present challenges to fire managers, such as increased temperature, lower fuel moistures and increased fire behaviors, negative impacts to plant and wildlife species may be reduced by conducting burns at this time.

Response: Underburning is proposed as a maintenance activity in oak woodlands, in Fuel Management Zones (FMZ), and in four owl activity centers. The season the underburnings would occur was not specifically addressed. Conducting burning in the fall creates additional air quality concerns, and the narrow time periods may not permit completion of projects. Conditions in the fall also create greater risks for controlling the burns. Depending on fuel types and fuel conditions, the BLM will consider burning in the fall as well as the spring.

Comment: Apparently the NOAA Fisheries only consulted about projects with funding certainty such as salvage logging, thinnings, road construction and culvert replacement (Appendix J 3-6). The 35 miles of road decommissioning and fish habitat projects from the DEIS were not mentioned in August 29, 2003 consultation letter. Restoration projects are not likely to be implemented soon since there was no consultation on the restoration projects.

Response: Consultation under Section 7 of the ESA was undertaken with NOAA Fisheries on July 17, 2003 with the submission of a Biological Assessment (BA). The BA states, "The result of salvage, fuels treatment, thinning and associated road work constitutes a 'May Affect, Not Likely to Adversely Affect' determination." NOAA Fisheries agreed with this determination in a Letter of Concurrence on August 29, 2003.

Restoration projects included in the Selected Alternative are covered by a programmatic Biological Opinion (BO) dated October 18, 2002, and further consultation is not necessary. The programmatic consultation contained many individual actions in one consultation. Projects in the programmatic BO are: 1) road maintenance, 2) aquatic and riparian projects, 3) recreation site, trail, and administrative structure maintenance and associated public use, 4) fisheries, wildlife, botany, and cultural programs, 5) non-commercial vegetative treatments, 6) pump chance/helipond maintenance and use, 7) rock quarry operations/ornamental rock collecting, 8) road decommissioning, obliteration, storm proofing, and inactivation, and 9) telephone line and power line renewal special-use permits/rights-of-way grants.

Comment: The BLM should be aware of the findings contained in Latham, P. and J. Tappeiner, 2002, "Response of old-growth conifers to reduction in stand density in western Oregon forests." *Tree Physiology 22, 137-146.* This study indicates that sugar pines do not respond well to culturing and that less than half of sugar pines showed increased growth rates while 5-13% of the treated sugar pines actually decreased their growth rates.

Response: We are aware of this study but disagree with the commenter about the management implications of the study. The study looked at the effects of thinning old growth stands to reduce the threat of stand-replacing fires and increase resource availability to large, old growth trees, which in turn may prolong their lives by reducing the effects of competition. The paper notes that current high densities of understory trees may contribute to water stress in large old growth trees and could make them susceptible to insect-related mortality. The Pine Restoration project focuses on those stands within the Ponderosa Pine Plant Series. The target species for release in this project is ponderosa pine but also includes releasing around sugar pine.

The comment indicates there would be no or little benefit from thinning around old growth sugar pine. The study indicates sugar pine response to thinning was not as great as the response of other species studied (Douglas-fir and ponderosa pine). The study does show the basal area growth was increased in the treated sugar pine stands compared with the untreated sugar pine stands. "The mean growth ratio of sugar pine trees in the treated stands was significantly greater than in the untreated stands" (Latham and Tappeiner 2002). Table 5 in the paper indicates the proportion of sugar pine with significant increased basal area growth was 40% and 25% in the 2 treated stands and 0% in the untreated stand. Significant decreased basal area growth was 13% and 5% in the treated stands and 26% in the untreated stand.

Under *Management implications* the paper states, "Cutting trees to reduce density in old-growth stands or to modify the amount and distribution of fuels can be beneficial to residual large old-growth trees. Reduction of stand density around individual trees with full crowns is likely to increase the basal area growth of a high proportion of the trees for several decades." In addition, the study states, "Based on our most conservative measure of growth, only 5-23% of trees in sugar pine and Douglas-fir stands significantly decreased growth following density reduction and no ponderosa pine trees did. Moreover, the decrease in growth observed in response to the density reduction was not a sharp decrease, but rather a continuation of the slower growth of these trees."

Comment: The principle reason that reliance on DecAID violates NEPA's requirement that the BLM ensure the scientific integrity of its analysis is that DecAID is clearly inappropriate for use in post-fire ecosystems. The authors of the DecAID note that "at present DecAID does not specifically address effects of fire."

Response: The BLM acknowledges that DecAID does not specifically address effects of fire; however, DecAID does recognize that the "sample plots of older forests might represent some post-fire conditions" (Mellen, et al. 2003, 'Caveats and Cautions'). Using DecAID is not "clearly inappropriate" for analyzing post-fire conditions.

Furthermore, the proposed snag and coarse woody debris retention level in Alternative G did not rely solely on DecAID but also considered other local and regional references (see FEIS Appendix D, page D-32). The prescribed snag and coarse woody debris levels are consistent with recommendations made in these other references. The snag retention level prescribed in the Preferred Alternative was reviewed by the LSR working group and determined to be consistent with the objectives for managing LSRs.

Comment: The FEIS (3-15) then falsely states that logging and other land uses have not had much affect on turbidity in the streams. The FEIS failed to report and analyze turbidity data for the USGS gauge on Elk Creek below Alco Creek (FEIS 3-44). Turbidity measurements by R. Nawa on 16 February 2004 revealed sharply elevated turbidity in Elk Creek due to turbid water flowing from small tributaries with recent salvage logging. Turbidity in Elk Creek increased from 36 NTUs above Sugar Pine Creek to 136 NTUs above Flat Creek. Sediment sources appear to be skid roads located along streams and stream diversions caused by roads. Elk Creek and some tributaries appear to be violating state standards for turbidity. Although BLM and private landowners have intensively logged and roaded the watershed, no turbidity monitoring data is being collected. The FEIS fails to disclose that public land logging will exacerbate turbidity that appears to be already violating state standards. Similarly, the Water Quality Restoration Plan is flawed because it does not provide for the monitoring of turbidity that would be harmful to fish and recreational fishing.

Response: The FEIS (3-15) reference is a quote from the Elk Creek Watershed Analysis (USDA and USDI 1996, II-19) addressing pre-fire conditions, not post-fire conditions. The FEIS (3-35) recognized turbidity would increase following the fire: "The first rainy season would probably see the greatest surface runoff and subsequent delivery of fine sediment and turbidity to the downstream aquatic system, with each of the following years becoming progressively less."

Monitoring on BLM-administered lands is providing data on turbidity, conductivity, and pH (FEIS 3-44). The station on Elk Creek below Alco was not used because it is a low-flow station only used for measuring flows during the summer and early fall months (FEIS 3-44). Future monitoring will include data from this site.

The data provided by R. Nawa is similar to data gathered at BLM monitoring stations showing an increase in turbidity between February 16 and 18, 2004. This increased turbidity was followed by a decrease to prior levels. These spikes coincided with recorded rain events in which Medford Airport received over 1" of precipitation on February 16 and 17, 2004. These spikes in turbidity are expected during storm events.

The effects of Alternative G on sediment are addressed in the FEIS (3-60). Project Design Features described in the document, along with delaying harvest for 2 years after the fire and the associated vegetation recovery in the Riparian Reserves, would prevent sediment from reaching the stream.

The Oregon Department of Environmental Quality (DEQ) included Elk Creek on the 303(d) list for the limiting factors of temperature and dissolved oxygen (DO). The Water Quality Restoration Plan (WQRP) only documents the extent that federal actions may contribute to changes in the limiting factors which result in the 303(d) listing. DEQ did not identify turbidity as a limiting factor in Elk Creek.

Comment: The following document, "Comments on Draft Environmental Impact Statement for Biscuit Recovery Project" by Jerry Franklin, are submitted to the Timbered Rock record for your consideration. While the Franklin comments are specific to the Biscuit Fire, the document speaks directly to the purpose and conservation biology strategy of the LSR network.

[NOTE: These comments were received after the Timbered Rock Final EIS was sent to be printed and the comments were not specifically directed to this project. However, Dr. Franklin's comments

primarily relate to salvage in an LSR, which is pertinent to this project.]

Response: Dr. Franklin opposes salvage logging in an LSR, particularly of large snags and boles. He states, "... general salvage of large snags and logs is absolutely antithetical to the goal of rapid recovery of fully functional late-successional forest habitat and inappropriate within the Late-Successional Reserves."

The Selected Alternative includes cutting across all size classes and retains approximately 2/3 of the fire-killed trees in each size class. While this is not consistent with the position advanced by Dr. Franklin, it is consistent with management direction provided in the NFP, the Medford District RMP, and the South Cascades LSRA which all provide for a conservative amount of salvage in an LSR following approved guidelines. Dr. Franklin's comments are a disagreement with the decision made in the NFP to allow salvage logging at all in the LSRs. This is not a new issue, or one directed at this particular project. The NFP has already resolved the issue whether to allow some salvage logging in LSRs and accompanied that decision with a detailed environmental impact statement.

Comment: The BLM did not release the Boise Watershed Analysis to the public as requested by NEDC until after the close of the DEIS comment period. As a result, NEDC was deprived a meaningful opportunity to consider the significance of the document. Because BLM did not release the document until after the close of the comment period, the public has been deprived of its only meaningful opportunity to comment on the contents of the Boise WA in violation of the CEQ NEPA regulations.

Response: The Boise Watershed Analysis was provided to NEDC prior to release of the Final EIS. Pertinent portions of that analysis were included in the record available to the public during the comment period on the draft. NEDC requested the entire document, which required time for us to get released from the private party. Not having the entire document apparently did not deprive NEDC of a "meaningful opportunity" to comment. While NEDC provided a number of substantive comments on the Draft EIS regarding mass wasting, none were provided on the Final EIS, even though NEDC possessed the entire document by that time.

Comment: Is the BLM really contending that no green trees will be felled for yarding or landings and that no fuel "management," pine release logging, riparian logging, or stand thinning involving green trees will occur within the deferred watersheds? If so the project maps need to be significantly revised.

Response: BLM reviewed project maps and determined some treatments, which included timber harvesting, were proposed within deferred watersheds. These treatments include pine restoration and late-successional forest habitat restoration in stands over 30 years old. These treatments within the Deferred Watersheds have been dropped from the Selected Alternative. Other restoration projects, such as riparian thinning (logging is not proposed in riparian thinning), FMZs, and oak woodland restoration, that do not include timber harvesting, are consistent with activities permitted within the deferred watershed.

Comment: Response to comments 207 and 213 appears to indicate that the BLM intends to log 4 acres at high-risk of mass wasting that it believes have a "realistic potential for delivery of CWD to streams vial landslides." What is the rationale for logging these acres? Economic recovery?

Response: The BLM has dropped these 4 acres from proposed salvage activities in the Selected Alternative.

Comment: We refer the agency to "A Report to the President In Response to the Wildfires of 2000" September 8, 2000 by USDA Forest Service and Department of the Interior. Find this report at: http://www.fireplan.gov/president.cfm. The following is taken directly from Part III of the report, "Key Elements of the Administration's Wildland Fire Management Policy."

> "The removal of large, merchantable trees from forests does not reduce fire risk and may, in fact, increase such risk. Fire ecologists note that large trees are "insurance for the future – they are critical to ecosystem resilience."

Response: This quote specifically refers to the harvest of large green trees to reduce fire risk. This EIS does not propose any harvesting of large green trees. Salvage is proposed to recover some economic

value of fire-killed trees while meeting LSR and watershed objectives and not to reduce fire risk.

Comment: Similarly, the Flounce Around EA (an adjacent 500 acres of matrix timber sale in the Butte Falls RA) acknowledges that: "Many of these road were previously closed or had little traffic but were opened up during the suppression effort of the Timbered Rock wildfire in the adjacent Elk Creek watershed in the summer of 2002. As a result, many of these high gradient access roads have not been re-blocked and winter traffic has destroyed many of the designated road drainage (i.e. water bars, water dips and culverts). This has caused damage to the road surfaces creating road related erosion (rill, gullies) and subsequent sedimentation of the nearby stream channel."

Response: Fire suppression rehabilitation included reblocking most roads opened during the fire suppression activities. Some roads were left open to provide access for emergency stabilization activities or to provide private landowners access to their land. The EIS proposes additional road maintenance, closures, or decommissioning on many of the BLM roads used during the fire suppression activities within the Elk Creek Watershed. Road projects for roads accessing the fire from the Lost Creek side were addressed in the Flounce Around EA.

Comment: The EIS statement that there are no granitic or sedimentary soils within the planning area is inaccurate. There are no granitic soils but there are sedimentary.

Response: All rock types within the Timbered Rock project area are igneous (volcanic) in origin. One of these rock types (Tu-Tertiary Undifferentiated) does contain igneous rocks that could also be considered sedimentary; however, USDA NRCS (formerly the Soil Conservation Service) recently rated soils derived from these rocks as having a low to moderate erosion potential.

6.3 Coordination with Other Agencies and American Indian Tribes

A scoping letter was sent to the following American Indian Tribes: Affiliated Tribes of Northwest Indians; Cow Creek Band of Umpqua Tribe; Columbia River Intertribal Fish Commission; Oregon Commission of Indian Services; Confederated Tribes of the Grande Ronde; Confederated Tribes of the Siletz; Coquille Indian Tribe; Klamath Tribe; Burns Paiute Tribe; Confederated Tribes, Warm Springs Reservation; and Confederated Tribes, Umatilla Indian Reservation. The Confederated Tribes of the Siletz, the Cow Creek Band of Umpqua Tribe, and the Confederated Tribes of the Grande Ronde requested, and were sent, copies of the DEIS and FEIS.

Approximately 2,647 acres of the Rogue River National Forest (RRNF) and 84 acres of the Umpqua National Forest (UNF) were affected by the Timbered Rock Fire. The BLM invited both National Forests to participate in the preparation of the Timbered Rock Fire EIS. The UNF declined to participate as a formal cooperating agency, although a liaison was appointed to work with the EIS Team throughout the EIS process. The RRNF determined only 12-15 acres were potentially available for salvage. This was not considered sufficient acreage for inclusion in the EIS.

The US Army Corps of Engineers (USACE) manages approximately 610 acres affected by the Timbered Rock Fire. The BLM invited the USACE to participate as a cooperating agency in the development of this EIS. The USACE declined to participate.

The Oregon State Historic Preservation Office (SHPO) was informed of this project and received copies of the Draft and Final EIS. Cultural resource surveys were completed following compliance procedures for cultural resource surveys set forth by Section 106 of the National Historic Preservation Act. Specific guidelines outlined by Oregon SHPO were followed. No new sites were located and no further consultation was necessary

6.4 Endangered Species Act, Section 7 Consultation

Consultation with the US Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration–Fisheries (NOAA Fisheries) for Threatened and Endangered (T&E) species is required under Section 7(a)(2) of the Endangered Species Act (ESA) .

Federal agencies must consult with the USFWS and/or NOAA Fisheries to ensure proposed activities will not jeopardize the continued existence of listed species or adversely modify designated critical habitat. Only two species occurring within the project area require consultation.

6.4.1 Coho Salmon (*Oncorhynchus kisutch*)

The Bureau of Land Management Medford District initiated consultation for the Timbered Rock Fire Salvage project with NOAA Fisheries on July 17, 2003. Consultation was sought for the Southern Oregon/Northern California (SONC) coho salmon. NOAA Fisheries listed the SONC coho salmon as threatened under the ESA on May 6, 1997 and designated critical habitat on May 5, 1999. On August 29, 2003, NOAA Fisheries concurred with the BLM's determination that the proposed project is "May Affect, Not Likely to Adversely Affect (NLAA)" for SONC coho salmon. Additionally, NOAA Fisheries was consulted under the Magnuson-Stevens Fishery Conservation and Management Act regarding actions in the proposed project that may adversely affect essential fish habitat (EFH). NOAA Fisheries determined that "the conservation measures that the BLM included as part of the proposed action to address ESA concerns are also adequate to avoid, minimize, or otherwise offset potential adverse effects to designated EFH" (NOAA Fisheries Letter of Concurrence August 29, 2003).

6.4.2 Northern Spotted Owl *(Strix occidentalis caurina),* Other Listed Wildlife Species, and Listed Botany Species

Section 7 consultation with the USFWS for wildlife and botany T&E species was requested in a programmatic Biological Assessment prepared by the Medford District BLM, Rogue River National Forest, and Siskiyou National Forest. The consultation was for proposed federal projects in southwest Oregon for fiscal years 2004-2008. The USFWS issued a Biological Opinion (BO) (log# 1-14-03-F-511) on October 20, 2003. The full text of the BO is available on the internet at http://www.or.blm.gov/Medford/planning/planning_docs.htm.

The only wildlife species found within the Timbered Rock project area requiring consultation with USFWS is the northern spotted owl (*Strix occidentalis caurina*). Excerpts from the BO relating to the Timbered Rock project were included in the FEIS Appendix N. The biological opinion for this EIS resulted in a "May Affect, Likely to Adversely Affect (LAA)" determination.

No other wildlife or botanical T&E species are located within the project area.

7.0 Implementation Process

Projects will be implemented as described in Section 1.2. Some projects will be implemented directly from this Record of Decision while others will require additional NEPA documentation and/or notification (see Tables 1, 2, and 3).

Economic recovery of fire-killed trees (salvage) will be implemented through timber sales. NEPA compliance was completed through this EIS. Timber sales can be protested when they are advertised for sale.

Many restoration projects will be implemented over the next 10 years, subject to availability of funding and personnel. The decision to go forward with these projects will be documented in a Decision Record, published in local newspapers, and mailed to interested individuals, businesses, agencies, and organizations on the Butte Falls Resource Area and ROD mailing lists. These decisions can be protested at that time.

8.0 Protest Procedures

Organizations or persons have the right to protest this ROD to the Authorized Officer of the Medford District Office. In order for your protest to be considered, it must be in accordance with the regulations contained in 43 CFR Subpart 5003. If a protest is taken, it must be filed in this office by close of business (4:30 p.m.) within 15 days of publication of the Notice of the Record of Decision in the local newspapers. Protests must be received on or before the filing deadline. The BLM may accept only written and signed hard copies of protests that are delivered to the physical address of the advertising BLM office. Postmark does not qualify as meeting the deadline. Electronic mail or facsimile protests will not be considered valid.

Address:

Medford District Office
Bureau of Land Management
3040 Biddle Road
Medford, OR 97504

9.0 Contact Persons

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Appendices

Appendix A
REO Review Letter

REGIONAL ECOSYSTEM OFFICE

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Portland, Oregon 97208-3623
Website: www.reo.gov E-Mail: reomail@or.blm.gov
Phone: 503-808-2165 FAX: 503-808-2163

MEMORANDUM

DATE: JAN 1 2 2004

TO: Elaine M. Brong, OR/WA State Director, Bureau of Land Management

FROM: Anne Badgley, Executive Director Anne Badgley

SUBJECT: Timbered Rock Fire Salvage and Elk Creek Late-Successional Reserve Restoration – Butte Resource Area Final Review

This memorandum is a final response regarding your May 1, 2003 request for clarification of interpretation of key concepts for the Timbered Rock Fire Salvage and Elk Creek Late-Successional Reserve Restoration – Butte Resource Area (RA). The Late-Successional Reserves (LSR) interagency work group reviewed proposals for the Timbered Rock Environmental Impact Statement (EIS) on May 1, 2003, and provided several recommendations and findings to you in a memo dated May 13, 2003.

The workgroup conducted a final review of the EIS proposed actions on December 1, 2003 and concluded with the RA's findings that all proposed actions were consistent with objectives for managing LSRs. The issues reviewed include:

Salvaging in stands less than 10 acres
The FEIS proposes no salvaging in stands less than 10 acres, except those adjacent to areas identified as Fuels Management Zones (FMZs). The workgroup concludes with the RA's findings that this proposal is consistent with the Northwest Forest Plan (NWFP) Standards & Guidelines for salvage within LSRs which allows for salvaging in stand-replacement areas less than 10 acres to reduce future risk of fire to late-successional forest conditions.

Use of the DecAID Wood Advisor in determining retention levels of snags and coarse woody debris (CWD) in salvaged areas
The FEIS Preferred Alternative proposes leaving snags on a landscape level which meet the DecAID Advisor recommendations for southwest Oregon. The LSR Work Group concluded the use of the DecAID Wood Advisor tool for determining snag and CWD retention levels would be consistent with objectives for managing LSRs.

Proposed research within an LSR
Two research proposals are included in the Preferred Alternative for wildlife/snag relationships and reforestation. The Regional Ecosystem Office memorandum clarifying NWFP provisions related to review and assessment of new research proposals (finalized on May 12, 2003) concluded that no advance concurrence was needed. The workgroup concurs with the RA's findings that the wildlife/snag research is consistent with objectives for managing LSRs.

Acre limitations for various restoration treatments identified in the South Cascades Late-Successional Reserve Assessment
The LSR work group concluded that the acres and treatment prescriptions in the EIS proposed actions are consistent with the objectives for managing LSRs.

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This memo serves as final documentation of the REO review. If you have any questions, please do not hesitate to contact Shawne Mohoric (503-808-2175).

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Appendix B
Research Projects

Evaluation of the influences of salvage and salvage intensity on wildlife
A research prospectus

October 14, 2003

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Recent fires throughout the western states have heightened interest in the influences of post-fire management activities on a variety of ecological processes, social goods and services, and forest attributes, including forest health, ecosystem integrity, future management options, and wildlife habitat (McIver and Starr 2000). Salvage of dead trees has been of particular interest because of the potential economic benefits of harvest activities and the influences of salvage on risk of future fire and insect outbreaks. Salvage also has been highly controversial because of known or hypothesized environmental impacts on soil, water, and biodiversity. Despite the coupling of potential social benefits and possible environmental impacts, a large number of questions remain about basic relationships between salvage and ecosystem response.

A key issue related to salvage activities concerns potential influences on wildlife and wildlife habitat. Most research of the effects of post-fire salvage logging has been conducted on avian species although some work has been conducted on other wildlife taxa (e.g., Haim and Izhaki 1994). In general, bird species richness and abundance generally are lower in burned stands that are heavily salvaged relative to unsalvaged stands (Caton 1996, Hitchcox 1996, Saab and Dudley 1998). However, substantial gaps in our knowledge remain concerning the effects of salvage on wildlife, and most of the research has been conducted outside of the Pacific Northwest (reviewed by Kotlier et al. 2002). Most notably, there are few studies that examine influences of different levels of salvage logging on wildlife. Moderate salvage logging that retains sufficient numbers of suitable snags may not have negative effects on some cavity nesting bird species (Saab and Dudley 1998). Existing research suggests that avian species most closely tied to early post-fire habitat may be most sensitive to salvage (Kotlier et al. 2002). As a consequence of lack of geographically relevant information, short- and long-term responses of wildlife populations to changes in forest structure resulting from salvage, the influences of different salvage intensities on wildlife response, and implications for development of late-seral attributes remain speculative.

This prospectus provides an outline of proposed research to investigate the influences of post-fire salvage and salvage intensity on wildlife response in the Timbered Rock Fire in the Butte Falls Resource Area of the Medford District of the BLM.

Objective

To determine the relative influence of 2 salvage intensities on wildlife populations.

Study area

This research will take place on lands managed by the Butte Falls Resource Area, Medford District of the BLM in areas burned during the Timbered Rock fire. The Timbered Rock Fire burned roughly 27,000 of federal and private forest in July, 2002. Approximately 11,775 acres of the fire occurred on lands managed by the BLM. The BLM lands are designated as Late Successional Reserve under the Northwest Forest Plan.

In collaboration with staff of the Medford District of the BLM, potential study sites within the Timbered Rock Fire were identified. Sites meeting the following criteria were considered to be potential sites for study: 1) the site had burned with a high fire intensity, 2) the site was at least 30 (preferably at least 40) acres in size, and was not exceptionally sinuous in shape or did not include elongate extensions, 3) the sites consist of good stocking of conifers $\geq$ 40 inches dbh, 4) the site could accommodate at least three non-overlapping 80 m radius bird survey circles, and 5) it was logistically feasible and reasonable to assign any treatment to any site. Initially, 16 sites were identified by the BLM that were thought to meet the criteria provided. On further investigation, it was found that four of these sites had inadequate numbers of large diameter trees to meet our criteria. These 4 sites were eliminated, resulting in 12 sites available in the area for the study.

Treatments

Three treatments will be implemented in the study:

1) Control. No salvage activity will occur on control sites.

2) Moderate salvage prescription. Salvage activities will occur on 70% of the site. In the salvaged area, six trees per acre, > 20 inches DBH will be retained. Retained snags will be dispersed throughout the salvaged area. The remaining 30% of the site will not be subjected to any salvage activity. If riparian areas are present, the unsalvaged will be oriented to include the riparian habitat. This prescription is designed to emulate likely salvage activities on BLM lands in the region, where sensitive areas, such as riparian areas, are left unsalvaged.

3) Heavy salvage prescription. The entire site will be salvaged. Six trees per acre >20 inches DBH will be retained throughout the site. Retained snags will be dispersed throughout the site.

Treatments were randomly assigned to stands. The resulting allocation of treatments is illustrated in Figure 1.

Aside from salvage activities, all management activities will be identical among treatments. For example, each area should receive the same underplanting density, vegetation control, etc. To the extent that activities undertaken on the sites do not impact the field experiment, all management activities conducted on the sites will be as similar to typical operational practices as possible.

Timing of salvage

Salvage should occur during a relatively narrow window of time to minimize impacts of salvage on data collection and to maintain the integrity of the research design. Salvage treatments should be installed so to meet three criteria: 1) no salvage activity should take place in the experimental plots from May 15 through July 7, to avoid data collection during the breeding bird season; 2) all salvage will be installed during the same time period, on a given year from July 7 through May 15 of the following year (e.g., between July 7, 2003 and May 15, 2004); and 3) no logging will occur on stands adjacent to or nearby to the experimental plots between May 15 and July 7 before 10:00AM.

Field methodologies

Bird populations. During the summer of 2004, we will establish 3 bird-sampling points in each experimental stand. Sampling points will be the chosen so that the distance between points is at least 160 m, and arranged so as to maximize distance between sampling points and stand boundaries. We will conduct bird sampling at each point between May 15 and July 7 during 2004 and 2005. Additional years for study will be determined later in consultation with the BLM, depending on interest and availability of funding. Sampling at least through 2007 may be desirable as changes in habitat structure during the initial years following fire and salvage can be dramatic. We anticipate 2 to 5 years of initial study to evaluate short-term impacts of salvage on birds, followed by additional future work to evaluate moderate- and long-term impacts. Each point will be visited a minimum of four times each year. Bird sampling will be conducted for an 8 minute time period at each point, between one-half hour before and three hours after sunrise. Distances from the observer to each bird will be recorded, and data will be analyzed using standard methodologies. Whenever possible, population density will be estimated rather than using indices of abundance. We will explore use of territory mapping or behavioral observations to evaluate patterns of habitat use within study sites.

Small mammals. Small mammals are of interest because of the key ecological role they play as predators of seeds and insects, dispersers of seeds and mycorrhizal fungal spores, and prey to northern spotted owls and other predators. Although size of the proposed treatments are not suitable to investigate treatment influences on flying squirrel population densities, they are adequate to evaluate use of sites by flying squirrels, and population-level responses of woodrats and other small mammals, including chipmunks, mice, voles, and shrews. We will establish a grid of Tomahawk live traps (for flying squirrels, woodrats, and chipmunks), and Sherman live traps or other traps (for mice, voles, and shrews) at each of the study sites. Trapping will be conducted for a minimum of five days during the spring and fall of 2004 and 2005. Additional years for sampling will be determined later in consultation with the BLM, depending on interest and availability of funding. We anticipate 2 to 5 years of initial study to evaluate short-term impacts of salvage on small mammals, followed by additional future work to evaluate moderate- and long-term impacts. Investigation of response of these species would involve establishing trapping grids on the sites and standard mark-recapture analyses (Thompson et al. 1998). Whenever possible, population density will be estimated rather than using indices of abundance.

Significance and Justification

Salvage and Late Successional Reserves

The Record of Decision (ROD) for the Northwest Forest Plan provides basic guidelines for the conditions under which salvage may occur in Late Successional Reserves. The ROD allows for salvage to prevent negative effects on late-successional habitat and to facilitate habitat recovery. The ROD specifically addresses the potential use of salvage to reduce catastrophic insect, disease, and fire threats. However, the ROD restricts activities that diminish habitat suitability in Late Successional Reserves now or in the future. Unfortunately the information base to fully evaluate the influences of salvage activity on habitat restoration and the short- and long-term impacts of salvage on habitat suitability is not available. This work would provide information on the influences of salvage and salvage intensity on habitat quality and abundance of wildlife species. In addition, if resources are directed to examining influences of salvage on stand structure, research on these sites could provide information on the influences of salvage on habitat recovery and development of late successional characteristics.

Applicability of findings beyond the Timbered Rock Fire

The proposed research will help fill a number of important gaps in our understanding of the influences of salvage on wildlife populations. The experimental, manipulative approach outlined here, combined with random allocation of treatments to sites proposed for this project provides the framework for inference of causality with minimal bias. In contrast, observational research is correlative in nature and cannot be used to infer causality, and research that does not invoke randomization of treatments and controls are subject to potential sampling biases. As a result, very strong inference can be gained from this research and it is likely to impact post-fire management on other public and private lands in southwestern Oregon and throughout the western states.

Deliverables

Products of the proposed project for delivery to the BLM will include annual progress reports during the years when active research is being conducted. In addition, I anticipate that the proposed research will yield at least 2 Master's theses and 3-5 peer-reviewed scientific journal articles (depending on the time frame of the study and the number of wildlife taxa examined).

Project Schedule

Below is a potential schedule for research, based on four years of initial post-treatment data collection. Actual duration of the initial data collection is subject to funding availability. Timing and duration of second and third data collection sessions is subject to modification depending on availability of funding, interest of the BLM, patterns of stand development, and findings of the initial data collection sessions.

Years 1-4
: Initial post-treatment data collection on wildlife populations and habitat characteristics.

Year 5
: Analysis and publication of initial post-treatment data.

Years 10-11
: Additional post-treatment data collection on wildlife populations and habitat characteristics.

Year 12
: Data analysis and publication of results.

Years 18-19
: Additional post-treatment data collection on wildlife populations and habitat characteristics.

Year 20
: Data analysis and publication of results.

Budget

Separate budget estimates are provided here for two studies: a bird response study and a small mammal (spotted owl prey species) response study. Both studies include habitat assessments as well as direct evaluation of wildlife communities. Costs are provided for the first 6 years of the project (years –1 through 5); actual costs for years 3-5 will depend on decisions made concerning the amount of field sampling to be done. Similar expenses for later entries could be anticipated, modified based on inflation. Higher costs during year –1 largely reflect costs of supplies for study establishment (mostly traps for the mammal study). If pre-treatment sampling is not possible, these costs would be transferred to year 1. Expenses may be reduced if the BLM is able to provide housing for the field crew and vehicles for field work. Estimates are made based on 15% indirect costs rate for transferring money from the BLM to OSU through the CESU.

Bird study budget

Year	Direct Costs	Indirect Costs	Total
Year 1	57,750	8,862	66,413
Year 2	57,750	8,862	66,413
Year 3	57,750	8,862	66,413
Year 4	57,750	8,862	66,413
Year 5	50,250	7,537	57,788

Mammal study budget

Year	Direct Costs	Indirect Costs	Total
Year 1	98,250	14,737	112,988
Year 2	77,250	11,587	88,838
Year 3	77,250	11,587	88,838
Year 4	77,250	11,587	88,838
Year 5	53,250	7,987	61,238

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Vegetation Dynamics and Fire Hazard in Experimental Mixed-species Restoration Plantings in Southwestern Oregon:

The Timbered Rock Fire
Butte Falls Resource Area, Medford BLM

A Research Proposal to the USDI Bureau of Land Management

by

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Vegetation Dynamics and Fire Hazard in Experimental Mixed-species Restoration Plantings in Southwestern Oregon: The Timbered Rock Fire Butte Falls Resource Area, Medford BLM

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Issue:

Recent large-scale fire events have degraded functional characteristics of upland forests over extensive areas and placed at risk ecosystem stability, productivity, habitat, and water quality. Reforestation efforts are being considered to enhance development of forest communities that serve a broad spectrum of ecological functions and vary in temporal development with respect to fuels structure and fire risk. Mixed-species plantings have been increasingly employed since the mid-1980's as an adaptive management option and yet remain poorly documented in terms of stand development and, in particular, interactions among species of planted trees, as well as interactions among planted trees, natural tree regeneration, and associated shrub, herbaceous, and non-vascular vegetation. Further, there is a paucity of information regarding temporal and spatial dynamics of fuels structure and abundance in mixed-species plantations. Addressing these information gaps will provide managers with an improved understanding of the potential role of mixed-species plantings for meeting goals of ecosystem restoration and enhanced function, and for improving fuels hazard analyses and fuels management strategies.

Background:

Fire is a natural process driving structure and function of many Pacific Northwest forest ecosystems including those in southwestern Oregon (Agee 1993). Over the past several decades, disruption of natural fire cycles characterized by high frequency low intensity burns has resulted in forest structures characterized by high fuel loads and vertical and horizontal canopy distribution favorable for large-scale high intensity stand replacement fires.

Post-fire management objectives tend to focus on site stabilization, capture of potential merchantable wood, reforestation and minimization of risk for recurrent high-intensity fires. On federal lands in the Pacific Northwest these objectives are differentially considered in the contexts of various land allocations such as matrix, late-successional reserves, adaptive management areas, and riparian reserves. The suite of tools available for post-fire management is defined in part by Standards and Guidelines put forth in the Record of Decision guiding US Forest Service and US Bureau of Land Management planning (Anon. 1994).

Two post-fire management activities employed are salvage logging and reforestation. Each of these activities generates its own set of issues and controversy regarding the appropriateness of application. Proponents justify the implementation of salvage logging as a means to recover economic value and to decrease fuel loading by removing fire damaged logs and snags before the onset of decay. Reforestation is often undertaken with the objective of enhancing development of tree cover. Conflicts arise between different perspectives on the degree of environmental, economic and social risks and benefits associated with the implementation or lack of implementation of these practices (McIver and Starr 2000, eg. Beschta et al. 1995). Until the consequences of post-fire management practices are known with respect to a wide array of values these conflicts can not be fully addressed.

The ways in which salvage logging and reforestation are applied can possibly have substantial impact on stabilization of burned sites and the subsequent nature and rate of vegetation development. Given Standards and Guidelines defined in the ROD (1994), salvage logging may be an infrequent activity in many land allocations, while reforestation may have a broader range of implementation. The remainder of this discussion will focus primarily on reforestation and will address snag removal (salvage logging) as it directly relates to reforestation and vegetation dynamics. Artificial reforestation techniques have been developed largely in the context of economic forest management where rapid development of tree cover is a major goal (Hobbs 1992). As a result, our discussion of reforestation will draw largely upon knowledge gained from post-harvest reforestation efforts. We will address basic reforestation concepts with respect to natural regeneration as a baseline and with respect to fire as a disturbance.

Fire of intensity sufficient to cause extensive tree and shrub mortality reinitiates succession processes. The subsequent course of natural forest regeneration is determined by abundance and proximity of seed

sources, seedbed characteristics, and the pre-burn presence and post-burn survival of sprouting species. Natural regeneration of conifers is dependent upon seed and seedbed conditions suitable for germination and establishment of seedlings. Production of large seed crops varies by species with intervals ranging from 2-11 years for Douglas-fir, 3-9 years for white fir, and 2-8 years for ponderosa pine (USDA 1965). Fires may act as thinning agents in which large healthy canopy trees are released to produce greater seed crops within a few years following the burn. Conversely, trees experiencing severe fire damage may not respond to release in the near term. There is little information available on the effects of fire on seed production (Minore and Laake 1992).

Seed dispersal is predominantly driven by topography and wind. Dispersal abundance decreases exponentially with distance from the source tree (Hobbs et al. 1992). Dispersal distance tends to be greater from tall trees and for species with light seeds (eg. Douglas-fir) versus those with heavy seeds (eg. Sugar pine). These factors tend to result in high degrees of spatial and temporal variation in seed availability. In areas where all seed-bearing trees are killed or removed in salvage harvests, seed supply may be insufficient for conifer regeneration in the near term.

Typically, even low intensity fires alter the seedbed conditions by removing the duff and litter layers. Thus, after they have been leached by rain, seeds on moderately burned seedbeds showed higher germination success of Douglas-fir and white fir (Minore and Laake 1992). Conversely, on severely burned sites physical changes in soil conditions, such as reduced infiltration and percolation, increased pH, and reduced mycorrhizal associations, can greatly diminish seedbed quality. Darkening of the soil surface by charcoal residue can result in higher surface temperature that may stimulate seed germination in the spring but cause heat injury to the stems of young seedlings later in the growing season (Minore and Laake 1992). This is especially critical in the climate of southwest Oregon after overstory vegetation and shading slash have been removed by fires.

In contrast to conifers, several hardwood tree and shrub species can regenerate either by seed or vegetatively from stump or root sprouts (Tappeiner et al. 1992). Seeds of many woody shrubs species (eg. manzanita or ceanothus) accumulate and remain viable in the soil. Fire can stimulate germination of these seeds leading to a flush of new shrubs that can readily occupy site resources (Biswell 1989, Tappeiner et al. 1992). Further, fires of moderate intensity may consume the above-ground shrub canopy without causing mortality to the below-ground root system. Sprouts from the surviving stump and root system can often proliferate resulting in the rapid establishment of a vigorous shrub canopy (Biswell 1989). Abundant shrub development can severely inhibit conifer establishment and growth.

Because of the uncertainty associated with natural regeneration of conifers following fire, artificial reforestation, usually tree planting, is often undertaken in southwestern Oregon to establish conifers. Wildfires function as natural site preparation by killing competing vegetation and removing barriers to seedling development such as slash. However, as previously indicated, the wildfires may also serve to stimulate woody shrub seed banks and sprouting which on direr sites may be strongly competitive and a hindrance to planted seedling survival and growth (Helgerson et al. 1992).

Once seedlings are planted, weeding treatments may be required to ensure survival or growth, depending on management objectives and the current and anticipated development of competing vegetation. As germinants of competing species are not as vigorous as established plants, release treatments may be more effective after fires as compared to harvested or undisturbed sites. Alternatively, sprouting vegetation may reoccupy sites rapidly and even a short delay (e.g., to grow seedlings in a nursery or wait for a good seed crop) may lead to substantial limitations with crop tree survival and growth (Helgerson et al. 1992).

Residual live trees and fire-killed snags are often salvaged after a burn. The impacts of salvage harvest on reforestation efforts have not been explicitly addressed. The body of research effectively documenting impacts of salvage logging on site and vegetation development is very limited (McIver and Starr 2000). Specific impacts of salvage logging vary with a variety of factors, including pre-fire vegetation composition (especially presence of sprouting species), fire intensity, slope, soil texture, and post-fire and harvest weather conditions. Depending on the harvesting system used, salvage logging may influence regeneration through removing downed woody debris, by disturbing the soil surface to expose mineral soil or by disrupting impermeable hydrophobic layers in the soil. Salvage logging has also been shown to have at least some short-term influence on vegetation development as characterized by herb, shrub, and sapling abundance, by species diversity, and by vegetation biomass (McIver and Starr 2000). Compared to unlogged burned controls, areas that were post-fire salvage logged and subsequently broadcast burned had a higher coverage of hardwoods and these hardwoods inhibited the establishment and growth of Douglas-fir (Stuart et al. 1993). Additional disturbances of the logging process may also encourage establishment of native ruderal species and exotic invaders (Abrahamson 1984). In addition to site disturbance effects, salvage logging may also remove snags and woody shrub skeletons that provide shade

and a mosaic of microsites in which harsh microclimatic conditions (temperature and evaporative demand) are moderated. Although there has been little explicit documentation of benefits of shade provided by snags, at least one study has demonstrated that shade from dead shrub canopies was beneficial to the survival and growth of planted white fir on dry sites in California (Conard and Radosevich, 1982).

Long-term forest structure and species composition depend upon events that occur within the first few years after the fire. Helms and Tappeiner (1995) provide a qualitative model that fits the situation in southwest Oregon and illustrates this point. If no conifer seeds are available and shrub germinant or hardwood sprouts are dominant early on, the shrub/hardwood community may persist for many years. Eventually shade tolerant species may invade to form a pure stand after overtopping the shrubs and hardwoods. Alternatively, if seed is present or trees are planted, a more rapid development of a mixed conifer (shade intolerant and shade tolerant species) may take place. Delay of planting or seeding of intolerant species or failure to control competing shrubs after planting may result in development of a shrub/hardwood community or mixed true fir shrub/hardwood community. There are many possible variations of these themes that may occur at various scales and depending on seed dispersal, shrub and hardwood densities, etc.

As short-term changes in growing conditions are reflected in the long-term development of tree and shrub cover, they also impact future fire potential and behavior. The primary issues of concern are the potential for resetting of the successional process, thus delaying development of late-successional habitat, and potential changes to long-term site productivity induced by high severity fires. Post-fire management activities are aimed at reducing the amount of large wood on the site through salvage logging and accelerating the development of forest structures that are more resistant to fires through reforestation activities. Areas dominated by a dense shrub cover (e.g., ceanothus species) and young, dense plantations or natural stands are likely to be highly flammable. On the other hand, if trees establish and grow quickly, natural stand development will lead to lower density of (flammable) understory vegetation. Potential for crown fires is reduced once crown lift occurs and when tree crowns are spaced further apart (Graham et al. 1999). Subsequently, pre-commercial thinning and understory fuel treatments, such as shrub busting or prescribed burning, are commonly used to reduce the potential for future crown fires in these stands (Graham et al. 1999). Thus, rapid development of stands may reduce the time period when stands are highly susceptible to stand replacing fires by speeding up development towards forest structures with lower flammability (Graham et al. 1999).

Objectives:

The general objectives of this study are to evaluate mixed-species reforestation plantings to identify and characterize temporal patterns of vegetation structural development and species diversity; to assess temporal dynamics of fuels loading and fire risk; and to determine impacts of snag retention on survival and growth of planted and naturally regenerated trees.

Implicit in the generalized objectives stated above are short- and long-term research issues. For initial phases of stand development covered in this proposal, six specific research objectives include to determine effects of:

1) snag retention on the survival and establishment of planted seedlings by species,
2) planted seedling versus natural regeneration on tree survival and growth,
3) monoculture versus mixed-species plantings on planted seedling survival and growth,
4) planting density on survival and growth of planted seedlings by species, and site occupancy by planted and naturally regenerating trees, shrubs, and herbs,
5) weed control on planted seedling establishment and growth of trees, shrubs, and herbs, and
6) physiographic site conditions on planted seedling survival and growth of trees, shrubs, and herbs.

Research Approach:

A replicated field experiment will be conducted to evaluate reforestation by mixed-species plantings as influenced by planting density, woody vegetation removal, dead structure (fire-killed snag trees and shrubs), and physiographic site (harsh or moderate sites). Treatments for establishment of planted trees will be designed to reflect planting schemes that are being undertaken at broader, operational scales. Experimental plantings will be evaluated with respect to vegetation structure, plant diversity, fuels, fire risk, and tree mortality, stress, growth, and productivity. The degree of site and treatment control in the experimental plantings will permit a more explicit evaluation of treatment and site factors than obtainable from monitoring or retrospective analysis of operational mixed-species plantations being established by the BLM in the Elk Creek Watershed.

Treatments and Experiments:

Experimental factors will consist of species mix, planting density, woody vegetation removal (weeding), snag retention (salvage), and physiographic site. These factors will be tested as a modular experimental design. A basic set of six planting treatments varying in composition, density, and competing vegetation will be employed. Depending on specific research objectives listed above, differing numbers of the six basic treatment plots will be established on harsh or moderate sites, or sites with or without snags.

The basic composition, density and weed treatments are:

Unplanted, not weeded (no woody vegetation removal)
Douglas-fir monoculture, weeded (woody vegetation removal through age 5)
Mixed species, 435 tpa (high density, 10' x10' spacing), not weeded
Mixed species, 435 tpa, weeded
Mixed species, 190 tpa (low density, 15' x 15' spacing), not weeded
Mixed species, 190 tpa, weeded

The basic treatment plot size is 1.5 ac (256' x 256') with the interior 1 ac (209' x 209') serving as the measurement plot.

In addition to the basic treatments listed above, physiographic site condition and snag retention will be included as experimental factors. Physiographic site conditions will be included through planting a subset of the six basic treatments on harsh and moderate sites as defined predominantly by aspect (southerly versus northerly), but also considering soil characteristics and slope position. Snag effects will be tested by planting a subset of the six basic treatments on sites with and without snags.

Three modular experiments are described below. Each module is designed to achieve statistical power for testing hypotheses specific to individual objectives. Each module will be analyzed separately, but all modules will have a subset of treatments in common to allow for limited interpretation of responses across modules.

Experiment A: Determine interactive effects of species composition, planting density, and weed control on seedling survival and early growth and site occupancy by planted seedlings and natural vegetation.

Objectives addressed: 2-5

Design: Five replications of the six basic treatments will be established on harsh sites with snags.

Rationale – This represents a base level test of the effects of species composition, planting density and weeding on plantation establishment and associated developmental responses of natural vegetation. Early responses, prior to tree canopy closure, represent individual tree and species responses to environmental heterogeneity. It is our assumption that salvage will not be the norm in fire restoration so this experiment will be conducted on sites with fire-killed snags. Conducting this experiment on harsh sites will result in an early expression of individual plant and species responses to the density and weed treatments.

Experiment A will be planted in 2004.

Experiment B: Determine effects of snags on survival and growth of planted seedlings.

Objectives addressed: 1

Design: Six replications of mixed species, high density, weeded treatments planted on harsh sites with and without snags.

Rationale: Snags will introduce microsite heterogeneity (light and possibly temperature and soil moisture modification). It is hypothesized that this microsite heterogeneity will result in different levels of mortality and early growth among planted tree species. Shrub skeletons and natural regeneration will be removed to provide an explicit test of the contribution by snags. Further, testing on harsh sites will result in an early expression of individual tree and species responses to snag moderation of microsite severity.

Experiment B will be planted in 2005.

Experiment C: Determine effects of physiographic site conditions on survival and growth of planted seedlings, and development of naturally regenerating herbs, shrubs and trees.

Objectives addressed: 1, 6

Design: Six replications of mixed species, high density, weeded and unweeded treatments; planted on harsh and moderate sites with snags.

Rationale: Resource availability and microclimate are influenced by physiographic site conditions and by competing vegetation. This experiment will permit differentiation of these two factors as they relate to seedling and species establishment. Snags will introduce additional microsite heterogeneity that will be exploited to differing degrees by different species of planted trees and naturally regenerating vegetation.

Experiment C will be planted in 2004.

Experimental Layout:

Implementation of the three modular experiments will require 56 1.5-ac plots. Where common treatments exist among modules, individual plots will contribute to multiple experimental analyses. Allocation of plots to individual experiments and in terms of specific treatment conditions required are summarized in tables 1 and 2, respectively.

Experimental units will be identified in 2003 and randomly assigned treatments. Plot layout will occur in 2004. Plots used in Experiments A and C are not dependent upon salvage and will be planted in 2004. Plots used in Experiment B are dependent upon the completion of salvage and will be planted in 2005.

Table 1. Allocation of treatments by experiment. Note that acreage and plots totals across experiments will exceed the totals in Table 2 because some of the plots that receive treatments in common will be shared in multiple experiments.

Composition	Density (tpa)	Weeding	Site (aspect)	Salvage	# Plots	Acres (min.)
Experiment A (2004 Planting)						
No planting	0	Not weeded	Southerly	No salvage	5	7.5
Douglas-fir	435	Weeded	Southerly	No salvage	5	7.5
Mixed-sp.	435	Weeded	Southerly	No salvage	5	7.5
Mixed-sp.	435	Not weeded	Southerly	No salvage	5	7.5
Mixed-sp.	190	Weeded	Southerly	No salvage	5	7.5
Mixed-sp.	190	Not weeded	Southerly	No salvage	5	7.5
Experiment B (2005 Planting)						
Mixed-sp.	435	Weeded	Southerly	Salvage	6	9.0
Mixed-sp.	435	Weeded	Southerly	No salvage	6	9.0
Experiment C (2004 Planting)						
Mixed-sp.	435	Not weeded	Southerly	No salvage	6	9.0
Mixed-sp.	435	Weeded	Southerly	No salvage	6	9.0
Mixed-sp.	435	Not weeded	Northerly	No salvage	6	9.0
Mixed-sp.	435	Weeded	Northerly	No salvage	6	9.0

Table 2. Acreage requirement by treatment condition for experiments A-C, combined.

Composition	Density (tpa)	Weeding	Site (aspect)	Salvage	Planting Year	# Plots	Acres (min.)
No planting	0	Not weeded	Southerly	No salvage	2004	5	7.5
Douglas-fir	435	Weeded	Southerly	No salvage	2004	5	7.5
Mixed-sp.	435	Weeded	Southerly	No salvage	2004	6	9.0
Mixed-sp.	435	Not weeded	Southerly	No salvage	2004	6	9.0
Mixed-sp.	190	Weeded	Southerly	No salvage	2004	5	7.5
Mixed-sp.	190	Not weeded	Southerly	No salvage	2004	5	7.5
Mixed-sp.	435	Weeded	Northerly	No salvage	2004	6	9.0
Mixed-sp.	435	Not weeded	Northerly	No salvage	2004	6	9.0
Mixed-sp.	435	Weeded	Southerly	No salvage	2005	6	9.0
Mixed-sp.	435	Weeded	Southerly	Salvage	2005	6	9.0
Total						56	84

Additional Treatment Details

Species mixes will consist of planted seedlings of the conifers Douglas-fir, white fir, sugar pine, ponderosa pine and incense cedar; and hardwoods sprouts, mainly Pacific madrone and chinquapin oak. Douglas-fir will predominate in all settings, comprising up to 40% of the planted seedlings. At elevations in excess of 3500' white fir will be planted (10% of seedlings) and the proportion of Douglas-fir will be decreased to 30%. Sugar pine will constitute 20% of the seedlings at all sites. Ponderosa pine and/or incense cedar will contribute an additional 20% of the seedlings. A hardwood component will be included in the mixed-species plots by retaining a proportion of existing sprouts, principally Pacific madrone, and chinquapin oak. If originating as a clump, hardwood sprouts to be retained will be thinned to a single stem.

Removal of woody vegetation (weeding) on specified treatment plots will be achieved by manual cutting methods. The intent of vegetation removal is to facilitate the establishment of planted seedlings; not to provide for long-term maximum tree growth. Cutting will be done in summer after full leaf-out when root carbohydrate reserves are at a minimum. Vegetation removal treatments will be repeated in years 1, 2 and 4, and if needed in year 6, following salvage. After six years, planted seedlings should be established. Subsequent development of woody sprout and seedling development will be untreated.

Harsh and moderate physiographic sites will be identified based predominantly on aspect (northerly versus southerly), but also with consideration of soils (deep versus skeletal) and slope position (mid versus upper).

Response Variables

Response variables to be measured are listed below and classified as either basic or optional. Variables listed as basic are considered essential to meeting the basic objectives for characterizing stand development in terms of vegetation composition and structure; and in terms of fuels structure and fire hazard. Variables listed as optional represent additional opportunities to address basic questions of ecosystem structure, function, and process that would be considered by the principal investigators if they obtain external funding to do so, or cooperators are identified who are willing to undertake these issues.

Basic

- Plant species richness – species list
- Planted tree survival - by species
- Planted tree growth – height, diameter
- Natural tree regeneration density – by species
- Natural tree regeneration growth – height, diameter
- Woody shrub density – by species
- Woody shrub cover – by species
- Woody shrub height and diameter – by species
- Herbaceous species cover – by species
- Snag height and density – by species and diameter class
- Coarse woody debris abundance – by species and diameter class
- Fuels profiles – biomass by combustion class

Optional

- Non-vascular plant species richness
- Non-vascular plant species abundance
- Planted tree leaf area – by species
- Planted tree biomass – by species
- Woody shrub leaf area – by species
- Woody shrub biomass – by species
- Canopy leaf area
- Canopy biomass
- Soil moisture status
- Soil and air temperature profiles
- Planted tree water relations
- Woody shrub water relations
- Planted tree rooting density
- Woody shrub rooting density
- Soil nutrient status
- Foliage nutrient status

Deliverables

Products of the proposed project for delivery to the BLM will include annual progress reports, including preliminary analysis of all vegetation, CWD, and fuels data as generated in years 1-3, and 5; a detailed report of findings in year 4 (covering years 1-3); and a detailed report of findings in year 6 (covering years 1-5).

In addition to the reports to be delivered to the BLM, it is anticipated that the proposed research will yield 1 or 2 Master's theses, a PhD dissertation, and 4-6 peer-reviewed journal articles in the first 6 years following establishment.

Findings will be presented to BLM personnel and at regional and national meetings as opportunities arise.

Partners, Roles and Responsibilities

USFS PNW – Paul D. Anderson, Principal Investigator

- Primary contact, facilitator and coordinator among primary BLM, OSU, and PNW partners
- Establishment of study including treatment and sampling plot layouts
- Primary collection of first year vegetation data
- Collaborator on vegetation data collection, analysis, interpretation, and reporting in years 2 through 6
- Database management and data quality assurance
- Co-advisor of student researchers
- Facilitation and coordination of potential research collaborators and partners
- Advocacy and solicitation for supplemental funding

OSU – Klaus Puettmann, John Tappeiner, Co-principal Investigators

- Primary collection of vegetation data years 2 through 6
- Collaborators on vegetation data collection, analysis, interpretation, and reporting in years 2 through 6
- Recruitment and principal advising of two graduate student researchers
- Advocacy and solicitation for supplemental funding

US BLM – Butte Falls Resource Area

- Advice on study scope, design and implementation
- Provision of study sites
- Purchase of planting stock
- Planting of experimental plots
- Vegetation control for weeding treatments
- Cutting of snags and removal of woody skeletons
- Facilitation of the long-term integrity of study plots
- Potential collaborator on supplemental data collection or research issues
- Potential collaborator on data interpretation and application of results
- Advocacy for supplemental funding

Project Schedule

This proposal explicitly covers activities through 2009. The timing of specific activities is summarized in Table 3. Progress reports will be written annually. Comprehensive analyses and reporting will be done following the third and fifth years after planting. Research activity beyond the fifth-year following planting is anticipated with intermediate- and long-term objectives to be addressed in future proposals and study plans.

Table 3. Schedule of research activities. Letters A, B and C refer to the corresponding experiments. Shaded cells refer to planned activities beyond the scope of this proposal. Beyond year 10, it is anticipated that data collection will occur at five-to-ten-year intervals throughout stand development.

Activity	'03	'04	'05	'06	'07	'08	'09	'10	'11	'13	'14
Establishment/Maintenance											
Experimental unit selection	A B C										
Plot establishment		A C	B								
Planting		A C	B								
Weeding		A C	A C B	B	A C	B	A C	B			
Data Collection											
Plant species richness		A C	A C B	A C B	B	A C	B	A C	B	A C	B
Planted seedling survival		A C	A C B	A C B	B	A C	B	A C	B	A C	B
Planted seedling ht. & diam.		A C	A C B	A C B	B	A C	B	A C	B	A C	B
Natural seedling density		A C	A C B	A C B	B	A C	B	A C	B	A C	B
Natural seedling ht. & diam.		A C	A C B	A C B	B	A C	B	A C	B	A C	B
Shrub density		A C	A C B	A C B	B	A C	B	A C	B	A C	B
Shrub cover		A C	A C B	A C B	B	A C	B	A C	B	A C	B
Shrub volume		A C	A C B	A C B	B	A C	B	A C	B	A C	B
Herbaceous cover		A C	A C B	A C B	B	A C	B	A C	B	A C	B
Snag density		A C	B	A C B	B	A C	B	A C	B	A C	B
Coarse woody debris		A C	B	A C B	B	A C	B	A C	B	A C	B
Fuels		A C	B	A C B	B	A C	B	A C	B	A C	B
Analysis, Reporting			A C	B	A C	B	A C B				

A – effects of species composition, density, and weed control on vegetation dynamics
B – effect of snag retention on vegetation dynamics
C – effects of edaphic site and weed control on vegetation dynamics
Weeding will be done in mid-summer
Herbaceous data will be collected in summer
Tree, shrub, snag, coarse woody debris and fuels data will be collected in the autumn

Estimated Costs

The total proposal budget request to the BLM for the 6-years of project funding is $415,600. These funds are distributed to OSU and PNW in the amounts of $280.4 K to Oregon State University and $135.2 K to PNW. In addition it is anticipated that the BLM will provide vegetation seedling stock, planting, and vegetation and snag removal funds through their operational management activity budgets estimated to total $40 K.

PNW and OSU in-kind contributions (Prinicipal Investigator salaries and PNW Corvallis laboratory indirect costs) total $96.3 K by PNW and $184.3 K by OSU (64.6 K as reduced overhead rate contribution, 119.7 K as in-kind salary). Respectively, this represents a cost-share of 42% by PNW and 66% by OSU, relative to the proposed funding to be received by the two research institutions.

The proposed budget, summarized annually and for the entire 6-year project is presented in Table 4. Detailed individual budgets for PNW and OSU are also available.

Table 4. Annual and total project cost estimates summarized by research institution assuming measurement of the basic response variables.

	Funding Year						
	FY04	**FY05**	**FY06**	**FY07**	**FY08**	**FY09**	**Overall**
Direct Costs							
Salaries and Benefits							
Oregon State University	$5,760	$23,619	$42,869	$25,038	$25,790	$20,811	$143,888
USFS PNW	$18,598	$6,712	$7,047	$4,431	$7,770	$4,886	$49,443
Research Assistant Tuition/Fees							
Oregon State University	$0	$9,273	$19,789	$10,314	$10,755	$11,495	$61,627
Travel							
Oregon State University	$3,000	$4,000	$7,000	$5,200	$4,000	$2,950	$26,150
USFS PNW	$17,070	$7,686	$7,686	$7,686	$7,686	$7,686	$55,500
Other Direct Costs							
Oregon State University	$0	$2,200	$2,800	$2,200	$1,900	$3,100	$12,200
USFS PNW	$1,500	$1,450	$750	$1,500	$1,450	$1,500	$8,150
Total Direct							
Oregon State University	$8,760	$39,092	$72,458	$42,752	$42,445	$38,357	$243,864
USFS PNW	$37,168	$15,848	$15,483	$13,617	$16,906	$14,072	$113,093
Indirect/Overhead							
Oregon State University	$1,314	$5,864	$10,869	$6,413	$6,367	$5,754	$36,580
USFS PNW	$7,248	$3,090	$3,019	$2,655	$3,297	$2,744	$22,053
TOTAL Request							
Oregon State University	$10,075	$44,956	$83,327	$49,165	$48,812	$44,110	$280,444
USFS PNW	$44,416	$18,938	$18,502	$16,273	$20,202	$16,816	$135,146
Annual Totals	**$54,490**	**$63,894**	**$101,829**	**$65,438**	**$69,014**	**$60,926**	
Project Total							**$415,591**
In-kind Contributions							
Direct Costs							
PI Salary - OSU KP (0.07* FTE)	$4,204	$11,083	$11,686	$12,319	$12,984	$13,682	$65,959
PI Salary – OSU JT (0.10 FTE)	$4,500	$9,270	$9,548	$9,835	$10,130	$10,433	$53,716
PI Salary - PNW PA (0.12 FTE)	$9,840	$10,332	$10,849	$11,391	$11,961	$12,559	$66,931
Indirect Costs							
OSU Overhead Reduction	$2,321	$10,359	$19,201	$11,329	$11,248	$10,165	$64,624
PNW CFSL Charge	$10,660	$4,160	$4,160	$3,120	$4,160	$3,120	$29,380
Annual Totals	**$31,525**	**$45,204**	**$55,444**	**$47,994**	**$50,482**	**$49,959**	
Project Total							**$280,608**

*** For budget year 2003 FTE is 0.04.**

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Appendix C
Salvage PDFs

Salvage Project Design Features

The following Project Design Features (PDF) are included in the design of salvage projects. These PDFs are a compilation of the Best Management Practices identified in the Medford District RMP and resource protection measures identified by the EIS ID Team. The PDFs will serve as a basis for resource protection in the implementation of any salvage actions. Additional PDFs for restoration projects are included in Appendix D.

1. The total number of skid trails will be minimized by designating skid trails with an average of 150' spacing. Avoid creating new skid trails and utilize existing trails where feasible in order to minimize ground disturbance, especially in thinning and selective cut units where no ripping is proposed. Design skid trails to minimize disturbance.
2. Skid trails will be located to minimize disturbance to coarse woody debris (CWD). Where skid roads encounter large CWD, a section of the CWD will be bucked out for equipment access. The remainder of the CWD will be left in place and not disturbed.
3. Tractor and/or mechanical operations will be restricted to slopes generally less than 35 percent.
4. Skid trails will be water-barred during the same operating season as constructed.
5. Ripping of skid trails will occur in all tractor yarded salvage units during the same operational season they were constructed. No ripping will occur within 100 feet of any existing green trees greater than 7″ DBH.
6. All tractor yarding, soil ripping, and excavator piling operations will be limited to the dry season, generally from May 15 to October 15, and/or when soil moisture is less than 25 percent.
7. Areas identified for ripping (skid roads, landings, decommissioned roads) will be ripped to a depth of 18″ utilizing a sub-soiler or winged toothed rippers.
8. Cable yarding will require one-end suspension, full suspension over streams, and no streambank disturbance.
9. Hand water bar corridors in roadside salvage areas above roads where drainage would lead directly to streams.
10. Water bar all yarding corridors within Riparian Reserves.
11. Water bar yarding corridors where needed, as determined by the contract administrator.
12. Along the ridgetops in the FMZs, where large diameter snags are present and salvage logging is proposed to reduce risk, 2 stumps per acre >30" DBH and 30-36" high will be retained, where it can be safely accomplished, to provide habitat for bats on ridges.
13. Activity slash will be lopped and scattered, piled, or burned as necessary to reduce or eliminate additional fuel loading. Piled slash will be burned during the fall and winter to reduce impacts on air quality. All burning will follow the guidelines of the Oregon Smoke Management Plan.
14. Harvest will be restricted from March 1 to September 30 within ¼ mile of known spotted owl sites (within ½ mile for helicopter operations). This restriction may be waived if non-nesting is determined. If any new owls are discovered in harvest units following the sale date, activities will be suspended until mitigation is determined.
15. Harvest will be restricted from March 1 to September 30 within ¼ mile of known spotted owl sites (within ½ mile for helicopter operations) in any unsurveyed green stand determined to be suitable as northern spotted owl nesting habitat. This restriction may be waived if non-nesting is determined.
16. Activities will be restricted from February 1 to August 1 within ½ mile of suitable, unsurveyed peregrine falcon nest cliffs (within 1 mile for helicopter operations).
17. Activities will be restricted from March 1 to August 1 within ¼ mile of newly discovered great gray owl nests or within unsurveyed, suitable great gray owl habitat.
18. Surveys will be conducted prior to any activity that could alter habitat for Survey and Manage mollusk and red tree vole species. Sites will be protected consistent with current management guidelines.

19. Activities will be restricted from March 1 to July 15 within suitable unsurveyed goshawk habitat.

20. Special Status and Survey and Manage vascular plant, lichen, bryophyte, and fungi sites that require protection will be buffered. Buffer sizes will be determined based on species, proposed treatment, site-specific environmental conditions, and management recommendations.

21. Mitigation measures and buffers will be applied as needed, to avoid disturbance to known archeological sites.

22. Cultural resources discovered during project implementation will be reported to the authorized officers and protected until properly evaluated.

23. All road renovation, decommissioning, and/or improvement work will be limited to the dry season, generally from May 15 to October 15, or when soil moisture is less than 25 percent.

24. Dust abatement materials, such as lignin, Mag-Chloride, and/or approved petroleum based dust abatement products, will not be applied 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' of a water body or stream channel).

25. Selected roads will be blocked and barricaded after use and before the beginning of rainy season (generally October 15).

26. When removing a culvert, slopes will be pulled back to the natural slope or at least 1:1.5 to minimize sloughing, erosion, and potential for the stream to undercut streambanks during periods of high streamflows. Stream channels will be restored to bank full width and natural grade.

27. Roads identified for decommissioning will be seeded with native seed and mulched in the same operational season they are decommissioned.

28. Temporary roads constructed for harvest operations will be decommissioned within the same operating season they are constructed.

29. Equipment will be free of weed reproductive plant parts prior to moving into the management area.

30. Divert the stream around the work area in a manner (e.g. pipe or lined ditch) that will minimize stream sedimentation. Contractor will submit a water diversion plan for approval prior to stream work. To reduce movement of sediment downstream from the project site, the use of straw bales, geotextile fabric, or coconut fiber logs/bales immediately downstream of the work area will be required.

31. Location of waste stockpile and borrow sites resulting from road construction or reconstruction will be at least one site potential tree length from a stream where sediment-laden runoff can be confined.

32. Soil disturbed during road work or culvert replacement will be seeded with native grass seed after completion of work, using appropriate native species.

33. Seed, straw, and mulch will be free of weed reproductive plant parts, as per the North American Weed Free Forage Certification Standards.

34. Apply native grass seed on landings and tractor skid trails within 50' of existing roads. Apply native grass seed on all helicopter landings. Use appropriate native species.

35. A Spill Prevention, Control, and Countermeasure Plan (SPCC) will be required prior to operation and will include, but not be limited to, identification of hazardous substances to be used in the project area and identification of purchasers' representatives responsible for supervising initial containment action for releases and subsequent cleanup.

36. Refueling of equipment will take place outside of the Riparian Reserves.

37. All hazardous materials and petroleum products will be stored in durable containers outside Riparian Reserves so that any accidental spills will be contained and not drain into the stream system.

38. Appropriate mitigation measures will be applied to ensure that fluids or hazardous materials from heavy equipment operations do not enter stream channels.

Appendix D
Restoration Projects

Fishery Habitat Enhancement

Project Objectives

To improve habitat complexity and passage on BLM-administered land for salmon and trout, to mitigate any adverse effects from erosion, and to improve shade and future large wood recruitment in the first 160' from the stream.

Desired Future Conditions

Improved passage through culverts; logs almost parallel to the stream; rock weirs and logs to provide spawning gravel retention and rearing habitat; and trees reestablished in the Riparian Reserve to improve shade and future large wood recruitment to the stream.

Project Design Features

Four culverts will be replaced for trout and potential coho passage to open five miles of habitat.

The use of rock weirs will aid in collecting gravels for spawning and create plunge pools for rearing. Rock weirs will vary from 3 weirs per mile to 10 weirs per mile. Up to 40 cubic yards of gravel will be placed above rock weirs where possible.

Where accessible, large wood (20-24" DBH) will be placed almost parallel to the streambank for adult holding cover. Twenty logs per mile will be placed instream. Smaller diameter trees will be taken from Riparian Reserve thinnings and added to the stream where appropriate. As part of the riparian thinning restoration plan, trees 10 to 80 years old will be thinned within 160' of the stream for instream habitat, provided 40 percent canopy cover is retained.

Instream projects will include the use of an excavator. Any temporary skid trails needed to access the stream will be water-barred and seeded. The excavator will make a 12-foot wide path from the road to the stream, with no more than 10 passes on the path. No blading on the path will occur. Other resources in conflict with the designated sites will be mitigated with buffers. Equipment will avoid archeological and botanical sites. West Branch Elk Creek will include existing logs from the fire with little supplementation of off-site logs needed.

Late-Successional Forest Habitat Restoration

Project Objectives

Accelerate the growth of trees in stands to promote late-successional conditions with a variety of size classes. Maintain species diversity to promote connectivity between owl activity sites and develop late-successional forest characteristics.

Desired Future Conditions

Suitable spotted owl habitat for nesting, roosting, and foraging composed of mature timber stands. Stands contain large conifers (21" DBH or greater), multi-layered structure, and 60 percent or greater canopy closure (USDA and USDI 2001, I-2, 3). Understory should be open between shrub layer and mid-canopy for flight paths. Nest sites include cavities 50 or more feet above the ground in large decadent old growth conifers, large mistletoe clumps, old raptor nests, and platforms formed by whorls of large branches.

Project Design Features

Stands of trees less than 8" DBH (10-29 years old) will be pre-commercially thinned (PCT) to accelerate the growth of reserve trees. Stands of trees greater than 8" DBH (30-80 years old) will be commercially thinned to increase growth on residual trees, retain and promote large branches on select trees, promote the development of variable tree sizes in the residual stand, and retain the variety of species present.

Condition 1: Young conifer plantations generally 10 to 30 years old.

These stands are comprised of conifers of similar size. Conifers will be thinned to a spacing range of 12-15' to increase growth rates, yet allow for crown closure within 10-20 years. This will promote natural shading, mortality, and removal of lower limbs. Retain unthinned patches up to ½ acre in size for every 10 acres thinned. Retain up to 25 percent canopy component in hardwoods. Retain up to 25 trees per acre and remove all surrounding vegetation for approximately 5' beyond the dripline. This will increase growth rates and retain limbs to allow for future large branches as these trees mature and become dominant in the overstory. Slash from operations will be piled and burned.

Condition 2: Young stands with mixed age and size classes, scattered overstory conifers.

These stands also have variable densities of conifers and hardwoods. In areas where predominant conifer size is less than 3" DBH, thin to a spacing of 12-15'. Areas where the predominant conifer size is 3-8" DBH, thin to a spacing of 15-20'. Retain unthinnned patches up to ½ acre in size for every 10 acres thinned. Retain hardwood trees unless they constitute greater than 25 percent of the canopy. Reduce hardwood component to 25 percent of canopy in stand being treated. Pile and burn slash from operations.

Condition 3: Stands dominated by conifers in age classes from 30 to 80 years old.

Conifer and hardwood densities and size classes are variable. Stands will be thinned to a basal area range of 120-140 feet per acre of total overstory basal area, retaining a minimum of 50 percent canopy closure in stand. Retain unthinnned patches up to ½ acre in size for every 10 acres thinned. Retain up to 25 percent of canopy component in hardwoods. Reserve trees will be a mix of species present. Variable spacing and reserving both dominant and codominant tree sizes is preferred over even-spacing and even-size distribution of reserve trees. Pile and burn slash from operations.

Pine Habitat Restoration

Project Objectives

Promote pine species regeneration in areas historically inhabited by pines, retaining existing dominant pine in the overstory. Promote pine dominance in stands historically dominated by pines but presently dominated by Douglas-fir and other species.

Desired Future Conditions

Ponderosa and sugar pines dominant in the overstory up to 23 trees per acre (tpa) with a codominant component of pines (<20" DBH) up to 40 tpa. An understory of conifers dominated by pines (<12" DBH) with less than 80 tpa (USDA and USDI 1998, 179). Mix of conifers in the overstory, including Douglas-fir and incense cedar and a component of hardwoods in mid-canopy and understory including madrone and chinquapin.

Project Design Features

Stands with ponderosa or sugar pine present in overstory or understory, or historic presence of pine in overstory will be thinned to promote pine retention and growth. Large overstory pines will have non-pine vegetation in understory removed to promote pine regeneration. Stands with pine less than 80 years old will be thinned to retain pine and promote growth of existing pine in stand.

- **Stands with large (>20" DBH and >80 years old) overstory ponderosa or sugar pines present.**

  In areas where pine are not present in the understory, clear around large (>24" DBH) overstory pines for up to 20' beyond dripline to promote pine regeneration. Trees up to 24" may be removed (USDA and USDI 1998, 165). When large overstory trees are within 50' of each other, only one of those trees will receive understory clearing.

  Beyond the clearing area, pre-commercial thin (14-20 foot spacing) understory stands (<8" DBH) presently consisting of Douglas-fir, white fir, incense cedar, ponderosa and sugar pine, madrone, and chinquapin to favor dominance of pine species as residual stand.

  Beyond the clearing area, commercial thin understory stands (>8" DBH) retaining 100-180 square feet of total basal area retaining the same species preference for pine. Only trees less than 80 years old will be removed. These would generally be less than 18" DBH.

- **Stands with sugar and ponderosa pines present in overstory predominantly less than 18" DBH (30-80 years old).**

  Commercial thin these stands favoring all healthy pines for reserve trees retaining 100-180 square feet of total basal area (USDA and USDI 1998, 190).

- **Young stands less than 8" DBH with pine present and without pine in the overstory, but with historic presence of pine in the overstory.**

  Pre-commercial thin (14-20 foot spacing) stands presently consisting of Douglas-fir, white fir, incense cedar, ponderosa and sugar pine, madrone, and chinquapin to favor dominance of pine species as residual stand. Retain

unthinnned patches up to ½ acre in size for every 10 acres thinned

Introduce prescribed fire into the understory after reducing initial fuel loadings through piling and burning of piles.

Riparian Reserve Thinning

Project Objectives

Improve the habitat and functioning of Riparian Reserves for late-successional dependent terrestrial and aquatic organisms. Accelerate the growth rates and size variability of residual trees in the existing stands and maintain species diversity.

Desired Future Conditions

Functioning riparian area that allows for late-successional species movement and stream protection, and maintains species composition and characteristics needed to attain Aquatic Conservation Strategy. Attain 75 percent late seral vegetation in riparian areas. Riparian vegetation would be dominated by large (>24" DBH) conifers with a diverse species composition including riparian hardwoods and mixed conifer species. Conifer species of preference would be Douglas-fir, incense cedar, and pacific yew, with western hemlock and white fir in the upper elevations (above 3,500') and ponderosa and sugar pines in the lower elevations (below 3,000'), particularly on south exposures. Hardwood species to favor include alder, big leaf maple, and Oregon ash. Canopy closures would generally be greater than 70 percent. The stand would be able to supply amounts and distributions of coarse woody debris sufficient to sustain physical stability and complexity (USDI 1995, 22).

Project Design Features

Stands of trees less than 8" DBH (10-30 years old) within Riparian Reserves will be pre-commercially thinned to accelerate the growth of residual trees. Retain unthinnned patches up to ½ acre in size for every 10 acres thinned. Stands of trees greater than 8" DBH (30-80 years old) will have up to 12 dominant tpa selected. Competing trees with crowns touching will be felled or girdled. This will be done to increase growth of residual trees, promote large branches on select trees, and develop the recruitment of large woody material for streams. Felling and girdling will occur on trees less than 20" DBH. Thinning will be performed on an irregular spacing with reserve trees selected to aid in the development of future stand characteristics such as variable spacing, multistory canopies, large limbs, and canopy gaps (USFS 2000). Pile and burn slash from treatments in stands <8" DBH. Leave a no-cut buffer zone 50' from streams containing coho salmon and 30' from all other streams.

Oak Woodland and Meadow Restoration

Project Objectives

Maintain or enhance oak woodland and meadow values for wildlife, range, plants, and biological diversity. Protect and improve special habitats within the Elk Creek Watershed.

Desired Future Conditions

Oak woodlands in an open condition that favors large oaks and pines and a diversity of native grasses, forbs, and shrubs and also provides for future regeneration of oaks and pines. Meadows would be in an open condition with healthy native grasses and forbs.

Project Design Features

Management activities could include manually thinning small-diameter white oak; removing competing conifers; clearing around large, healthy pine; manually cutting, piling, and burning older brush patches; and applying frequent low-intensity prescribed fire. Meadow openings will be maintained by removing Douglas-fir and incense cedar from around the edges of meadows.

Inside the fire perimeter, sites will be monitored and treatment applied when vegetative conditions warrant (in 5-15 years). Those conditions are:

- Numerous small conifer seedlings reappearing on a site.
- Large amounts of brush seedlings reoccupying the site.
- Oak resprouting or oak seedlings reoccupying the site.

Outside the fire perimeter, site-specific treatment will include the following:

- Manually thinning small-diameter white oak.
- Manually thinning small competing conifers.
- Clearing around large, healthy pine.
- Manually cutting, piling and burning older brush patches.
- Applying low-intensity fire.
- Stagger treatments over several years so areas are treated at different times and oak woodlands are in different successional stages across the landscape. Treatments will not begin until at least 2004.

Prescribed fire will be applied under conditions when a low intensity, short-duration fire would occur. Flame-length will average 3 feet or less. Fires will need to be prescribed while reestablishing vegetation is small enough to be susceptible to the low flame lengths. Some manual slashing of woody vegetation may be required prior to burning in order to meet resource objectives.

Reforestation

Project Objectives

Reforest areas that supported forest vegetation before the fire. Plant areas with species representative of the plant series existing in those forest stands. Place a stand on a pathway toward a mixed conifer forest that can, more quickly, obtain the attributes of a late-successional forest than would occur naturally.

Desired Future Conditions

Mixed conifer stands at age 20 with a minimum of 70 percent canopy closure and a hardwood component of up to 25 percent of canopy. Retain a residual level of remnant overstory trees, snags, and coarse woody debris as described in stand advisories for late-successional habitat or the LSRA. This is an interim stage. The final condition for stands in this watershed is described in the proposed Late-Successional Forest Habitat Restoration project.

Project Design Features

Areas burned at high or moderate severity levels will be planted with tree seedlings to a species mix consistent with those species present in those locations before the fire. Priority for planting will be in past plantations, areas with slopes greater than 65 percent, riparian areas, and remaining areas of high or moderate burn intensity, including spotted owl activity centers.

Reforestation Research Project

Project Objectives

To evaluate mixed-species reforestation plantings, to identify and characterize temporal patterns of vegetation structural development and species diversity, to assess temporal dynamics of fuels loading and fire risk, and to determine impacts of snag retention on survival and growth of planted trees.

For the initial phases of stand development, there are six specific research objectives to determine the effects of:

1. snag retention on the survival and establishment of planted seedlings by species,
2. planted seedling versus natural regeneration on tree survival and growth,
3. monoculture versus mixed-species plantings on planted seedling survival and growth,
4. planting density on survival and growth of planted seedlings by species, and site occupancy by planted and naturally regenerating trees, shrubs, and herbs,
5. weed control on planted seedling establishment and growth of trees, shrubs, and herbs, and
6. physiographic site conditions on planted seedling survival and growth of trees, shrubs, and herbs

Desired Future Conditions

Forest stands having a high degree of species and structural diversity (relative to monospecific plantations) in which Douglas-fir, white fir, and incense cedar contribute to the main overstory canopy as codominants; dispersed sugar pine and ponderosa pine having complex canopy structure and large diameter stems and branches as dominants; and sub-canopy hardwood trees providing structural continuity between understory shrubs and the overstory.

Project Design Features

This planting is a research project designed to provide a rigorous basis for evaluating the efficacy of snag retention,

mixed-species plantings, variable planting density, and woody vegetation removal as means for regulating the development of biologically and structurally complex forest stands, and for varying the temporal dynamics of fuels profiles and fire risk.

Six species composition, planting density, and vegetation removal treatments (weeding) would be established:
1. Unplanted, woody vegetation not removed
2. Douglas-fir, planted at 435 tpa, woody vegetation removed
3. Mixed species planting, 435 tpa, woody vegetation removed
4. Mixed species planting, 435 tpa, woody vegetation not removed
5. Mixed species planting, 190 tpa, woody vegetation removed
6. Mixed species planting, 190 tpa, woody vegetation not removed

Woody vegetation removal on designated treatment plots will be completed manually prior to planting, in year 1 and in year 3; and in year 5 if necessary, following planting.

Species mixes will consist of the following:
- Sites 3500'+ elevation – Douglas-fir, 20%; White fir, 20%; sugar pine, 20%; incense cedar and ponderosa pine, 20%; hardwood sprouts (Pacific madrone and/or chinquapin oak) 20%.
- Sites <3500' elevation – Douglas-fir, 40%; sugar pine, 20%; incense cedar and ponderosa pine, 20%; hardwood sprouts (Pacific madrone and/or chinquapin oak) 20%.

Where specified, hardwood densities will be obtained by retaining hardwood sprouts, thinned to a single stem per clump, at the 20 percent proportion prescribed.

The treatments will be implemented on both unsalvaged and salvaged sites to evaluate effect of residual snags as microsite modifiers on seedling establishment. Some treatments will be replicated on moderate and harsh planting sites as defined predominantly by aspect (northerly vs. southerly), but also taking into account soil depth (shallow vs. deep) and slope position (mid vs. upper).

A total of 56, 1.5-acre plots will be established and allocated by treatment condition as outlined in Table B-7 below.

Plots will be located, planted and treated in FY04 following salvage. Vegetation monitoring measurements (trees, shrubs, herbaceous) and fuels evaluations will be made in years 1, 2, 3, and 5 following planting. Annual reports will be delivered to the BLM with additional in-depth summaries and interpretations after the third and fifth growing seasons.

It is anticipated that these plots will be maintained and monitored for several decades to achieve project objectives. Beyond the fifth year, sampling frequency and reporting will be dictated by observed vegetation dynamics, continued BLM interest and support, and funding availability.

Fuel Management Zone (FMZ)

Project Objectives

Create FMZs to assist in future wildfire suppression activities, to provide for firefighter safety, and to provide anchor points for control lines. To meet the LSRA recommendation for breaking the watershed into 5,000- to 7,000-acre blocks. Construction of FMZs would also meet intent of National Fire Plan by providing protection to Communities at Risk and Wildland Urban Interface areas.

Desired Future Conditions

A series of FMZs on the ridgelines, on the perimeter and within the LSR. Anchor points for fire lines, burnout operations, and possible safety zones for firefighters. LSR divided by FMZs into blocks of 5,000- to 7,000-acres to reduce future fire size.

Project Design Features

Within the burn perimeter, stand-replacement areas less than 10 acres will be salvaged to reduce fuel loadings and reduce spotting potential. Proposed units will be located within an identified FMZ and cover between 50-70 acres. A target of six snags per acre will be left standing on or near the ridge top. The preferred leave snags would be the shorter snags. The understory vegetation will be cut, piled, and burned.

In FMZs proposed in the unburned portion of the watershed, the understory conifers and hardwoods will be thinned and slash will be hand-piled. Hand-cutting, hand-piling, and burning of brush will occur. The majority of the conifers cut will be 6" DBH and less. In some cases, small diameter commercial conifers will be cut and removed as needed to reduce crown bulk density to a level that will not perpetuate crown fires. After ladder fuel loadings are reduced, an underburn will be conducted to further reduce ground fuels. This treatment will occur two to five years after the initial entry. A second underburn will occur 10-15 years later. At that time, initial treatment will be finished and any further treatments will be considered maintenance.

Removal of brush and sub-merchantable timber will be accomplished through hazardous fuel reductions contracts. Merchantable timber will be removed through a timber sale contract, where feasible. Approximately 35 acres located in T33S, R1W, Sections 14 and 15 will be proposed for commercial thinning.

The West Branch Fire of 1972, located in T32S, R2W, was reforested and pre-commercially thinned. This area burned again in the Timbered Rock Fire. Stand diameters range from 3-8 inches. Young conifers in this area killed in the Timbered Rock Fire will be cut, piled, and burned. This will aid in reforestation efforts and reduce fuel loads to help reduce future fire severity.

Owl Activity Center Underburns

Project Objectives

The short-term objective is to reintroduce fire to maintain existing reduced fuel loadings and current fuel profiles created by the Timbered Rock Fire, and to simulate the historic natural disturbance process. The long-term objective is to increase the resiliency of sites during future high intensity fire events by reducing fire severity while maintaining owl habitat in late-successional forest conditions.

Desired Future Conditions

Multi-storied stands with low ground fuel loadings. These stands would have a break in the ladder fuels from the ground to the overstory canopy layer.

Project Design Features

This action will capitalize on the natural fuel reduction created by the Timbered Rock Fire. Underburning will occur when fuel moistures for the larger, 6-inch or greater (1000-hour) fuels are at a level too moist for total consumption. The primary carrier of the prescribed fire is the 0 to 3-inch (1- to 100-hour) fuels, litter layer, and any small brush the fire will consume. These treatments will occur on a limited scale to demonstrate effectiveness and ability to meet prescription requirements. The units will be configured using logical topographic breaks and may include all or portions of the owl activity centers and some adjacent areas. In addition, some burning outside the activity centers will be proposed using logical topographic breaks. Burning will occur outside of nesting season.

Initial entry will be in the next 2-3 years or later, if site conditions warrant. The need for follow up treatments will be evaluated and treatment proposed when fuel buildups approach the mid- to high-range of Fuel Model 11, or prior to reaching the mid-range of Fuel Model 10 (see Appendix M, FEIS for fuel model descriptions). The second treatment will occur in 5-10 years and further treatments will occur in the 10- to 20-year range. All treatments will be based on actual conditions and time frames are approximate. Seasonal restrictions will be implemented to avoid disturbing spotted owl nesting activities.

Eagle Nesting Habitat Enhancement

Project Objectives

To promote growth and future development of large overstory trees into trees with large limbs or broken tops suitable for nesting eagles.

Desired Future Conditions

Scattered individuals and groups of large overstory ponderosa pine, sugar pine, and Douglas-fir trees with large limbs suitable for supporting eagle nests and with openings between branching whorls. The trees would have an open or broken canopy or would be located near the edge of the stand so the eagles would have an unrestricted flyway. Tall perch trees would be present at the edges of the stand. These nest stands would be located on the ridge between Lost Creek Lake and Elk Creek.

Project Design Features

Younger stands will be treated to promote growth of large overstory ponderosa pine, sugar pine, and Douglas-fir with large boles and thick limbs, strong enough to support the large stick nests built by bald eagles and golden eagles. Smaller trees around the meadow edges will be thinned. A residual conifer spacing of 12-20' will be implemented in stands less than 30 years old to promote the development of large trees with the desired habitat attributes, such as large limbs and whorls.

Stands with existing large overstory trees, treatments will improve the vigor of large overstory sugar pine, ponderosa pine, and Douglas-fir. Removing competing vegetation around selected trees will increase resistance to mortality from fire. Vegetation will be removed around the reserved large trees by clearing 10-15' out from the drip line of the pine. Codominant trees with crowns touching the selected trees will be removed unless the removal would harm reserve trees. Projects will be coordinated with proposed fuel management projects.

Two areas will be treated:

- T33S, R1E, Section 15 - Around the meadows in the north central part of the section and the NWSW part of the section. The project will occur along the west side of the meadow and extend 300 feet into the stand. Two areas extend outside the project boundary into the Lost Creek Watershed; approximately 200 feet in one area and 100 feet in the second area.
- T33S, R1E, Section 21 - Located within a proposed pine restoration project area. The project will occur along the north and west edge and extend 300 feet into the stand.

Maintain or Create Log Piles for Wildlife Habitat

Project Objectives

To provide denning/hiding/resting/foraging/escape sites for animals, including larger mammals such as American martin, fisher, bobcat, cougar, and bear.

Desired Future Conditions

Scattered piles of large wood with spaces to provide denning, hiding, resting, foraging, or escape sites for animals, including larger mammals such as American martin, fisher, bobcat, cougar, and bear.

Project Design Features

During salvage operations, piles of fallen logs will be left in the selected areas where trees were cut to clear the right-of-way for the Pacific Power powerline in T32S, R1E, Section 5. Selected piles will be located near the east and west borders of section and one in the middle, away from the road.

Three additional piles of larger wood will be left between West Branch Elk Creek and Flat Creek. These will be at or near the end of a road that will be closed either with a permanent block, earthen berm, or gate. This will be completed as part of the roadside salvage. Piles will be located in areas where roads identified for decommissioning are closed to traffic.

Piles should be approximately 20' x 20' and 4-6' high and provide space to allow animals access within the piles. Larger logs (>16" DBH) will be stacked in a loose, crisscross/haphazard pile in a way that will create spaces beneath the wood. The logs could be smaller lengths, broken tops, and boles large enough to stack with spaces between.

Logs will be obtained from salvage operations. Broken parts and whole logs will be hauled to location and piled. Piles should be located in the largest accumulation of trees. Pile locations can be moved to a different site if adjacent land owners object to specific road closures, or if there are inadequate snags in the area near the selected location.

Road Reconstruction

Project Objectives

Stabilize roads to reduce the risk of road failure.

Desired Future Conditions

Roads in a stable condition with a low risk of failure.

Project Design Features

Drainage structures, such as culverts and armored drain dips, will be added to reduce the chance of the road becoming saturated by water and failing. Unstable material will be removed from shoulders of roads and large rocks will be placed on the face to armor the surface and hold the fill in place. It is anticipated there will be a greater need for maintenance on roads within the fire area over the next few years.

Road Stream-Crossing Upgrades

Project Objectives

Reduce the risk of road damage from debris torrents plugging culverts and diverting stream flows down roads.

Desired Future Conditions

Road fills constructed of rock, rather than mixed soil and rock fills at stream crossings in high risk locations. Road segments below the pipe would be protected from water or debris torrents diverting from the channel and eroding a gully in the roadbed.

Project Design Features

Road fills constructed out of soil and rock fill material at high risk stream crossings will be replaced with rock fills. These fills will be designed with a dip over the culvert to keep the stream flow in the channel in case the culvert plugs. Culverts will be upsized to pass 100-year storm events and allow movement of water, gravels, and debris through the culvert.

Road Maintenance

Project Objectives

To restore or improve road segments identified in the Transportation Management Objectives (TMO) process to the desired standard.

Desired Future Conditions

To maintain road access through BLM-administered lands while minimizing erosion and sedimentation from these roads and protecting water quality.

Project Design Features

Roads will be maintained and improved, as needed. Maintenance may include: blading and shaping the road surface, adding rock to the road surface, brushing the roadsides, cleaning the ditches, cleaning culvert catch basins, cleaning or replacing culverts, and adding drainage structures such as culverts and drain dips

Road Decommissioning

Project Objectives

To reduce the road density in the Key Watershed by decommissioning road segments identified in the TMO process. In addition, identify road segments for closure to reduce wildlife harassment, degradation to the road surface, and trash dumping.

Desired Future Conditions

Appropriate access to provide for administrative needs and public use. Most roads out of the riparian areas, and few with native surfaces. Access across public lands through reciprocal rights agreements will be maintained.

Project Design Features

Roads will be decommissioned or closed as identified from the TMO process.

Seasonal Road Closures

Project Objectives

Reduce damage to road surface during the wet season and protect sensitive fish species from surface road erosion; protect wildlife from poaching and harassment; and reduce trash dumping.

Desired Future Conditions

Year-round vehicle access would be restricted to mainline roads. Secondary and non-surfaced roads would be seasonally closed to motorized vehicles from mid-October through April 30. Only foot and non-motorized traffic would be allowed on closed roads during the wet season. All roads would be available for motorized vehicle traffic (unless fire restrictions are in place) from May 1 through mid-October. Roads would remain open to administrative access for landowners, BLM employees, and BLM contractors and permittees.

Project Design Features

Roads will be seasonally closed to motor vehicles from mid-October through April 30. Roads across private lands may or may not be closed by the landowner.

Pump Chance Restoration

Project Objectives

To restore existing pump chances and helicopter dip ponds for future fire suppression needs.

Desired Future Conditions

To have pump chances and helicopter dip ponds that will hold adequate pools of water, about 500 gallons, to be used primarily for initial attack fire suppression.

Project Design Features

Restoration work will include cleaning pump chance pools by excavating gravels, soil, and vegetation that have built up. Excavated materials will be moved to an appropriate disposal site. Water inlets and outlets will be cleaned or repaired and rock will be added to access ramps as needed. Access ramps will have an adequate rock surface and be brushed to accommodate up to 4,000 gallon water tenders. Cascade Frogs will be protected by a seasonal restriction with no restoration occurring from mid-March to August 31.

Rock Quarry Closure and Rehabilitation

Project Objectives

To close and rehabilitate rock quarries where the usable rock has been depleted and to minimize erosion from steep side slopes and lack of vegetation.

Desired Future Conditions

Abandoned rock quarries with vegetation growing in them and blended into the landscape.

Project Design Features

Rock quarries that are no longer viable will have benches sloped, soil imported (if necessary), and vegetation planted. Any oversized or usable material will be stored at the quarry or moved to another location where it will be stored until needed.

Appendix E
Monitoring Plan

Monitoring Plan

Monitoring is the process of collecting information to evaluate if objectives and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned. Three types of monitoring are considered in this monitoring plan: implementation, effectiveness and validation monitoring. Monitoring will provide information to determine if the standards and guidelines for a Late-Successional Reserve are being followed (implementation monitoring), verify if projects are achieving the desired results (effectiveness monitoring), and determine if underlying assumptions are sound (validation monitoring).

Along with the monitoring proposed in this plan additional monitoring would occur in accordance with the Medford District RMP Monitoring Plan (Appendix L) and the Monitoring and Evaluation Plan described in the NFP ROD (E 1-12).

Implementation Monitoring

Implementation monitoring ensures that decisions implemented comply with the appropriate decision document.

Implementation compliance generally answers the following questions:
a. Are actions being implemented in accordance with BLM's decision document(s)?
b. What, if anything, is preventing or impeding implementation in accordance with the decision?
c. Are priorities, if any, specified in the decision being followed?

Projects implemented would be monitored to assure compliance with the project design features (PDFs) as described in this EIS. They would also be monitored for consistency with Standards and Guidelines for Late-Successional Reserves as described in the RMP and NFP and with the South Cascades Late-Successional Reserve Assessment (LSRA). The LSR work group reviewed the proposed actions and found them to be consistent with objectives for managing LSRs.

NEPA requires some level of implementation monitoring be completed to ensure compliance with the decision. The following implementation monitoring is proposed for the proposed projects.

All Projects

Goals

- To confirm all contracts include project design features ensuring the project decision is implemented.
- To ensure all contracts are being implemented in accordance with their design and the project decision.

Objectives

- To review draft contract specifications prior to advertisement.
- To ensure provisions to safeguard the environment and public safety are being adhered to through contract monitoring.

Assumption

Implementation of decision and project design features would achieve results identified in EIS.

Purpose

- Determine if projects follow direction in decision.

Unit of Measure

- Review of contracts prior to advertisement.
- Written documentation of contract inspections.

Threshold

All PDFs are included in the contracts and implemented as designed.

Frequency of Monitoring

- Prior to each contract being advertised/negotiated.
- Daily/weekly inspections during operating time.

Estimated Annual Costs

- $40,000

Management Responsibility

- Team Leads or Project Lead
- Contract Administrators

Oak Woodland Restoration Projects

Goal

- To provide variation in successional stage development of the Oak Woodlands in the watershed.

Objectives

- To stagger implementation of oak woodland restoration projects.

Assumption

- Staggered implementation of oak woodland restoration projects will provide variation in successional stage development.
- Prior to implementation, all appropriate surveys have been completed and NEPA adequacy has been determined.

Purpose

- Determine when oak woodland restoration projects will be implemented.

Unit of Measure

- Percentage of total acres treated and in early successional stage.

Threshold

- One-third acres treated every five years.

Frequency of Monitoring

- Field visits every 3-5 years to determine which units are priorities for treatment. Selection of units would be based on density of shrubs and oaks, Douglas-fir, and incense cedar less than 8 inches in diameter.

Estimated Annual Costs

- $5,000 every 3 to 5 years

Management Responsibility

- Botanist
- Contracting Specialist

Fuels Management

Goal

- To monitor fuel build-up in FMZs and treated owl activity centers to determine when follow-up or maintenance treatments are needed.

Objectives

- To assist future wildfire suppression activities by maintaining FMZs.
- To maintain owl habitat in late-successional conditions by increasing resiliency of owl activity centers during future high intensity fire events through reduced fuel loadings.

Assumption

- Maintaining FMZs will provide anchor points for fire lines and burnout operations, and act as possible safety zones for firefighters.
- Maintaining reduced fuel loading in owl activity centers will increase resiliency of these sites during future high intensity fire events.

Purpose

- Determine when follow-up or maintenance treatments need to be implemented.

Unit of Measure

- Height to live canopy in feet used to determine crown fire potential. Fuel loadings by tonnage and size class or species composition will be used to determine changes in fuel models.

Threshold

- Threshold for canopy fire shall be reached when height to live crown is reduced (by regrowth of understory vegetation) to point where natural ground fuels will produce flame lengths and heat enough to initiate crown fire under typical summer weather conditions. Threshold for ground or live fuels will be reached when fuel loadings fall into the following fuel models: Timber 10, 11, and 12; Grass 3; Brush 4 and 5

Frequency of Monitoring

- 3-7 years post treatment depending on vegetation types: grasses at the shorter end of the scale and woody fuels at the longer end of the scale

Estimated Annual Costs

- $2000

Management Responsibility

- Fuels Specialist
- Wildlife Biologist
- Contracting Specialist

Reforestation

Goal

- To maintain desired stocking levels as described in the EIS.

Objectives

- To monitor stocking levels in reforested areas to determine if replanting or vegetation control is needed.

Assumption

- Replanting will occur when stocking falls below 100 conifer trees per acre

- Competing brush would be removed around all seedlings, if stocking is <250 trees per acre, and around ½ the seedlings, if stocking is >250 trees per acre.

Purpose

- Determine if replanting and vegetation control is needed.

Unit of Measure

- Trees per acre
- Density of brush competition

Threshold

- Replant if stocking falls below 100 trees per acre.
- Brush around all trees, if stocking falls below 250 trees per acre, and around ½ the trees if stocking is above 250 trees per acre.

Frequency of Monitoring

- Surveys at Years 1, 3, and 5

Estimated Annual Costs

- $20,000 each year the surveys are conducted.

Management Responsibility

- Silviculturalist
- Contracting Specialist

Effectiveness Monitoring

Effectiveness monitoring measures the effectiveness or success of decisions. It determines if decisions are achieving intended environmental objectives.

Effectiveness monitoring generally answers the following questions:
a. Are the intended environmental objectives or management prescriptions still correct or valid?
b. Are the terms, conditions, and mitigation measures still needed to achieve environmental objectives?

Effectiveness monitoring will continue existing monitoring in the Elk Creek Watershed including: water temperature, northern spotted owl, and neotropical bird monitoring. Additionally, monitoring of salvage effects on erosion, bank loss, and sedimentation will occur along with monitoring described in the Water Quality Restoration Plan. Monitoring of effectiveness is not required under NEPA. Completion of the proposed effectiveness monitoring is dependent on availability of funding and personnel.

Soils

Goals

- To assess salvage-caused erosion, bank loss, and sedimentation.
- To evaluate mass wasting along roads.
- To assess upland mass wasting.

Objectives

- To survey changes in stream bank conditions due to salvage.
- To initiate mitigation measures, as needed.
- To monitor erosion along roads to evaluate and adjust road restoration plans.
- To validate mass wasting analyses along uplands.

Assumption

Most sediment comes from stream bank erosion (Gartner 2002).

Purpose

- Determine if post-fire salvage increases bank erosion.
- Determine if Project Design Features (PDF) adequately prevent detrimental soil disturbance.
- Compare sedimentation rates of private vs. public salvage, relative to control.
- Determine if fire has a substantial effect on the incidence of mass wasting along roads and adjust road restoration priorities.
- Evaluate the effects of fire on upland mass wasting.

Unit of Measure

- Turbidity (conducted daily by the United States Geological Survey [USGS] on Elk Creek).
- Direct observation of salvage operations.
- Paired-basin sedimentation study (conducted by Oregon State University).
- Number and volume (cubic yard) of landslides along roads.
- Number of upland landslides.

Threshold

- Measurable increase in turbidity.

Frequency of Monitoring

- Continual daily monitoring of turbidity by USGS; summarized yearly for 5 years.
- Direct observation of salvage operations when salvage is occurring.
- Two-year study conducted by Oregon State University.
- Annual monitoring for 3 years of landslides along roads and in uplands.

Estimated Annual Costs

- $1,000 (daily turbidity monitoring).
- No additional costs (salvage operations).
- Funding requested through Oregon State University grant; no additional costs for the BLM (study).
- $2,000 (landslides along roads).
- $2,000 (upland landslides).

Management Responsibility

- Soil Scientist and/or Hydrologist (daily turbidity monitoring)
- Sale Administrator (salvage operations)
- Oregon State University (study)
- Area engineers (landslides along roads)
- Soil Scientist/Hydrologist (upland landslides)

Water Quality (see Water Quality Restoration Plan, Appendix I, FEIS)

Goal

- To assess the capability of streams to withstand 30-year interval storm events.
- To measure temperature changes in water quality limited streams.

Objectives

- To monitor the recovery of riparian areas, stream channels, and aquatic habitat.
- To monitor long-term temperature recovery, better understand the natural variability, and track potential project effects.

Assumption

- Adequate vegetation channel form and large woody debris will dissipate stream energy associated with high water flows.
- Passive and active restoration will affect stream temperature by altering shade, channel form, and stream flow.

Purpose

- To monitor vegetation/shade development over streams
- To monitor sedimentation resulting from roads (see soils)
- To monitor proper stream drainage and routing.

Unit of Measure

- Aerial photo interpretation, field checking of riparian vegetation.
- Miles of road decommissioned, improved, renovated, or maintained

Threshold

- Properly Functioning Condition (PFC) of streams.

Frequency of Monitoring

- Review select reaches every 5-10 years.
- Complete PFC surveys for select streams.
- Review yearly road work.

Estimated Annual Costs

- $5,000

Management Responsibility

- Hydrologist

Neotropical and Resident Land Birds

Goal

- To determine if there is a change in bird species present in the watershed over time.
- To track changes in species detected in the watershed as the forest recovers from the fire and as actions proceed.

Objectives

- To maintain a list of species present within the watershed.

Assumption

- Bird species present in the watershed will change over time as the forest recovers from the fire.

Purpose of Monitoring

- To monitor the bird species present in the watershed.

Unit of Measure

- Number of routes in the watershed (1)

Frequency of Monitoring

- Repeat in 5 years

Estimated Costs

- $2000 (cost of survey - 3 visits)

Management Responsibility

- Wildlife biologist

Spotted Owl

Goal

- To continue monitoring of historic owl sites within and adjacent to the burn area.

Objectives

- To monitor owl demographic performance as a measure of recovery of suitable owl habitat as an indicator of quality of late seral/old growth (LSOG) condition.
- To monitor contract seasonal restriction dates to minimize human disturbance during the nesting season.
- To monitor whether restoration projects benefit or harm owl demographic performance.

Assumption

- More spotted owl pairs will be present and producing young as LSOG condition improves.

Purpose

- To determine if owls are still present, or are recolonizing abandoned sites, and are they producing young.
- Are mitigating measures such as seasonal restrictions being followed, that enhance the potential for owl breeding.

Unit of Measure

- Number of historic owl sites monitored for occupancy and productivity.

Threshold

A minimum of 15 historic sites will be monitored. Pre-burn, there were 13 active and 5 inactive sites within the burn, and another 5 active adjacent to the burn.

Frequency of Monitoring

- Sites will be checked annually for five years, from 2003 through 2007.
- Vacant sites will be surveyed three times a year to demonstrate non-occupancy.
- Owls detected will be color banded to enable monitoring of individuals over time, without having to recapture them annually.
- Fieldwork would occur in April through August, with an annual summary report completed by December 1.

Estimated Annual Costs

- $12,000

Management Responsibility

- Wildlife biologist

Validation Monitoring

Validation monitoring evaluates the validity of a decision. It can be used to determine if a decision continues to be the correct or appropriate decision over time.

Validation monitoring typically answers the following questions:
a. Are the intended environmental objectives or management prescriptions still correct or valid?
b. Are the terms, conditions, and mitigation measures still needed to achieve environmental objectives?

Validation monitoring includes research designed to test critical assumptions of the Standards and Guidelines from the Northwest Forest Plan and produce results important for habitat development. This research will also help fill knowledge gaps relating to Late-Successional Reserves habitat development.

1. See research project, *Evaluation of the Influences of Salvage and Salvage Intensity on Wildlife,* in Appendix B.
2. See research project, *Vegetation Dynamics and Fire Hazard in Experimental Mixed-species Restoration Plantings in Southwestern Oregon,* in Appendix B.