ENVIRONMENTAL ASSESSMENT

for

DEADMAN'S PALM LANDSCAPE PROJECT

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MEDFORD DISTRICT
ASHLAND RESOURCE AREA

EA No. OR-116-05-03

This environmental assessment (EA) for the proposed Deadman's Palm Landscape Project was prepared utilizing a systematic interdisciplinary approach integrating the natural and social sciences and the environmental design arts with planning and decision-making.

Public notice of the availability of this EA was provided through advertisement in Medford's *Mail Tribune* and the Bureau of Land Management's Medford District Website.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MEDFORD DISTRICT

EA COVER SHEET

RESOURCE AREA: Ashland

ACTION/TITLE: Deadman's Palm Landscape Project

EA NUMBER: OR-110-05-03

LOCATION: T.39 S., R.3 W., in sections 4,8,9,15,17-21,29,30; and T.39 S., R.4 W., in sections 10, 12-16, 21-27, Jackson County Oregon

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CHAPTER I: PURPOSE AND NEED FOR THE PROPOSED ACTION

A. INTRODUCTION

This Environmental Assessment (EA) documents the environmental analysis conducted to estimate the site-specific effects on the human environment that may result from the implementation of the Deadman's Palm Landscape proposal. This document complies with the Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA; 40 CFR Parts 1500-1508) and the Department of the Interior's manual guidance on the National Environmental Policy Act of 1969 (516 DM 1-7

B. WHAT IS BLM PROPOSING?

The Deadman's Palm Landscape project is a proposal to thin trees and shrubs in conifer dominated forest stands on BLM-administered lands in the Applegate River-McKee Watershed. The term 'landscape' refers to the project assessment which reviewed the entire project area landscape to understand the distribution of forest types and growth stages and integrate proposed treatments with existing conditions. The proposed action would utilize a combination of commercial timber sale contract(s) and service contracts to complete the proposed thinning. See Chapter II for specific project details.

The Bureau of Land Management (BLM), Ashland Resource Area, proposes to implement the Deadman's Palm Landscape Project, a forest management project, designed to implement the objectives of the Bureau of Land Management's Medford District Record of Decision and Resource Management Plan (RMP) (USDI 1995). The overall effects of implementing the Medford District Resource Management Plan were analyzed and disclosed in the Medford District Proposed Resource Management Plan/Environmental Impact Statement (RMP/EIS) (USDI 1994).

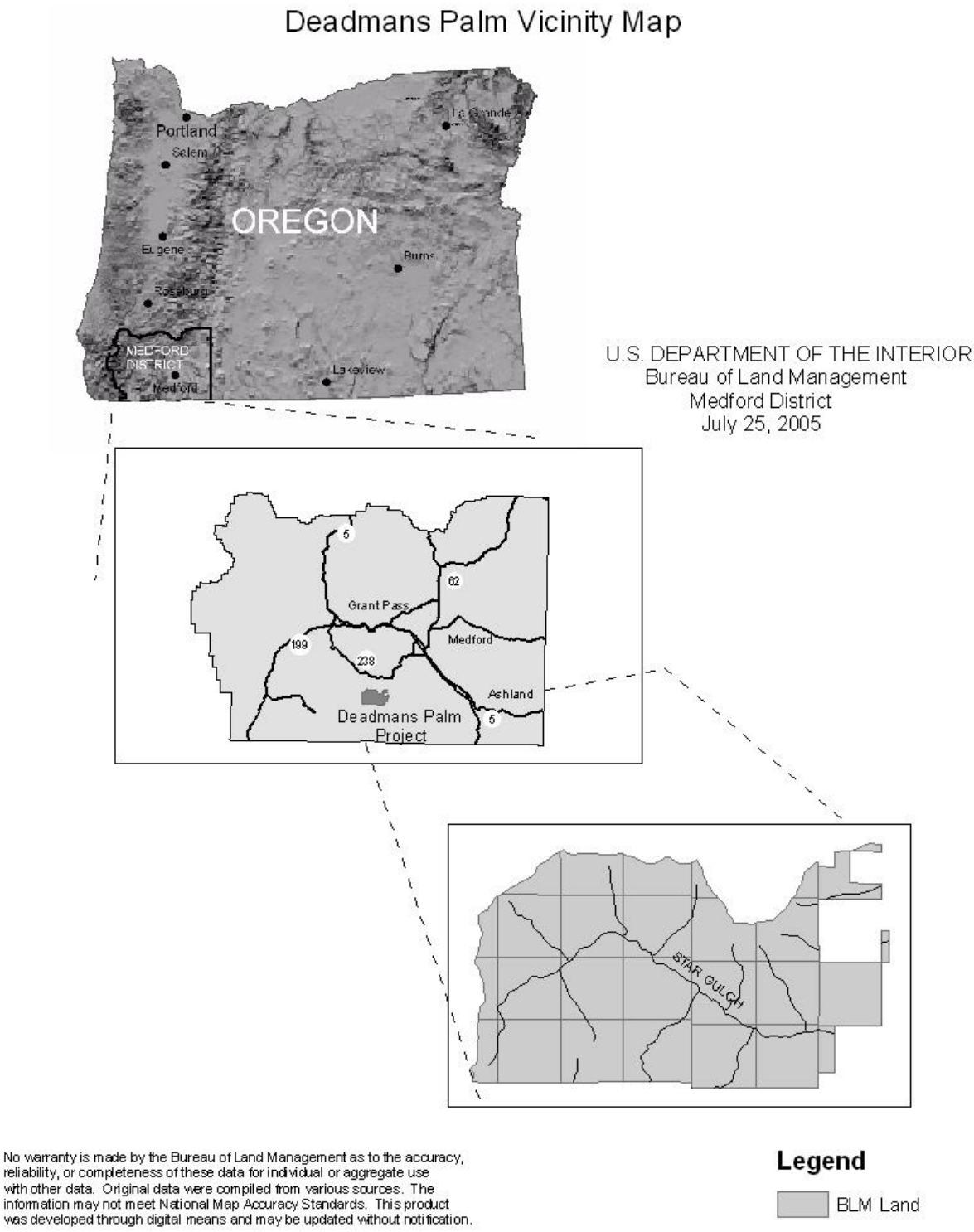
Three alternatives were considered and analyzed in detail, a No-Action Alternative (Alternative A),the Proposed Action (Alternative B) and an alternative to the proposed action (Alternative C). A detailed description of the Proposed Action and Alternative is contained in Chapter II, Alternatives.

C. WHERE IS THE PROJECT LOCATED?

The Deadman's Palm Landscape Project is located in the Applegate River-McKee Watershed, the legal description is: T.39 S., R.3 W., in sections 4,8,9,15,17-21,29,30; and T.39 S., R.4 W., in sections 10, 12-16, 21-27, Jackson County Oregon (Map 1-1).

The Deadman's Palm Landscape project planning area encompasses approximately 12,324 total acres. BLM administers all the lands within this planning area. Jackson County land use planning data within the project planning area shows 100% of the land is zoned forest or woodland resource.

The Northwest Forest Plan land allocations on BLM administered lands within the planning area are; Adaptive Management Area – 9,933 acres, Riparian Reserve – 2,091 acres and northern spotted owl late seral reserve - approximately 300 acres. Management activities are proposed for approximately 5,121 acres, or 41% percent of the BLM administered lands within the project area. No commercial treatment is proposed in Riparian Reserves or northern spotted owl reserves.


Deadmans Palm Vicinity Map
Portland
Salem
OREGON
Eugene
Burns
Roseburg
MEDFORD DISTRICT
Medford
Lakeview
U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management
Medford District
July 25, 2005
5
62
Grant Pass
199
238
Medford
Ashland
Deadmans Palm Project
5
STAR GULCH
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. The information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.
Legend
BLM Land

Map 1-1

D. NEED FOR THE DEADMAN'S PALM PROJECT

The overall need for the Deadman's Palm Project is to implement the Management Actions/Direction of the Medford District Record of Decision and Resource Management Plan (RMP) within the Deadman's Palm Planning Area located in Star Gulch. The following site-specific needs would be met through the implementation of the Deadman's Palm Project:

1. **There is a need to thin forest stands using a combination of silvicultural systems described in the RMP (Appendix E p. 180-186, 192-194) to maintain and promote vigorously growing conifer forests composed of fire resilient tree species, to reduce tree mortality, to maintain individual or groups of trees with old-growth characteristics, and to maintain and promote large tree structure. (ROD/RMP p.62, 72-73).**

Fire is recognized as a key natural disturbance process throughout southwest Oregon (Atzet and Wheeler 1982) (Agee 1993) Historically, frequent, low intensity fires[1] maintained Douglas-fir and pine forest types in more open conditions than exist today (Agee 1993).

Because of the lack of frequent, low-intensity fire in recent history, the landscape in the Applegate Watershed has changed and forest stand densities are increasing. Along with increases in stand densities, there has been a shift in species composition. Douglas-fir, the climax species for some of the forested area, is replacing ponderosa pine, sugar pine, and incense cedar because of its more shade-tolerant nature. In some areas white fir is migrating to lower elevations and encroaching upon the Douglas-fir tree series

Many trees with old-growth characteristics are dying as a result of increased competition for limited resources from younger trees more recently established on the site. Douglas-fir trees, occurring on harsh dry sites historically occupied by pine, are experiencing moisture stress and are also being killed by Douglas-fir bark beetles. Pine series stands have experienced high levels of tree mortality due to stress caused by the competition from Douglas-fir trees and subsequent attacks by the western pine beetle.

Trees in the project area are growing at the lowest levels since stand establishment in the late 1800's and early 1900's. Ten year radial growth is approximately .42 inches for all tree age classes sampled, less than 1.5 inches of diameter growth every 10 years . Entomologists have found that at least 1.5 inches of tree diameter growth per decade decreases the risk of bark beetle attack. Stand vigor is decreasing because timber stands are significantly overstocked. Relative density index (RDI) ratings indicate that stands are at the point of imminent mortality and suppression (RDI of .55; crown closure occurs at a RDI of .15). Relative density index is the ratio of actual stand density to the maximum stand density attainable in a stand with the same mean tree volume. Many stands in the project area have a relative density of over .70, so in regard to stand growth and vigor the forest is not healthy. (See Appendix - Silvicultural Prescriptions for Deadman's Palm)

Forest thinning treatments are designed to maintain forest stands which are more fire resilient and resistant to insect and disease attacks. When exposed to drought, wildfire, insect attack, and human-induced changes, these forest stands remain productive and resilient over time.

- The relative density index of stands within the project area should range between 0.25 and 0.55 to maintain vigor and growth.

- Dry Douglas fir and ponderosa pine sites within the project area should be maintained at 60 to 120 ft^2 BA/AC[2] sites (USDA/USDI 1994 p.68 - Ecosystem Health Assess.) (Applegate River Watershed Assessment p. VIII-92).

[1] Some stand replacement fires may have occurred periodically prior to Euro-American settlement, but were likely infrequent and of smaller size in comparison to fires experienced today.

[2] Basal area is another measurement that is used to quantify the densities of forest stands

- On harsh sites the species composition of stands should contain at least 25 percent ponderosa pine, which is a drought tolerant species.

2. There is a need to treat hazardous fuels to reduce the risk of high intensity, stand replacing wildfires to protect and support land use allocations (RMP p. 91) and to reduce fuel hazards in rural interface areas (RMP p. 89).

As a result of the forest continuing to grow over time and the policy to suppress all natural wildfire events, there is a build-up of fuels and a change to more fire-prone vegetative conditions. In most areas, surface fuels and ladder fuels have increased, which has increased the threat of fire spreading to the canopies of trees. While some disagree with the cause of fuels build-up or whether the level of fuels build up is greater than pre-fire exclusion levels, the fact remains that 34 percent of the Deadman's Palm planning area is characterized with a moderate fire hazard and 66 percent as high fire hazard. Less than one percent of the area is considered low hazard. These hazard ratings developed for the project area characterize an existing fuel profile which represents a moderate to high resistance to control of fire under average climatic conditions, (see Chapter III, Affected Environment, Fire and Fuels). Both BLM-managed resources and rural residential areas are threatened from a potential for high-intensity stand replacing wildfires.

The following discussion describes the desired conditions with a reduced threat of high intensity, stand replacing wildfires.

A low fire hazard rating usually results in lower fire line intensity in the event of a wildfire, allowing for a more direct approach to fire suppression.

Agee (1996) also describes vegetation conditions that lead to manageable fire behavior:

- Surface fuel conditions that would limit the surface fireline intensity (flame lengths);
- Forested conditions comprised of fire tolerant trees and vegetation, described in terms of species, sizes and structures (arrangement and condition); and
- A low probability for crown fires (fire burning through the canopies of trees) to be initiated or spread through the forest (Agee 1996).

The Deadman's Palm Project is designed to retain and promote more fire tolerant tree species such as pine and incense cedar and to alter forest conditions to reduce surface, ladder, and aerial fuels such that the potential fire behavior and the initiation of crown a fire is reduced.

3. There is a need to manage the transportation system within the project area to better serve the management of resource program areas (RMP) including timber resources, forest health, rural interface areas, water and soils, wildlife, and the Aquatic Conservation Strategy Objectives.

Currently the existing transportation system is insufficient to provide access to BLM-administered lands in need of forest management (see Need #1) making the management of those lands difficult and more expensive. Some roads are located in areas no longer serving resource program needs, some of these roads are located within Riparian Reserves, paralleling streams and contributing to sedimentation and riparian habitat fragmentation.

Roads throughout the project area have also been identified in need of maintenance to restore, repair, or improve road surfaces, culverts, and roadside drainage ditches in order to reduce road related erosion and sedimentation to stream courses.

Road construction, decommissioning and renovation is designed for the Deadman's Palm Project to improve road access to areas in need of forest management, reduce road densities in areas where the road system no longer serves resource program needs, and to maintain roads to reduce road related erosion and sedimentation to stream courses.

E. PURPOSE

This section describes the purposes to be accomplished while implementing the Deadman's Palm Project. These purposes are considered when evaluating and selecting a course of action among the alternatives considered.

Purpose #1. Design a project that is economically practical.

The RMP directs that all silvicultural systems (forest thinning strategies) applied to achieve forest stand objectives would be economically practical (ROD/RMP p. 180; PRMP/EIS p. 2-62). The economic feasibility of forest management actions is affected by the ease of access from the forest road system. Portions of the project area are inaccessible from existing forest roads increasing the cost associated with forest treatments. The Deadman's Palm project is designed to improve the economic efficiency of implementing silvicultural systems to achieve forest health and timber management objectives.

Purpose #2. Contribution towards the Districts Allowable Sale Quantity

The Deadman's Palm Project Area is located on BLM-administered lands allocated to produce a sustainable supply of timber. There is a need to sell timber products produced from forest thinning treatments, in support of the District's Allowable Sale Quantity in order to meet Timber Resource Objectives (ROD/RMP p.17, 72-73).

Purpose #3. Consider the interests of rural residential land owners (RMP p. 88).

BLM-administered lands within ¼ of private rural residential lands are described as Rural Interface Areas in the Medford District RMP. The RMP provides guidance to the agency to determine how land owners might be affected by management activities on BLM-administered lands and to use project design features or mitigation to avoid or minimize impacts to health, life, property, and the quality of life (RMP p. 88).

Due to hazardous fuels conditions on BLM administer lands (as determined by fire hazard ratings described above) forest resources and residents living in the Rural Interface Areas threatened by the potential for high intensity stand replacing wildfire. The RMP guides the agency to reduce natural fuel hazards on BLM lands in rural interface areas.

F. CONFORMANCE WITH EXISTING LAND USE PLANS

The proposed activities are in conformance with and tiered to the *Medford District Record of Decision and Resource Management Plan* (RMP), and the Proposed Resource Management Plan Environmental Impact Statement (USDI 1995b), as amended by the March 22, 2004 *Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* and *by the Record of Decision Amending Resource Management Plans for Seven Bureau of Land Management Districts and Land and Resource Management Plans for Nineteen National Forests within the Range of the Northern Spotted Owl to Clarify Provisions Relating to the Aquatic Conservation Strategy*. The 1995 Medford District Resource Management Plan incorporated the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl and the Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (Northwest Forest Plan) (USDA and USDI 1994). These documents are available at the Medford BLM office and the

Medford BLM web site at http://www.or.blm.gov/Medford/>.

G. RELATIONSHIP TO STATUTES, REGULATIONS, AND OTHER PLANS

The proposed action and alternatives are in conformance with the direction given for the management of public lands in the Medford District by the Oregon and California Lands Act of 1937 (O&C Act), Federal Land Policy and Management Act of 1976 (FLPMA), the Endangered Species Act (ESA), and the Clean Water Act.

Through implementation of the RMP, Aquatic Conservation Strategy, and Best Management Practices, the proposed action and alternatives are designed to attain the Oregon Department of Environmental Quality's Applegate Subbasin Total Maximum Daily Load (ODEQ 2003) for 303(d) listed streams on federal lands. Recovery goals for listed streams on federal lands in the Applegate Subbasin are identified in the *Water Quality Restoration Plan for the Applegate Subbasin* (BLM, USFS 2005:45-47). The proposed action and alternatives draw upon the passive and active restoration management actions recommended for achieving federal recovery goals.

H. RELEVANT ASSESSMENTS & PLANS

1. Watershed Analysis (USDI 1995)

Watershed Analysis is a procedure used to characterize conditions, processes and functions related to human, aquatic, riparian and terrestrial features within a watershed. Watershed analysis is issue driven; analysis teams of resource specialists identify and describe ecological processes of greatest concern establishing how those processes are functioning and recommend restoration activities and under what conditions management activities should occur. Watershed analysis is not a decision making process, rather watershed analyses establish the context for subsequent planning, project development, regulatory compliance and agency decisions (Federal Guide for Watershed Analysis 1995 p. 1).

The Deadman's Palm Project Area falls within the Star Gulch watershed, a small portion of Palmer Creek, and portions of the Applegate River-McKee Watershed between Beaver Creek and Little Applegate River. Watershed Analysis generally focused on the use of existing information available at the time the analysis was conducted, and provides baseline information. Additional information, determined to be necessary for completing an analysis of the Deadman's Palm Landscape project, has been collected and is considered along with existing information provided by the 1998 Applegate-Star/Boaz Watershed Analysis document. Management Objectives and Recommendations in the Watershed Analysis document were considered and addressed as they applied to the Deadman's Palm proposal. Information contained in the watershed analysis is incorporated by reference throughout this EA.

2. Applegate Adaptive Management Area (AMA) Ecosystem Health Assessment (USDA/USDI 1994)

An increase in dead and dying forest trees in southwest Oregon prompted land managers from the Bureau of Land Management and Forest Service to appoint an interagency group to conduct an ecological assessment of the Applegate Subbasin. The assessment was based on existing information and addressed primarily the terrestrial components of the ecosystem, focusing on long term health. Stand level recommendations for the attainment of forest health and fuels reduction are included in the Ecosystem Health Assessment (p. 64-68, and 70). Information contained in the AMA Ecosystem Health Assessment is incorporated by reference throughout this EA.

3. Applegate Communities' Collaborative Fire Protection Strategy (2002 Applegate Fire Plan)

The Applegate Fire Plan is the result of a collaborative effort between local citizens and local and federal agencies to develop a strategy for addressing the high fire danger throughout the Applegate Valley. The main components of the plan include fire protection and suppression, fuel hazard reduction, and emergency communications. The plan is based on a foundation of neighbors cooperating with neighbors. The Applegate Fire Plan developed recommendations for nineteen strategic planning areas across the Applegate Watershed. The Deadman's Palm Project Area falls within the Star Strategic Planning Area of

the Applegate Fire Plan. Recommendations for the Star Strategic Planning Area include addressing hazardous fuels on BLM lands along Upper Applegate Road near Star Gulch and creating fuel breaks along the south west and east of Star Gulch.

4. U.S. Department of Interior, Bureau of Land Management, Western Oregon Districts, Transportation Management Plan (1996, updated 2002).

This transportation management plan, is not a decision document, rather it provides guidance for implementing applicable decisions of the Medford District Resource Management Plan (which incorporated the Northwest Forest Plan).

5. Applegate River Watershed Assessment: Aquatic, Wildlife, and Special Plant Habitat (USDI/USDA 1995);

The Applegate River Watershed Assessment, based on existing information, is not a decision document; the assessment provides an overview of conditions and trends related to aquatic, wildlife, and special plant habitats in the Applegate Watershed. The assessment includes recommendations for maintaining these habitats over the long-term.

6. Applegate Adaptive Management Area (AMA) Guide (USDI/USDA 1998)

The Applegate AMA Guide was developed as a working document outlining how agencies expect to do business in the Applegate Watershed for the next several years. The guide is not a decision document. Key questions and strategies are outlined in the AMA Guide provides an overview of the physical, biological and social setting of the Applegate Watershed and includes key questions and strategies or approaches for management.

I. DECISIONS TO BE MADE

The Ashland Resource Area Field Manager must decide whether to implement the Proposed Action as designed or to select one of the alternatives considered (including the no-action alternative). The decision will also include a determination whether or not the impacts of the proposed action are significant to the human environment. If the impacts are determined to be within those impacts analyzed in the Medford District Resource Management Plan/EIS (USDI 1995) and the Northwest Forest Plan (USDA/USDI 1994), or otherwise determined to be insignificant, a Finding of No Significant Impact (FONSI) can be issued and a decision implemented. If this EA determines that the significance of impacts are unknown or greater than those previously analyzed and disclosed in the RMP/EIS and the NWFP SEIS, then a project specific EIS must be prepared.

J. SCOPING AND ISSUES

Scoping is the name for the process used to determine the scope of the environmental analysis to be conducted. It is used early in the NEPA process to identify (1) the issues to be addressed, (2) the depth of the analysis, (3) alternatives to the proposed action, and (4) potential environmental impacts of the proposed action.

Scoping has occurred for the Deadman’s Palm Landscape Project. The Deadman’s Palm Project was announced with the listing of the project in the Medford Messenger. Public outreach occurred for the Deadman’s Palm Landscape project. Outreach included mailings to interested organizations, community groups, other agencies, tribes, adjacent land owners, and other individuals; and meetings with neighbors and organized neighborhood groups. Approximately fifty letters were mailed announcing the begging of formal scoping and requesting comments. Three letters with comments concerning the project were received.

An interdisciplinary (ID) team of resource specialists reviewed the proposal and all pertinent information,

including public input received, and identified relevant issues to be addressed during the environmental analysis. Some issues identified as relevant to this project proposal were analyzed at a broader scale in association with the 1994 *Final Environmental Impact Statement for the Bureau of Land Management Medford District Proposed Resource Management Plan* and the 1994 *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old Growth Forest Related Species Within the Range of the Northern Spotted Owl(as amended)*. This EA will focus on addressing those issues ripe for decision at this level of environmental review, and will incorporate by reference broader level NEPA analysis where appropriate.

Issues were identified through specialist review and public input received. The following issues were determined by the ID Team to be relevant to the Deadman's Palm project development and/or analysis. Other issues were also identified. Those issues were also considered and addressed during project development (including project design features) and environmental analysis (documented in this EA Chapter III).

K. RELEVANT ISSUES

Aquatic Systems: Hydrology, Water Quality and Fish

Star Gulch is in the project area and is listed as water quality limited as defined by the Oregon Department of Environmental Quality on the State 303(d) list. Non-point source pollution (sedimentation) from road construction and other ground-disturbing activities could further degrade the aquatic ecosystem (e.g., reduce water quality).

The main stem of the Applegate River and the lower stretches of Star Gulch are considered critical habitat for Coho salmon (listed as threatened under the Endangered Species Act (ESA) of 1973). Forest management activities could potentially increase sedimentation and negatively impact critical habitat.

Forest Health & Stand Density

Fire exclusion has resulted in dense vegetation throughout the project area. Dense stands are not vigorous (i.e., slow growth rates, competition for water, nutrients, and sunlight) and are more susceptible to insect infestation and high intensity wildfire. Shade intolerant plants such as ponderosa pine are declining in number. Oak woodlands are being lost as shrub species come in and dominate sites resulting in decline in the health of oak trees.

Wildfire and Fuel Hazard

With effective fire exclusion of low intensity fire, the amount of vegetation (fuel loading) and consequent fire hazard continues to increase. When fires occur, they burn with more intensity and result in more damage. Thinning activities can temporarily increase fuel loadings and subsequent fire hazard for a short time period after treatments occur.

Transportation System

Some of the project area is not currently accessible by existing roads. Increasing access through road construction and road improvements would greatly decrease the cost associated with meeting current long-term management objectives. Some long-term management objectives (i.e. fuels treatments) may not be possible without increased access. New and improved roads may also contribute to increases in other uses (e.g., off-highway vehicles, hunting, and horse back riding) throughout the area. Some roads in the planning area are being considered for decommissioning. Closing roads may affect access to places used historically by the public. Closing roads limit access for wildfire suppression response.

Wildlife

Overall change in the number of snags and forest stand canopy closures over large landscapes would reduce habitat for some wildlife species and increase habitat for others. Reductions in canopy closure would affect late-successional species' habitat and could affect dispersal. Proposed road construction

could increase human disturbance to wildlife and may fragment habitat. Management activities could result in localized, short-term noise disturbances affecting wildlife such as deer and nesting birds.

Special Status Animal Species

Special status animal species occur in the proposed project area and would need to be protected from project-related activities through buffers and/or seasonal restrictions appropriate to the species in question. Some species habitats are declining and would benefit from restoration activities.

Special Status Plant Species

Special status plant species occur in the proposed project area and would need to be protected from project-related activities through buffers appropriate to the species in question. Some species habitats are declining and would benefit from restoration activities.

Invasive, non-native plants

Non-native weed species are present in the proposed project area. Some kinds of soil disturbance could facilitate the spread of these species.

Off Highway Vehicle (OHV)

Currently the project area has very little use by off highway vehicles. There is concern that use may increase and as a result, undue resource damage may occur associated with OHV activity.

Cumulative Effects

A series of land management actions occurring or planned on private, BLM, and Forest Service lands in the area may have impacts on the watersheds and its resources.

Air Quality

Concerns for management of smoke during prescribed burning operations and wildfires.

CHAPTER II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

A. INTRODUCTION

This chapter describes two action alternatives developed by the ID Team, one of which is the proposed action. In addition, a "No Action" alternative is presented to form a base line for analysis. An essential part of the Proposed Action and Alternative are project design features (PDFs), which incorporate Best Management Practices as outlined in Appendix D of the RMP. The PDFs are included for the purpose of reducing or eliminating anticipated adverse environmental impacts.

B. PROJECT DEVELOPMENT

1. Introduction/Background

The Interdisciplinary Team utilized a landscape based approach in identifying the site specific treatments proposed for the Deadman's Palm Landscape Project. This process considered the current conditions of the various sub-drainages in and near Star Gulch in terms of need for vegetation management, road restoration, fuel reduction and implementing land management policy direction (see Chapter I, Purpose and Need).

The BLM is proposing to implement a landscape level treatment project with activities focused on increasing the health and vigor of forest vegetation by thinning in conifer forest, oak woodland and shrubland. Providing a sustainable supply of timber is part of the project proposal. Transportation system maintenance, including renovation of existing roads, new road construction and road decommissioning are proposed. Fuel hazard reduction is an integral part of all treatments and would be accomplished using hand, mechanical and prescribed fire methods. The vegetation treatments proposed, use a variety of silvicultural techniques based on the existing and potential vegetation at each site. A group of silvicultural prescriptions have been developed that match the potential and characteristics of each site with the forest vegetation goals. These prescriptions, referred to as *variable prescriptions*, take into account subtle changes in the potential vegetation based on factors such as aspect, slope, moisture and soil type. The prescriptions guide which trees are to be left and which trees are to be cut. The target density for trees left on each site is based on the individual site's ability to sustain healthy trees long term.

All BLM administered lands within the planning area were reviewed to develop the Deadman's Palm Project. Stands selected for treatment are those that could best benefit from silvicultural intervention to encourage more stable and resilient forest vegetation conditions and promote habitat conditions suitable for certain wildlife species. Areas that currently have the desired density and vegetative species mix, were not selected for treatment. Other areas were excluded from the current proposal as a result of the presence of a special status species that would not directly benefit from vegetation change at this time. The project design also includes efforts to reduce fuel loadings to minimize the effects of wildfires on both federal and private lands in and near the planning area. Outreach and discussions with private citizens living near the project area concerning fuels reduction treatments on BLM administered lands adjacent to private lands had direct influence on the project design.

Thinning is accomplished in commercial conifer forest by a timber sale contract which sells material over eight inches in diameter at breast height. Trees to be removed greater than eight inches in diameter are designated by BLM employees. Material less than eight inches is removed through contracts that hire out cutting, and piling of material. When possible, cut material in the

form of poles, firewood and biomass (tree tops and branches) are made available for removal. Because of a lack of cost effective removal techniques, most non-commercial material is piled to be burned. BLM will burn the piles during wet weather conditions. Thinning in oak woodlands and shrublands is also accomplished by hiring contractors to cut and pile the material.

Fuel treatments are an integral part of all conifer forest thinning proposals. Additional fuels reduction treatments are proposed in oak woodlands and shrublands. Fuel reduction is especially of concern in the eastern portion of the project area adjacent to private lands and homes. Areas such as major ridge lines and larger contiguous blocks of land are targeted for treatment in order to provide reduced fuel loadings in strategic locations. The use of prescribed fire and thinning would reinforce natural features and large block treated areas would aid in the suppression of wildfires.

The RMP directs that all silvicultural systems (forest thinning strategies) applied to achieve forest stand objectives would be economically practical (ROD/RMP p. 180; PRMP/EIS p. 2-62). The economic feasibility of forest management actions is affected by the ease of access from the forest road system. Therefore, road development and maintenance is important component of project development (RMP p. 84, 86). The renovation of roads to reduce road related run-off and sediment production is also the most important component of watershed restoration (ROD/RMP p. 23). Roads throughout the project area were reviewed by a BLM road engineer to identify roads in need of renovation and roads that were no longer needed to meet transportation and access needs. Road renovation and road decommissioning were identified to respond to the purposes described in Chapter I, Purpose and Need. As forest stands were identified for commercial treatments, the need for new road construction was identified to provide access to forest stands currently inaccessible (or difficult to access) from the existing transportation system. Each proposed road location was reviewed by the interdisciplinary team; some roads were eliminated from detailed study entirely, some locations were modified to address resource and/or social concerns (see Actions and Alternatives Eliminated from Detailed Study).

Ongoing or recently completed actions within this planning and analysis area are addressed in the cumulative effects analysis for affected resources (see Chapter III, Environmental Consequences).

C. ALTERNATIVES

This section describes the proposed action (Alternative B) and two alternatives to the proposed action, Alternative A – No Action and Alternative C – a modified version of the proposed action.

2. Alternative A - No Action Alternative

Under the “No Action” alternative, none of the activities presented here would be implemented. There would be no forest health treatments, no commercial cutting of trees, no roads would be constructed, decommissioned or renovated, and there would be no hazardous fuels reduction.

3. Alternative B – Proposed Action

Alternative B, the Proposed Action, was developed to respond to the purposes described in Chapter I, Purpose and Need. The Proposed Action would treat 5,121 acres of vegetation using the various silvicultural prescriptions and treatment methods described below. Of these acres an estimated 3,991 acres are proposed for commercial timber harvesting using one or more timber sales to accomplish the proposed silvicultural treatments. Another 1,130 acres are proposed for non-commercial vegetation treatments; an estimated 689 acres of pre-commercial thinning and

441 acres of non-commercial fuels reduction. Table 2-1 summarizes the vegetation treatments prescribed and Table 2-2 summarizes the treatment methods.

This alternative would construct 1.6 miles of new road to provide access to proposed treatment areas. An estimated 42.7 miles would be renovated to maintain and improve watershed conditions and infrastructure investments. An estimated 4.3 miles of road are proposed for decommissioning.

Landings are locations along the road system where trucks can turn around, equipment can be parked and serviced and harvested material can be stockpiled temporarily awaiting transport. There are twenty-three existing landings to be used under both action alternatives. There are fifteen new landings planned under the Proposed Action.

Table 2-1. Vegetation Treatments-Alternative B:

Proposed Treatments for Conifer Forest	Acres
Moist DF Commercial Thin	165
Dry DF Commercial Thin	569
Pine Regeneration	249
DF Understory Reinitiation	16
Poles	499
Late Seral Retention DF – Maintain 60% + Canopy	2,239
Late Seral Retention Pine – Maintain 40% + Canopy	253
Total Acres of Proposed Conifer Forest Treatments	**3,991**

Non-Commercial Young Forest Thinning (PCT) Within Harvest Units (additional treatments on areas listed above)	2,346

Non-Commercial Shrub & Oak Woodland treatments	441
Non-Commercial Young Forest Thinning (PCT) Not in Harvest Units	689

Table 2-2. Treatment methods-Alternative B:

Treatment Methods	Acres
Commercial Timber Harvest	3,991
Helicopter Yarding	2,517
Cable Yarding	1,263
Tractor Yarding	211

All non-commercial material will be cut by hand methods (chain saw) and either removed from site for bio-mass and pole products or hand piled and burned.

Road Construction, Renovation, Decommission for Alternative B

Table 2-3: Existing roads accessing the planning area and possible improvements.

Road Number	Approximate Length (miles)	Existing Surface: Depth (inches) and Type[1]	Control[2]	Possible Improvements and/or renovation: Depth (inches) And Type[3]	Seasonal Restriction[4] (for log hauling)
38-3-32.0 A1	1.6	4" ASC	BLM		1
38-3-32.0 A2	2.0	4" ASC	BLM	4"ASC from 39-3-8 Rd (0.6 mi.)	2
38-3-32.0 B	1.9	4" ASC	BLM	4"ASC	2
38-3-32.0 C	0.4	4" ASC	BLM	4"ASC	2
38-3-32.0 D1	0.6	6" ASC	BLM	4"ASC	2
38-3-32.0 D2	0.2	NAT	BLM	8"ASC	2
38-3-33.0 A	0.4	BST	BLM		2
38-3-33.0 B	0.2	BST	BLM		2
38-3-33.0 C	1.3	BST	BLM		2
38-3-33.0 D	0.2	BST	BLM		2
38-3-33.0 E	3.1	BST	BLM		2
38-3-33.0 F	3.8	6" ASC	BLM		1
38-3-33.1 A	0.3	BST	BLM		2
38-3-33.1 B1	1.5	4" ASC	BLM		1
38-3-33.1 B2	1.3	4" ASC	BLM		1
39-3-7.0 A1	0.6	6" ASC	BLM	4"ASC	2
39-3-7.0 A2	0.6	6" ASC	BLM	4"ASC	2
39-3-7.0 B	0.6	6" ASC	BLM	4"ASC	2
39-3-7.0 C	1.2	NAT	BLM	8"ASC	2
39-3-8.0 A1	0.8	4" ASC	BLM	4"ASC	2
39-3-8.0 A2	2.2	4" ASC	BLM	4"ASC	2
39-3-8.0 B	1.1	NAT	BLM	8"ASC, Gate	2
39-3-15.0 A	0.3	NAT	PVT		1
39-3-15.0 B	0.2	NAT	BLM		1
39-3-17.1	0.7	4" ASC	BLM	4"ASC	2
39-3-17.2	0.8	NAT	BLM	8"ASC	2
39-3-19.0 A	0.9	6" ABC	BLM	4"ASC	2
39-3-19.0 B1	0.3	6" ABC	BLM	4"ASC	2
39-3-19.0 B2	2.8	6" ABC	BLM	4"ASC	2
39-3-19.1 A1	1.2	4" ASC	BLM	6"ASC	2
39-3-19.1 A2	1.8	4" ASC	BLM	6"ASC	2
39-3-19.1 A3	0.6	6" ABC	BLM	4"ASC	2
39-3-19.2	0.8	NAT	BLM	8"ASC	2
39-3-19.3 A	1.6	GRR	BLM		2
39-3-19.3 B	0.9	NAT	BLM		1
39-3-19.4	0.1	NAT	BLM		1
39-3-20.0	1.1	NAT	BLM		1
39-3-20.1	0.2	NAT	BLM		1
39-3-20.2	0.2	NAT	BLM		1

Road Number	Approximate Length (miles)	Existing Surface: Depth (inches) and Type[1]	Control[2]	Possible Improvements and/or renovation: Depth (inches) And Type[3]	Seasonal Restriction[4] (for log hauling)
39-3-28.0 A	0.7	BST	BLM		2
39-3-28.0 B	1.8	BST	BLM		2
39-3-28.0 C	1.6	BST	BLM		2
39-3-28.0 D	1.7	BST	BLM		2
39-3-28.0 E	1.0	6” ABC	BLM	4”ASC	2
39-3-28.0 F1	0.5	6” ABC	BLM		1
39-3-28.0 F2	1.4	6” ABC	BLM		1
39-3-28.0 F3	0.4	6” GRR	BLM		1
39-3-28.0 G	0.5	NAT	BLM		1
39-3-28.0 H	1.3	NAT	OTA		1
39-3-28.0 I	0.3	NAT	BLM		1
39-3-29.0	0.1	6” ASC	BLM		1
39-3-30.0 A	1.2	6” ASC	BLM	4”ASC	2
39-3-30.0 B	0.4	6” ASC	BLM	4”ASC	2
39-3-30.1	1.0	6” ASC	BLM	4”ASC	2
39-3-30.2	0.5	6” ASC	BLM	4”ASC	2
39-3-30.3	0.1	6” ASC	BLM		1
39-3-30.4 A	0.3	6” ASC	BLM	4”ASC	2
39-3-30.4 B	0.4	6” ASC	BLM	4”ASC	2
39-3-30.6	0.5	6” ASC	BLM	4”ASC	2
39-3-30.7	0.5	6” ASC	BLM	4”ASC	2
39-3-30.8	0.5	6” ASC	BLM	4”ASC	2
39-4-3.0 A1	1.1	6” ASC	BLM		1
39-4-3.0 A2	1.6	NAT	BLM		1
39-4-10.0	1.2	NAT	BLM	4”ASC	1
39-4-22.0 A1	0.1	6” ABC	BLM	4”ASC	2
39-4-22.0 A2	3.1	6” ABC	BLM	4”ASC Replace Culvert	2
39-4-22.0 B	0.9	NAT	BLM	8"ASC	1
39-4-22.2 A	3.2	6” ABC	BLM	4”ASC	2
39-4-22.2 B	1.1	NAT	BLM	8”ASC	2
39-4-22.3	0.6	NAT	BLM	4”ASC	1
39-4-23.2 A	1.1	6"ABC	BLM	4”ASC	2
39-4-23.2 B	1.4	NAT	BLM	8”ASC	2
39-4-24.0	1.9	NAT	BLM	8”ASC	2
39-4-24.1	1.1	NAT	BLM	8”ASC	2
39-4-26.0	0.7	NAT	BLM	Temp use, MD	1
39-4-28.0 A1	0.3	6” GRR	BLM		1
39-4-28.0 A2	1.9	6” GRR	BLM		1
39-4-28.1 A1	0.2	6” PRR	BLM		1
39-4-28.1 A2	0.5	6” GRR	BLM		1
Total Mileage:	**79.1**			**42.7 mi. renovation**	

Key for road table

1) **NAT = natural; ASC = aggregate surface course; ABC = aggregate base course; PRR = pit run rock; GRR = grid rolled.**
2) **BLM = Bureau of Land Management; PVT = Private**
3) **- = no improvement; ASC = aggregate surface course; ABC = aggregate base course; PRR = pit run rock; GRR = grid rolled; BST = bituminous surface treatment; DI= Drainage Improvement; SR=Spot Rock**
4) **0 = no restrictions; 1 = hauling restricted from 10/15 to 5/15. 2 = hauling restricted from 11/15 to 4/15**

Table 2-4: Alternative B : Proposed new road construction in the project area.

Road Number	Approximate Length (miles)	Existing Surface:	Control[2]	Possible Improvements:	Seasonal Restriction[4]
		Depth (inches) and Type[1]		Depth (inches) and Type[3]	(for log hauling)
38-3-32.0	0.1		BLM	8”ASC	2
39-3-8.0	0.5		BLM	8”ASC	2
39-3-30.0	0.2		BLM	8”ASC	2
39-4-24.1	0.2		BLM	8”ASC	2
39-4-26.1	0.6		BLM	8”ASC	2
Total Mileage:	**1.6**				

Table 2-5: Alternative B : Proposed road decommissioning in the project area.

Road Number	Approximate Length (miles)	Existing Surface:	Control[2]	Proposed Treatment	Seasonal Restriction[4]
		Depth (inches) and Type[1]		Decommission Method	(for log hauling)
39-4-13.1	0.4	NAT	BLM	**ND**	**1**
39-4-23.0	1.7	NAT	BLM	**MD**	**1**
S1/2 of N1/2 sec 11,12 39-4W	2.2	NAT	BLM	**ND**	**1**
Total Mileage:	**4.3**				

ND - Natural Decommission - Some roads are presently well drained and have vegetation growing on them. They may also have trees and brush encroaching from the sides and trees that have fallen across them. Sections of these roads would be allowed to decommission naturally but may include some selective ripping, removal of drainage structures, construction of water bars and barricades.

MD - Mechanical Decommission - Roads would be decommissioned mechanically. This would include ripping, removing drainage structures, seeding and/or planting, mulching, constructing water bars and barricades.

4. Alternative C – Modified Action (No New Roads)

This Alternative was developed to respond to the ecological and social concerns associated with new road construction. Alternative C would not construct any new roads, would decrease the number of acres overall treated and would increase the number of acres utilizing helicopter yarding

Alternative C would treat 4,980 acres of vegetation using the various silvicultural prescriptions and treatment methods as described in components of the action alternatives. Of these acres an estimated 3,635 acres are proposed for commercial timber harvesting using one or more timber sales to accomplish the proposed silvicultural treatments. Another 1,345 acres are proposed for non-commercial vegetation treatments; an estimated 906 acres of pre-commercial thinning and 441 acres of non-commercial fuels reduction. Approximately 2,131acres of the commercial timber sale unit acres would also be treated to thin non-commercial size trees and reduce fuel ladders. Table 2-6 summarizes the vegetation treatments prescribed and Table 2-7 summarizes the treatment methods.

This alternative would not construct any new roads. Existing roads would be used to provide access to proposed treatment areas. An estimated 42.7 miles would be renovated to maintain and improve watershed conditions and infrastructure investments. An estimated 4.3 miles of roads are proposed for decommissioning; 2.6 miles would be decommissioned naturally and 1.7 miles would be decommissioned mechanically.

Table 2-6. Vegetation Treatments-Alternative C:

Proposed Treatments for Conifer Forest	Acres
Moist DF Commercial Thin	158
Dry DF Commercial Thin	561
Pine Regeneration	188
DF Understory Reinitiation	16
Poles	378
Late Seral Retention DF – Maintain 60% + Canopy	2,081
Late Seral Retention Pine – Maintain 40% + Canopy	253
Total Acres of Proposed Conifer Forest Treatments	**3,635**

Non-Commercial Young Forest Thinning (PCT) Within Harvest Units (additional treatments on areas listed above)	2,131

Non-Commercial Shrub & Oak Woodland treatments	441
Non-Commercial Young Forest Thinning (PCT) Not in Harvest Units	904

Table 2-7: Alternative C - Treatment methods

Treatment Methods	Acres
Commercial Timber Harvest	3,635
Helicopter Yarding	2,292
Cable Yarding	1,132
Tractor Yarding	211

All non-commercial material will be cut by hand methods (chain saw) and either removed from site for bio-mass and pole products or hand piled and burned.

Table 2-8: Alternative C: Proposed road decommissioning-Alternative C.

Approximate Length (miles)	Existing Surface: Depth (inches) and Type[1]	Control[2]	Proposed Treatment: Decommission Method	Seasonal Restriction[4] (for log hauling)
0.4	NAT	BLM	ND	1
1.7	NAT	BLM	MD	1
2.2	NAT	BLM	ND	1
4.3				

ND - Natural Decommission - Some roads are presently well drained and have vegetation growing on them. They may also have trees and brush encroaching from the sides and trees that have fallen across them. Sections of these roads would be allowed to decommission naturally but may include some selective ripping, removal of drainage structures, construction of water bars and barricades.

MD - Mechanical Decommission - Roads would be decommissioned mechanically. This would include ripping, removing drainage structures, seeding and/or planting, mulching, constructing water bars and barricades.

Actions and Alternatives Eliminated From Detailed Study

In the development of the proposed action, BLM considered numerous ways to meet the Purpose and Need. What is presented in this Environmental Assessment (EA) as the Proposed Action reflects what the planning team determined to be the best balance and integration of resource conditions, resource potential, competing management objectives and expressed interests of the various communities that have a stake in the project. Other actions or alternatives were discussed and eliminated from detailed study for the reasons given below.

Minimize helicopter logging and rely on added road construction for access to project areas.

***Rationale for Elimination*:** Constructing enough roads to manage the planning area without helicopters would require many more miles of new road construction and could increase impacts to waterways, aquatic wildlife, and terrestrial wildlife beyond acceptable limits. Increased road construction could also increase impacts to the local community. Potential impacts include increased noise from off-highway vehicles, potential wildfire ignition from off-highway vehicles, use of firearms behind and adjacent to residences, and the visual impacts of roads. Therefore, this action was eliminated from detailed study.

Multiple routes of new road construction were considered but eliminated from the proposed action.

Rationale for Elimination: Many alternative routes were considered to provide road access to the areas proposed for treatment but ultimately rejected from the Proposed Action. The ID Team worked to review numerous options and routes and chose those which met the multiple resource

goals the best for incorporation in the Proposed Action. The team chose routes that minimize the resource impacts and the amount of new road construction required to treat the areas proposed. Other routes initially considered would increase the density of roads in the project area beyond acceptable limits and may have chosen locations of new roads in potentially unstable terrain. New roads originally considered were dropped because of the trade off between economics, access and potential for unwanted resource impacts.

Maximize economic return by utilizing more aggressive harvest prescriptions for the dominant portion of the area.

Rationale for Elimination: While meeting the economic and wood supply goals of the project, more aggressive harvest would not meet the balanced ecological approach sought after. Intensive harvest could limit the acres treated by concentrating harvest on fewer acres. It would not provide the opportunity to treat additional acres of the landscape to restore health, vigor and reduce fuel loading over a wide area. Not treating understory ladder fuels and young stands would not provide the reduction of fuel hazard and increase of vigor expected from those treatments. Therefore, this action was eliminated from detailed study.

Exclude commercial harvest and only remove small non-commercial sized trees.

Rationale for Elimination: Comments have been received for this project as well as other projects suggesting that no commercial products should be removed from federal lands. The ID team considered the idea of treating only oak woodlands, shrublands and grass and restricting the removal of conifer tress to those less than eight inches in diameter (non-commercial). This would effectively eliminate removing any material that could be sold for saw logs. Restricting the project to not remove any trees over eight inches DBH would not meet the purpose and need. It would not meet the need of increasing forest health, reducing fuel loadings and improving tree vigor because it would not remove enough of the vegetation on the majority of sites to reduce competition or reduce fuel loads. It would not assist in the goal of providing some of the wood product needs for the local community. Therefore, this action was eliminated from detailed study

No helicopter logging - No new roads: This alternative would have eliminated any new road construction needed to improve vehicle access for the purpose of managing forest stands and would also have eliminated helicopter yarding as an option.

Rationale for Elimination: Under this alternative it would have been operationally infeasible to manage many forest stands within the project area; many other stands would have been economically impractical. This would have resulted in no treatment of lands that are identified as in need of thinning to meet the stated purpose and need due to the distance from road systems. This would have resulted in no treatment of lands that are identified for management under the Medford District RMP. Therefore, this alternative was eliminated from detailed study.

Using only prescribed fire to thin conifer stands, shrublands and oak woodlands. This alternative would have treated vegetation within the planning area using only prescribed burning to reduce vegetation densities and hazardous fuels.

Rationale for Elimination: In conifer stands, using prescribed fire alone would not be effective in reducing stand densities to improve the vigor and health of stands. The energy release from prescribed fire (underburning) as the initial entry would exceed desired intensity levels and have undesirable effects on vegetation and soil. A combination of mechanical or manual treatments with prescribed fire is necessary to insure all resource objectives are met. Prescribed

underburning alone would not meet the need to supply timber in contribution of the Medford District's Allowable Sale Quantity and to provide sustainable forest products from lands managed under the Oregon and California Lands Act.

Wildland Fire Use for Resource Benefits: The use of wildland fire for resource benefits is the method of allowing naturally ignited (lightning-caused) fires to burn assisted by fire management response to meet prescribed resource objectives for an area.

Rationale for elimination: The practicality of using natural-caused fires in the planning area. Lightning usually results in fire ignitions during the period from late spring through fall when soil and fuel moistures are dropping or very low. The low fuel moistures combined with heavy fuel loads increase the likelihood of large forest replacing wildfires. BLM lands within the planning area are located in Wildland Urban Interface; there is a high level of concern for protecting lives and property. The use of prescribed fire, during periods when fuel and soil moistures allow for its controlled application, remains the preferred option for reintroducing fire to meet both ecological and social objectives.

Additionally, the use of fire alone would not meet the need to supply timber in contribution of the Medford District's Allowable Sale Quantity and to provide sustainable forest products from lands managed under the Oregon and California Lands Act.

3. Components Common to both Action Alternatives

Vegetation Treatment Prescriptions

(1) Commercial Conifer Forest Thinning – Selected conifer stands are proposed for thinning to reduce stand densities to help restore the health and vigor of the remaining trees by reducing competition. Selective tree cutting would generally consist of the removal of the smaller diameter trees within a stand allowing the larger, healthier trees to grow. Trees are marked for thinning within proposed treatment units by BLM personnel; oversight is provided by the Ashland Resource Area silviculturist to ensure that treatment units are properly marked according to the silvicultural prescriptions and marking guidelines.

The prescriptions are landscaped oriented to respond to variations in forest stand and site conditions. As the BLM tree markers move through a stand, they may transition from homogenous dry Douglas-fir to mixed Douglas-fir forest with scattered old growth trees and an occasional 1-2 acre patch of pine savannah; the prescription would flex accordingly. Overlain over the prescriptions are layers of instructions to address special situations as they arise. For example, there will be some "group selections", which would clear the trees out from below the crowns of old growth and/or pine trees. Other examples include specifications to leave canopy over large-diameter Coarse-Woody Debris (to retain moisture), thin to manage the special occurrence of pines with healthy native grass understories, and to leave all large-diameter hardwoods for vertical and horizontal structure. All of these layers serve to make the prescriptions complex. The following summarizes variations in prescriptions based on stand types. Detailed silvicultural prescriptions and marking guidelines are included in Appendix B, Silviculture.

Moist Douglas-fir: Moist Douglas-fir sites are typically found on the more northerly facing slopes. The prescription involves thinning from below (the removal of smaller diameter trees within a stand allowing the larger, healthier trees to grow) and creating or maintaining structural diversity. The following treatment variations would occur based on existing forest stand characteristics:

(a) Homogeneous large pole-sized (11 to 21 inches dbh) stands would be thinned to 100 to 160 $ft^{2/}$ basal area (.005454 x tree diameter ^{2} which is calculated for each tree in a plot of designated size), equating to 3 to 15 foot spacing between tree crowns (crown-spacing).

(b) Trees with old-growth characteristics would be retained, and second growth trees would be cut within and surrounding the dripline to create an approximate 25-foot crown spacing surrounding the old-growth tree. Any tree leaning against or with its crown entangled with the old-growth tree would not be cut to prevent damage to the old-growth tree or degradation of wildlife habitat.

(c) Trees of varying crown classes (intermediate, co-dominant, dominant) would be retained to maintain structural diversity.

(d) Small openings (1/7 to 1/6 acre), also referred to as group selection areas, could be created where openings in the crown canopy already exist (group selection areas must be rock and ravel free). This creates space for the establishment and or the growth of young healthy Douglas-fir trees already in the understory. Openings would be no closer than 300 feet between the edges of openings. The area between created openings can be commercially thinned using the basal area and crown spacing guidelines discussed above (bullet #1) and may also be pre-commercially thinned.

(e) Where small patches (1/5 to 1 acre in size) of old-growth trees are encountered, selectively thin only second-growth trees from below trees with old-growth characteristics For a radius of 200 feet surrounding the patch of old-growth, selectively thin trees leaving the most vigorous trees within various crown classes. In this area leave an average of 16 to 25 trees per acre to maintain at least 35-foot spacing between the crowns of trees. This prescription can be applied wherever small patches of old-growth trees are found to help create structural diversity.

Dry Douglas-fir: Dry Douglas fir sites typically have west, southwest, southeast, and east aspects. The prescription involves thinning from below, creating openings to allow ponderosa pine to become established, and creating or maintaining structural diversity.

(a) Homogenous Douglas-fir stands would be thinned to 80-140 $ft^{2/}$ basal area per acre; if stands are patchy or have widely spaced trees use crown spacing guidelines and thin stands to 10 to 25 feet between tree crowns. Leave the most vigorous dominant and codominant trees with the best crowns (greater than 30 percent crown ratio).
(b) Trees with old-growth characteristics would be retained.
(c) Create 1/5 to 1-acre openings around individual pine or old-growth trees; leave 20 to 40 ft^2 basal area per acre of healthy pine or incense cedar when they are available in the created opening. Adjacent to openings, for a distance of the average tree height of the stand being treated, thin trees to 80 ft^2 basal area per acre. Openings should be naturally spaced depending on the location of good seed trees, and should be no closer than 100 feet between the edges of openings. For the remaining area between openings, thin trees using the basal area and crown spacing prescription described above (bullet #1).
(d) Where small patches (1/5 to 1 acre in size) of old-growth trees are encountered, selectively thin only second-growth trees from below trees with old-growth characteristics. For a radius of 200 feet surrounding the patch of old-growth, selectively thin trees leaving the most vigorous trees within various crown classes. In this area leave an average of 16 to 25 trees per acre to maintain at least 35-foot spacing between the crowns of trees.

Late Seral Emphasis – 60% or greater canopy

This prescription applies to Douglas-fir forest types and is very similar to the moist and dry Douglas-fir prescriptions above. The difference here is the late seral emphasis 60% will retain slightly higher basal area as well as slightly higher canopy cover. The late seral emphasis prescription maintains habitat suitable for nesting, roosting and foraging for the northern spotted owl.

1. For the mature stands south of Star Gulch Road, thin from below patches of second growth timber to 140 square feet of basal area. Old-growth and all pine and cedar trees should have the 25-foot crown spacing around them.
2. For the mature stands north of Star Gulch Road, thin from below patches of second growth timber to 100 to 120 square feet of basal area. Old-growth and all pine and cedar trees should have the 25-foot crown spacing around them.

Late Seral Emphasis – 40% or greater canopy

This prescription applies to ponderosa and sugar pine forest types and is very similar to the Pine Site Description that follows. The difference is the late seral emphasis 40% will not create any group openings. The late seral emphasis 40% prescription maintains forest conditions suitable for dispersal habitat for the northern spotted owl.

Pine Site Prescription (Dry Ponderosa Pine): These sites are typically small in size and found on dry ridges and low elevations. Sites have south, southwest, and southeast aspects. These sites are also identified by the presence of ponderosa pine, black or white oak, and whiteleaf manzanita (either live or dead) in the understory. Poison oak may or may not be present. These stands may have developed understories of Douglas-fir as a result of fire exclusion. The objectives of treatment on these sites is the retention of existing large ponderosa pine, the development of young pine, and to reduce stand basal area to reduce competition and improve tree vigor and growth.

(a) Thinning treatments would leave the best, healthiest pine and remove the majority of Douglas-fir trees to allow the pine to once again dominate the site. Suppressed, damaged, or beetle infested pines would be thinned. Approximately 16 to 25 trees per acre would be left; an additional 10 to 20 basal area of conifer trees 7 to 11 inches dbh would also be left if available. The spacing in between the crowns of trees would be approximately 15 to 35 feet. Older Douglas-fir trees that developed as open grown trees along with older pine trees would be favored as leave trees.
(b) Leave all hardwood trees; thin conifers shading oak species.
(c) Create 1/5 to 1-acre openings around individual pine or old-growth trees.

Pine Site Prescription (Predominantly Ponderosa Pine with Grass Savannah): These sites tend to be microenvironments located on ridges, southeast to west aspects, and hot, droughty sites. Sometimes slopes are gentle to flat bench like areas. Common components of this plant association are California fescue and hairy honeysuckle. The objectives of treatment for these sites are to retain the most vigorous pine trees, maintain sites as predominantly pine, and to encourage natural pine regeneration.

(a) Thinning treatments would leave the best, healthiest pine and remove the majority of Douglas-fir trees to allow the pine to once again dominate the site. Thin pine sites to retain 15 to 20-foot spacing between the crowns of trees; leave all healthy dominant and codominant pine trees. Only pine trees that are intermediate or suppressed (less than 30 percent crown ratio) pine, damaged, or beetle infested would be thinned.
(b) The area around pine site patches, for a distance of the average tree height of the stand being treated, would be thinned to 60 to 80 ft^2 basal area per acre.
(c) One acre openings can be created around individual yellow bark, old-growth pine trees. Leave healthy pine and all incense cedar trees in created openings.
(d) Trees with old-growth characteristics would be retained.

Douglas-fir Understory Reinitiation (Regeneration Harvest): Forest stands proposed for understory reinitiation or regeneration harvest are stands that have poor vigor, severely declining health, and have overstory trees that are 150 years of age or older. Selective harvest prescriptions focus on maintaining the largest trees while opening up stands to encourage the establishment and growth of young healthy trees and the creation of multi canopied late-successional characteristics. There are 16 acres of understory reinitiation or “regeneration harvest” in this project.

Three situations are encountered in the these stands: 1)stands with only older large diameter trees; 2) Stands with a variety of age classes including old trees, smaller second growth trees, and seedlings to pole sized trees; and 3) patches of second growth only within a regeneration harvest unit boundary.

(a) For situations 1 and 2, select a minimum of 16 trees per acre (bole spacing 45 to 52 feet) that are 20 inches or larger diameter breast height (dbh) for leave trees when available. When the older trees are widely spaced, then healthier second-growth trees would be left to prevent spaces more than 35 feet between tree crowns. In openings between trees, leave an additional 10 to 20 basal area acre of seedlings through large pole-sized trees. (2 to 2,500 trees per acre).

(b) Where natural regeneration exists or is desired, openings (66-foot tree bole spacing) can be created.

(c) In situation 3, where patches of younger second growth trees occur, thin trees to appropriate spacing/basal area based on site encountered. For moist Douglas-fir sites, thin trees to 3 to 10 foot crown spacing (100 to 160 basal area per acre; 35 to 55 trees per acre); for dry Douglas-fir sites, thin trees to 10 to 25 foot crown spacing (80 to 140 ft^2 basal area per acre; 30 to 45 trees per acre). Select trees from various crown classes (intermediate, codominate, dominate) as leave trees to create as much stand diversity as possible.

(d) In all situations, where healthy pine seed trees are encountered (18 inches dbh or greater) on west and northwest slopes group selection openings (1/5th to 1 acre in size) may be created to maintain the health of the pines and to encourage pine regeneration.

Douglas-fir and Pine Pole Stands (5 to 11 inch dbh): Thrifty, young stands with good crown ratios (30% or more) on cool, moist sites would be thinned to a 3 to 15 foot crown spacing. Dense, decadent pole stands on dry sites would also be thinned to a 3 to 15 foot crown spacing when possible, except that all trees with poor crown ratios (30% or less) and dying trees would be targeted for removal, resulting in a more patchy distribution of remaining trees.

(2) Commercial Harvest Methods - Trees designated for removal as a result of application of the forest stand prescriptions described above would be moved from forest stands to landing areas using a combination of helicopter, cable, and tractor yarding methods.

(a) Helicopter Yarding: lifts trees bunched together by a cable, moving the trees from the treatment unit to a landing area near a road. Helicopter yarding allows for full suspension of the trees from the treatment unit to the landing area and does not create skid trails or corridors.

Existing helicopter landings would be used whenever possible. Landings shall not exceed one acre in size. The actual shape of the landing depends on the specific site location. Existing landings may need to be improved; improvements include the removal of encroaching vegetation, widening of clearing limits to meet safety regulations, and smoothing the landing surface. Landings would be treated as described in the Project Design Features later in this chapter for helicopter landings. Helicopter landings would be located on stable locations only. Where possible, landings would be located on ridges or in saddles. One new landing is located on the proposed road construction and would be incorporated into the new road construction design.

(b) Skyline Yarding: drags trees with one end suspended, and one end on the ground, up the

slope to a landing area on or near a road. This requires narrow skyline corridors about every 200 feet, and parallel to each other, through the treatment unit to operate the skyline cable. Corridors are about 9 to 15 feet wide, depending on the size of trees to be removed and the terrain, and are pre-located and approved by the BLM. Trees removed are end-lined (dragged) to the corridor.

(c) ***Tractor Yarding:*** utilizes tractors to drag trees to landing locations. Tractor yarding only occurs on lands with less than 35 percent slopes. This method requires narrow skid trails (about 9 to 12 feet wide). Skid trail locations are approximately 150 feet apart, but vary depending on the site-specific terrain, and are pre-located and approved by the BLM sale administrator. Pre-located skid trails minimizes the area of ground a tractor operates on, thus, minimizing soil disturbance

(3) Fuels Reduction -Although fuels reduction is not the primary purpose for every stand treatment proposed, fuels reduction is an important component and project design feature incorporated into the proposed action. ***Commercial forest thinning would be followed by post treatment fuels reduction.*** This involves cutting and disposing of small diameter (sub-merchantable) trees that are contributing to ladder fuels, along with cutting, piling, and burning of slash created from forest thinning. Post harvest evaluations would determine the extent and method (hand pile and burn versus underburning) of treatments needed. The majority of units would be handpiled and burned then maintained with underburning (see followup maintenance underburning below). The fuels reduction component of this project is best described in three categories: surface fuels, ladder fuels, and crown fuels. The following describes each of these categories:

(a) Surface fuels include dead and downed wood on the forest floor and understory vegetation (shrubs and small trees ten feet tall or less). This component of forest structure is managed to reduce the intensity of surface fires. The higher the fire intensity and the higher the flame lengths, the greater the potential for a crown fire to be initiated. By treating the surface fuels, the intensity of surface fires is reduced, along with the potential for crown fire initiation and the severity (fire effects) of wildfire on forested stands.

(b) Ladder fuels include vegetation (live and dead) that span between the surface fuels and the canopies of trees that would allow for the vertical spread of fire from the forest floor into tree canopies, initiating a crown fire. The thinning of understory vegetation (shrubs, small conifers, and some hardwoods) and smaller diameter conifer trees to meet forest health prescriptions will also reduce fuel ladders reducing the likelihood of crown fire initiation within the forest stands treated.

(c) Canopy fuels include the portion of the forest canopy interacting in the crown fire process. As forest stands are thinned to reduce densities for the purpose of improving tree vigor, crown fuels are also reduced. Thinning prescriptions vary by alternative, depending on the function of each alternative.

(4) Non-commercial thinning - is used to accomplish forest health thinning and fuels reduction treatments in conifer forest, woodlands, and shrublands. Non-commercial thinning consists of cutting small trees (generally less than 8 inches diameter) and vegetation with chainsaws and disposing of the material by handpiling and burning or use of a lop and scatter method in lighter fuels. This practice is often referred to as ***pre-commercial thinning*** when associated with young conifer forest thinning.

Conifer Dominated Communities with Hardwoods
Applies to all pre-commercial thinning areas (also known as young conifer stand thinning)

Thin conifer trees 2-feet tall and taller to the following spacings:

- Trees up to 2 inches DBH – 12-foot spacing;
- Trees 2 to 4 inches DBH - 16-foot spacing;
- Trees 4 to 8 inches DBH – 25-foot spacing.
- (Lop trees up to 2-feet in height to a 6 X 8-foot spacing)

The spacing of non commercial trees is independent of trees 8 inches DBH and larger. When spacing trees of different diameter classes, use the spacing for the smaller diameter class. For example, if a 2-inch DBH tree must be left next to a 5 inch DBH tree, the spacing distance would be 10-feet.

When considering a group of trees for thinning, select leave trees by the following order of species preference, sugar pine, knobcone pine, ponderosa pine, incense cedar, Douglas-fir, and white fir.

Select trees for leave with good form and vigor (non-chlorotic) that are free of disease, fire damage, cankers, or blister rust.

When canopy closure is 90 to 100% for trees 8 inches DBH and larger, cut all understory, suppressed trees less than 8 inches DBH with live crown ratios of less than 30%.

Thin madrone trees less than 10 inches diameter to 45 by 45 foot spacing; thin all other hardwoods less than 6 inches diameter to a 35 by 35 foot spacing;

When acceptable leave trees are not available, shrub clumps at least one foot high and 3 to 10 feet in crown diameter shall be selected as leave vegetation.

Pine and Black Oak Woodland

Applies to units 20-1, 20-2, 20-3 in section 20.

Target Plant Community: Conifer/hardwood mix on south slopes within the boundary of the Star Gulch fire of 1987. These units now have a mix of conifers, (low stocking) hardwoods, (Pacific madrone and black oak) and brush species such as deerbrush ceanothus, buck brush and manzanita. High densities are evident and due to post fire sprouting.

Goals

1. Reduce fuels and hence fire hazard adjacent to conifer stands.
2. Promote a mix of more mature hardwoods and conifers (black oaks and ponderosa pine).
3. Maintain Historic Hardwood and Conifer Species

This prescription is intended to reduce fuel hazard and promote growth of hardwoods and conifers by thinning hardwood stems in clumps and singly and by thinning the conifers where found. Brush species will be reduced primarily when competing with tree species.

Prescription Objectives

1.Any species of conifer, hardwood or brush considered as rare (less than 5% coverage) within the entire unit shall be left.

2. Slash all conifers when growth is suppressed in overstocked areas.

3. Slash multiple stem madrones less than 12 inches dbh, leaving one or two of the healthiest stems per clump while maintaining 20 foot spacing or maximum canopy. Black Oak will generally not be cut unless competing with itself at high densities. Trees selected for removal will usually be small and suppressed. Space off of all trees and shrubs not designated for slashing 15' to 20'. Leave trees shall include primarily singles, however, clumps and groups shall also be considered as leave trees for spacing.

4. Spacing of conifer leave trees will be variable depending on size. Thin to allow room for long term growth typically, 12-20 foot spacing. Favor pine where possible. Madrone will be retained when codominant and oak or pine are not present. Thin clumps to the most vigorous one or two stems.

Ponderosa Pine / White Oak / Buckbrush

Applies to Unit #15-1

Target Plant community Occasional open grown ponderosa pine and some white oak with dominant ground cover of buck brush. Douglas-fir dead/dying/declining in health from moisture/competition stress.

Goals

1. reduce fuels and fire hazard adjacent to private residences.
2. promote a species mix that includes ponderosa pine, white oak, less buck brush than now present and native grasses.

Prescription Objectives

This prescription is intended primarily to reduce fuel hazard in an area of high concern near residences. Brush species and dying Doug-fir will be reduced in numbers and continuity.

Removal of up to 10% white oak and black oak when suppressed
No removal of mountain mahogany or silk tassel
No removal of manzanita >12" single stem at one foot above ground.

In areas where pine or oaks or other reserve vegetation do not exist, leave clumps of shrubs with a 15 to 25 foot diameter spaced 45 to 55 feet apart.

Leave chaparral shall include primarily single shrubs; however, clumps and groups shall also be considered as leave shrubs. Leave chaparral shall be left as 15 to 25-foot diameter singles or groups spaced 45 feet to 55 feet apart.

Leave no large clumps within 50 feet of private property line.

Hardwood Woodland

Applies to units 9-1, 9-2, 21-1, 21-2, 21-3b & and 29-1 & 29-2

Target Plant Community: the full range of woodlands with oak and other hardwood components.

The units in section 21 have some pine and a great deal of Douglas-fir encroachment, sometimes larger commercial sized trees are present. A mosaic of white oaks, deerbrush, buckbrush, and manzanita are found. Unit 28-29-1 has more madrone present.

Goal

1. Reduce fuels and hence fire-hazard in close proximity to private property.
2. Prepare units for follow-up underburning.
3. Create more open mosaic of historic vegetation.

Description
This prescription is aimed at reducing fire-hazard within extended areas adjacent to public holdings. Depending on initial conditions, the resultant stands may be thinned hard, and show a large reduction in shrub and tree canopy. Underburning will be required for maintaining these sites in a low-fuel condition.

Prescription Objectives

Any species of conifer, hardwood or brush considered as rare (less than 5% coverage) within the entire unit shall be left.

1. Slash all Douglas-fir trees less than 8 inches dbh. Encourage pine vigor by thinning around pine and spacing appropriately.

2. Thin madrone less than 12 inches dbh, other hardwoods less than 6 inches and brush species to a 35 foot spacing. Hardwoods shall be favored over brush species. Less than 10% of the Oaks present will be cut. Trees selected for removal will be small and suppressed. Space off of all trees and shrubs not designated for slashing. Leave trees shall include primarily singles, however, clumps and groups shall also be considered as leave trees. Groups shall be left as 25 foot diameter 100 or more feet apart when available.

3. Select areas for No-treatment approximately 2-3 acres in size and scattered throughout the unit at 1 acre per 10 acres of unit size. Areas for No treatment shall be placed greater than 100 feet from the unit perimeter. These may be used for monitoring in the future.

4. Prune all conifers greater than 8 inches dbh up 10 feet in height. No girdling shall be used. Conifer, Hardwood and brush snags less than 6 inches dbh shall be felled.

(5) Follow-up Maintenance Underburning would involve the controlled application of fire to understory vegetation and downed woody material when fuel moisture, soil moisture, and weather and atmospheric conditions allow for the fire to be confined to a predetermined area at a prescribed intensity to achieve the planned resource objectives. Various ignition patterns are used depending on resource objectives and site and weather conditions. The most common ignition technique used is referred to as strip-head ignition. Beginning on the uppermost end of a unit along a control point such as a road or ridgeline, fire is ignited in narrow strips running along the

contour of the slope. Working down slope, strips are ignited at intervals and the fire burns upslope toward the previously burned strip of fuels. The speed at which fire is applied and the width between strips adjusts the intensity of fire to address variations in fuel conditions (amount, type, and moisture content), weather, and topography as needed to meet resource objectives.

Prescribed underburning usually occurs during late winter to spring when soil and duff moisture conditions are sufficient to retain the required amounts of duff, large woody material, and to reduce soil heating. Occasionally, these conditions can be met during the fall season.

To meet State air quality requirements, prescribed underburning would be implemented during periods of atmospheric instability (when weather disturbances are moving into or through the area) and air is not trapped by inversions on the valley floor. This allows smoke to be lofted up and away from the Rogue Valley. These atmospheric conditions are more frequent in late winter to spring.

Prescribed Fire Plans, also referred to as Burn Plans, must be completed prior to a planned fire ignition and approved by the Field Manager. Prescribed Fire Plans guide the implementation based on site-specific unit conditions (including fuel moisture and weather conditions) at the time of planned ignition, and provide for pre- and post-burn evaluation to monitor if the burn was carried out as planned and its effectiveness at meeting resource objectives. The Prescribed Fire Plan is an important tool for ensuring that project goals and objectives are met in a safe and carefully controlled manner.

Wildfire Suppression Assumptions Common to All Alternatives

The Bureau of Land Management has a master cooperative fire protection agreement with the Oregon Department of Forestry (ODF). This agreement gives the responsibility of fire protection of all lands within the project area to the Oregon Department of Forestry. This contract directs ODF to take immediate action to control and suppress all fires. Their primary objective is to minimize total acres burned while providing for fire fighter safety. The agreement requires ODF to control 94 percent of all fires before they exceed 10 acres in size.

Due to ownership patterns and political constraints in southwest Oregon, the use of wildfire to meet resource objectives is currently not possible. There are stipulations within the protection agreement with ODF that allows BLM to designate areas that require special fire management activities during suppression efforts in order to insure damage to resources are minimized. It is recognized that restrictions could increase the cost of suppression which the Bureau of Land Management would incur and would require a modification of the contract. During suppression activities on BLM lands the following guidelines would be followed:

- BLM resource advisors will be dispatched to fires which occur on BLM lands. These resource advisors are utilized to ensure that suppression forces are aware of all sensitive areas and to insure damage to resources is minimized from suppression efforts.
- When feasible, existing roads or trails will be used as a starting point for burn-out or backfire operations designed to stop fire spread. Backfires will be designed to minimize fire effects on habitat. Natural barriers will be used whenever possible and fires will be allowed to burn to them.
- In the construction of fire lines, minimum width and depth will be used to stop the spread of fire. The use of dozers should be minimized and resource advisors will be consulted when appropriate. Live fuels will be cut or limbed only to the extent needed to stop fire spread. Rehabilitation of fire lines will be considered.
- The felling of snags and live trees will only occur when they pose a safety hazard or will

cause a fire to spread across the fire line.

- The construction of helispots should be minimized. Past locations or natural openings should be used when possible. Helispots will not be constructed within riparian reserves, or areas of special concern.
- Retardant or foam will not be dropped on surface waters or on occupied spotted owl nests.
- Resource advisors will determine rehabilitation needs and standards in order to reduce the impacts associated with fire suppression efforts.

D. ECONOMIC DIFFERENCES IN ALTERNATIVES

Table 2-9:. Differences in cost of implementing timber harvest utilizing existing roads vs. newly constructed roads. This table shows differences without constructing new roads.

Road	Delete Unit # and (ac.)	Change tractor logging to helicopter (ac.)	Change cable logging to helicopter (ac.)	Increase flight distance (ac.)	Road construction cost	Increase in logging cost without new road access (first entry only)
38-3-32.0		1 ac	18 ac.	9 ac.	$7,000	$18,450
39-3-8.0	30B (86ac) 32 (2ac) 34 (36ac)			30 ac.	$ 35,000	$63,449
39-3-30.0			59 ac.	9 ac.	$14,000	$ 33,993
39-4-24.1			13 ac.	107 ac.	$14,000	$ 15,534
39-4-26.1			58 ac.	99 ac.	$ 42,000	$ 63,477
SUM	124 acres	1 acres	148 acres	254 acres	$112,000	$194,903

Tractor and cable logging costs were determined using the Pacific Northwest Logging Cost software. The helicopter logging costs were determined using Helipace software.

The changes in logging costs represent the savings during the one entry. All future commercial entries would have continued logging cost savings with no future construction cost. In addition to road construction and commercial logging costs, additional costs would be incurred for follow-up fuels treatments and young forest stand thinning.

E. PROJECT DESIGN FEATURES APPLICABLE TO THE PROPOSED ACTION

Project Design Features **(**PDFs) are an integral part of the project design for each alternative. PDFs include seasonal restrictions on many activities in order to minimize erosion and reduce disturbance to wildlife. PDFs also outline protective buffers for sensitive species, mandate the retention of snags, and delineate many measures for protecting Riparian Reserves throughout the project. Most PDFs reflect Best Management Practices and standard operating procedures.

The PDFs with an asterisk (*) are Best Management Practices (BMPs) to reduce nonpoint source pollution to the maximum extent practicable. BMPs are considered the primary mechanisms to achieve Oregon Water Quality standards. Implementation of PDFs in addition to establishment of Riparian Reserves would equal or exceed Oregon State Forest Practice Rules. BMP effectiveness monitoring would be conducted and where necessary, BMPs modified to ensure compliance with Oregon Water Quality Standards. The PDFs listed below apply to Alternatives B and C.

Riparian Reserves

Northwest Forest Plan (NWFP) Riparian Reserves are located on federal lands throughout the project area. A BLM stream survey crew conducted exhaustive surveys within the Deadman's Palm project area in order to ensure that all areas needing Riparian Reserve protection were identified. The survey crew assessed stream condition, documented the location of wetland and unstable areas, and determined whether stream channels were perennial, intermittent, or dry draws (USDA and USDI 1994:C30-C31). Existing stream maps were updated with the new information. For locations of Riparian Reserves, refer to the Riparian Reserve map in the EA file, available by request.

Riparian Reserve widths were determined site-specifically using the NWFP Standards and Guidelines (USDA and USDI 1994:C-30-31). Riparian Reserve widths in the Deadman's Palm project area are as follows:

- Fish streams: from 320' to 360' slope distance on each side of the stream.
- Perennial nonfish-bearing streams: from 160' to 180' slope distance on each side of the stream.
- Intermittent nonfish-bearing streams: from 140' to 180' slope distance on each side of the stream.
- Unstable and potentially unstable ground: the extent of the unstable and potentially unstable ground. For unstable and potentially unstable areas adjacent to dry draws: from 160 to 180' slope distance on each side of the draw.
- Springs, seeps and other non-stream wetlands less than one acre in size: 100' slope distance from the edge of the wetland and associated vegetation. This is an increase over the Northwest Forest Plan requirement that Riparian Reserves just extend to the edge of the wetland and associated vegetation for such areas.

<u>A. Applicable Harvest and Yarding Project Design Features (PDFs)</u>

1. Objective: Protecting Riparian Reserves

- No commercial harvest in Riparian Reserves. *
- No use of skid trails in Riparian Reserves. *
- No yarding corridors in Riparian Reserves. *
- Trees would be directionally felled away from Riparian Reserves. *

2. Objectives: Reducing or Eliminating Surface Soil Erosion and Soil Productivity Loss

- When operationally feasible, all units would be yarded in such a way that the coarse woody material remaining after logging would be maintained at or greater than current levels in order to protect the soil surface and maintain soil productivity. *
- Wherever trees are cut to be removed, directional felling away from dry draws and irrigation ditches would be practiced. Trees would be felled to the lead in relation to skid trails. *
- All tractor skid trail locations would be approved by the BLM Contract Administrator. Maximum area in skid trails would be less than 12%. Existing skid trails would be utilized when possible. Tractors would be equipped with integral arches to obtain one end log suspension during log skidding. Skid trail locations would avoid ground with slopes over 35 percent and areas with high water tables. The intent is to minimize areas affected by tractors and other mechanical equipment (disturbance, particle displacement, deflection, and compaction) and thus minimize soil productivity loss. *
- All skid trails would be waterbarred according to BLM standards. Main tractor skid trails would be blocked with an approved barricade where they intersect haul roads. The intent is to minimize erosion and routing of overland flow to streams by decreasing disturbance (e.g. unauthorized use by OHVs). *
- Tractor yarding would occur between June 15 to October 15 or on approval by the Contract Administrator. Some variations in these dates would be permitted dependent upon weather and soil moisture conditions. The intent is to minimize off-site erosion and sedimentation to local waterways.*
- For all cable yarding, maximum operational suspension would be maintained on slopes greater than 50 percent. Maximum operational suspension would be practiced to alleviate gouging and other disturbance on draw side slopes and headwalls. Minimum corridor widths (generally less than 15 feet in width) would be utilized to reduce soil productivity loss. Waterbars would be constructed manually on steeper slopes with higher erosion potential to direct water off the cable yarding corridors. *
- Skyline and tractor yarding would be avoided up and down dry draws. The intent is to minimize the occurrence of erosion and compaction in existing areas of concentrated surface or substrate flow. *

B. <u>Applicable Non-Commercial Manual Fuel Reduction Treatment Project Design Features</u>

1. Objective: Protecting Riparian Reserves

- Manual treatments would only take place in Riparian Reserves adjacent to short or long-duration intermittent streams. Vegetation treatments would *not occur* within 30 feet of long-duration intermittent streams (Table 1). *
- Riparian hardwood species such as willow, ash, maple, alder, and black oak would not be thinned.
- Down large woody debris over 16" diameter would not be damaged, driven over, or used for fire wood.
- Crossing stream channels or riparian areas with vehicles or equipment (including ATVs), would be limited to existing system roads shown on EA maps. *
- Piles would not be placed in channel bottoms. *

2. Objectives: Reducing or Eliminating Surface Soil Erosion and Soil Productivity Loss

- Vegetation would be thinned using manual techniques. Slash created by the project would be hand piled or lopped and scattered. No piling in dry draws would be allowed. *
- Old skid trails would not be opened or driven on without the approval of the authorized officer. Cut material would be placed on the running surface of old skid trails or jeep roads that are authorized to be used. *
- Old skid roads would not be treated near the intersections with system roads in order to provide a visual screen and discourage vehicular access.

Table 2-10: Riparian Reserve Buffer Distances for Non-Commercial Treatment Areas

Riparian Reserve Type	Manual treatments
Fish-bearing	Not allowed in RR
Perennial	Not allowed in RR
Long-duration intermittent	30' buffer
Short-duration intermittent	Where necessary (treating through is okay, as prescribed)
Springs/seeps/wetlands	Not allowed in RR
Unstable areas	Not allowed in RR

C. Applicable Prescribed Fire Project Design Features

1. Objective: Protecting Riparian Reserves

- With underburns, no ignition would occur within Riparian Reserves. Fire lines would be avoided in Riparian Reserves. *
- Pile burning would not occur in Riparian Reserves for fish-bearing or perennial streams, springs/seeps/wetlands, or unstable areas. Pile burning would not occur within 30 feet of long-duration intermittent streams or in short-duration intermittent channels (Table 2). No pile burning would occur in dry draws. *

Table 2-11: Riparian Reserve Buffer Distances for Prescribed Fire Treatment Areas

Riparian Reserve Type	Underburning	Pile burning
Fish-bearing	No ignition	Not allowed in RR
Perennial	No ignition	Not allowed in RR
Long-duration intermittent	No ignition	30' buffer
Short-duration intermittent	No ignition	No piles in the channel
Springs/seeps/wetlands	No ignition	Not allowed in RR
Unstable areas	No ignition	Not allowed in RR

2. Objective: Reducing or Eliminating Surface Soil Erosion and Soil Productivity Loss

- Underburns would be conducted only when a light to moderate burn can be achieved (spring-like conditions when soil and duff are moist).
- Firelines for underburns would be constructed manually on all slopes greater than 35 percent.
- Waterbars on tractor and hand firelines would be constructed according to District guidelines (USDI 1995:167).
- Piles would be dispersed across treatment areas. Piles would be burned when soil and duff moisture are high.

D. Applicable Road/Landing Construction and Renovation Project Design Features

1. Objective: Protecting Riparian Reserves

- No construction of new landings or expansion of old landings would be allowed in Riparian Reserves. *

2. *Objective: Reducing or Eliminating Surface Soil Erosion*

- Road and landing construction and renovation would not occur during the wet season (October 15th to May 15th) when the potential for soil erosion and water quality degradation exists. This restriction could be waived under dry conditions and a specific erosion control plan (e.g. rocking, waterbarring, seeding, mulching, barricading). All construction activities would be stopped during a rain event of 0.2 inches or more within a 24-hour period or if determined by the administrative officer that resource damage would occur if construction is not halted. If on-site information is inadequate, measurements from the nearest Remote Automated Weather Station would be used. Construction activities would not occur for at least 48 hours after rainfall has stopped and on approval by the Contract Administrator. *
- All new permanent roads would have eight inches of rock surfacing. *
- Landings would be treated to reduce soil erosion. Treatment of the running surface would be dependent on site conditions and would include one of the following: subsoil, till, or rip, then mulch and seed with native grasses or other approved seed; surface with durable rock material; or leave "as is" where natural rock occurs. *
- Bare soil due to road and landing construction/renovation would be protected and stabilized prior to fall rains. *
- Fill slopes on all new roads and landings would be seeded with native or approved seed, fertilized and mulched, except where rock occurs. No fertilizer would be applied within Riparian Reserves. *
- Slash would be windrowed at the base of newly-constructed fill slopes to catch sediment. *
- The temporary road would be mechanically decommissioned at the completion of log haul and site preparation. The road would be waterbarred and barricaded if use is not completed by October 15th. *
- In order to reduce the amount of road-related soil disturbance occurring in one season, decommissioning would occur the final dry season (usually May 15 to October 15) of the contract, while road construction and renovation would occur the first year of the contract. *
- All natural surface roads would be closed during the wet season. *

3. *Objective: Protecting Natural Discharge Patterns*

- Where possible, rolling grades and outsloping would be used on road grades that are less than 8%. These design features would be used to reduce concentration of flows and minimize accumulation of water from road drainage.
- Cross drain structures (culverts, water dips, waterbars) would be installed at intervals not greater than the spacing distances identified in the RMP (USDI 1995:177) for soil erosion class and road gradient.
- Armored splash pads (e.g. rock material) would serve as energy dissipaters at cross drain outlets or drain dips where water is discharged onto loose material, erodible soil, or steep slopes.

4. *Objective: Eliminate Chemical Water Pollution*

- No fertilizer would be applied within Riparian Reserves. *

E. <u>Applicable Culvert Installation Project Design Features</u>

1. *Objectives: Protecting Stream Banks and Stream Channel Integrity*

- Road approaches at all stream crossings would be as near a right angle to the stream as possible to minimize disturbance to streambanks and riparian habitat. *

2. *Objective: Reducing or Eliminating Surface Soil Erosion*

- Fill material over stream crossing structures would be stabilized as soon as possible after construction has been completed, before October 15. Exposed soils would be seeded and mulched. Work would be temporarily suspended if rain saturates soils to the extent that there is potential for environmental damage, including movement of sediment from the road to the stream. *
- Waste stockpile and borrow sites would not be located within Riparian Reserves. *

3. *Objective: Eliminating Water Pollution from Contaminants*

- During construction of instream structures the contractor would be responsible for meeting all state and federal requirements for maintaining water quality. Standard contract stipulations would include the following:
  - Heavy equipment would be inspected and cleaned before moving onto the project site in order to remove oil and grease, noxious weeds and excessive soil. *
  - Hydraulic fluid and fuel lines on heavy mechanized equipment must be in proper working condition in order to avoid leakage into streams. *
  - Waste diesel, oil, hydraulic fluid and other hazardous materials and contaminated soil would be removed from the site and disposed of in accordance with DEQ regulations. Areas that have been saturated with toxic materials would be excavated to a depth of 12 inches beyond the contaminated material or as required by DEQ. *
  - Equipment refueling would be conducted within a confined area outside Riparian Reserves. *
  - Use spill containment booms or other equipment as required by DEQ. *
  - Equipment containing toxic fluids would not be stored in or near (within 300') a stream channel anytime. *

F. <u>Applicable Hauling Project Design Features</u>

1. *Objective: Reducing or Eliminating Surface Soil Erosion*

- A seasonal hauling restriction would be required on natural surfaced roads during October 15th to May 15th. This would protect the road from damage and decrease the amount of sedimentation that would occur. Some variations in these dates would be permitted dependent upon weather and soil moisture conditions of the roads.
- Hauling would be restricted on surfaced roads during November 15th to April 15th.
- Dust abatement would include water, lignin, magnesium chloride, or bituminous surface treatment (BST).

G. <u>Applicable Road Decommissioning Project Design Features</u>

1. *Objective: Reducing or Eliminating Surface Soil Erosion*

- Some road sections proposed for natural decommissioning have significant amounts of naturally generated trees, brush, and downed wood that are beneficial for long-term erosion control. This material would be preserved as much as possible but the priority would be to convert all existing man-made drainage structures such as ditches, culverts and dips to a long-term no maintenance drainage configuration such as large dips, outsloped road surface, and well drained, high-capacity waterbars. Barricades, additional planting, seeding (with native or approved seed), and mulching would be done as needed to reduce erosion. Open areas would be ripped where feasible.*
- The primary objective for roads proposed for mechanical decommissioning is to establish a stable, long term drainage configuration that would be self-maintaining. Existing road drainage structures such as ditches, culverts and dips would be replaced with a long-term no maintenance drainage configuration such as large dips, outsloped road surface, and well drained, high-capacity waterbars. Barricades, additional planting, seeding (with native or approved seed) and/or planting, and mulching would be done as needed to reduce erosion. The road surface would be ripped to the extent feasible without compromising the cross drainage. *
- Decommissioned roads would be waterbarred on each side of stream crossings in order to adequately filter road surface runoff and minimize sediment transport to streams. *
- In order to reduce the amount of road-related soil disturbance occurring in one season, decommissioning would occur the final dry season (usually May 15 to October 15) of the contract, while road construction and renovation would occur the first year of the contract. *
- Unless specifically designated, OHV use on decommissioned roads would be discouraged by placement of woody material or other appropriate barriers.

H. <u>Applicable Decommissioning Culvert Removal Project Design Features</u>

1. Objective: Reducing or Eliminating Surface Soil Erosion

- Instream work period for Ladybug Gulch and its perennial tributary would be from August 15 - September 15.
- During instream work, perennial streams would be diverted around each work area in a manner (e.g. a pipe or lined ditch) that would minimize stream sedimentation, unless the Field Office biologist approves a deviation from this practice (i.e. if the stream is just a trickle and too small to physically divert). The contractor would be required to submit a plan for water diversion before instream work begins. The diverted stream would not be returned to the channel through the project area until all instream work had been completed. If it is impractical to dewater a stream channel, the work would be scheduled toward the end of the instream work period. *
- The use of settling ponds, straw bales, geotextile fabric or coconut fiber logs/bales would be used to reduce movement of sediment downstream from the project site. *
- Excavated material from removing stream crossings would be removed from the stream crossing area and placed in a stable location. Stream side slopes would be reestablished to natural contour then seeded (with native or approved seed) and mulched. *
- Sediment trapping materials (such as straw bales) would be placed at the toe of the stream adjacent side slopes.
- Streambanks would be seeded (with native or approved seed), mulched, and planted (with native tree species) to stabilize exposed soils as soon as possible after construction has been completed, before October 15. Work would be temporarily suspended if rain saturates soils to the extent that there is potential for environmental damage, including movement of sediment from the road to the stream. *
- Waste stockpile sites would not be located within Riparian Reserves. *

I. Applicable Fuel Transport Project Design Features

If more than 100 gallons of fuel would be transported to a project site, the following precautions would be implemented.

1. *Objective: Eliminating Water Pollution from Contaminants*

- Provide for immediate notification in the event of a spill. A suggested PDF is to have a radio equipped vehicle lead the chemical or fuel truck to the project site. This precaution also reduces the risk of the transport truck becoming lost – a common factor in spill incidents.
- Plan a safe route and transfer sites that could contain the transported volume.
- Have an active dispatch system that can relay the information to appropriate resources.
- Have spill clean-up equipment readily available and pre-select deployment sites.
- Have a water user contact list with address and phone numbers.
- Have a spill notification list that includes DEQ and spill clean-up contractors.
- Pre-estimate travel times through the watershed to predict downstream arrival times.
- Be prepared for appropriate water sampling. This includes supplies and site locations.

J. Maintaining Forest Stands

- In pine series forests where the single tree and group selection methods are used, logging slash should be handpiled outside of the driplines of individual pine trees and burned (swamper burning). This site preparation treatment should also be used in the areas marked for heavy mistletoe mortality and in areas where hardwoods may have been harvested so that early seral species can be planted. Prescribed, fall or spring under burning is an option in the pine series forest stands in order to reduce slash and fuel loading while preparing suitable seedbeds for reproduction. All prescribed burns should be performed when moisture conditions are high enough and prescription windows are at a level so that no more than 50% of the mound depth/duff layer around pine trees is consumed during burning. In addition no more than 25% of the pine tree live crown should be scorched for trees 8 inches DBH and larger. Cool burns are needed so that tree roots and foliage are not killed, stressed or damaged in a manner which predisposes pine to bark beetle infestation.
- In moist and dry Douglas-fir units where only commercial thinning is performed, logging slash should be lopped and scattered if the tree tops are removed. If tops are not removed the slash should be handpiled and burned (swamper burning). Prescribed burning would benefit some Douglas-fir timber stands that have dense mats of grass or shrub species.
- After timber harvest, non-merchantable trees with undesirable silvicultural characteristics should be slashed. In areas where precommercial thinning is prescribed, all non-merchantable trees should be cut <u>except</u> the largest live conifer trees that meet the following criteria:

1) Minimum 4-inch terminal leader with at least the top 40 % of the tree containing live limbs.

2) Non-chlorotic, light or dark green with very little or no yellowish tint.
3) Undamaged top.
4) Free of visible disease, cankers, fire damage, or blister rust.
5) Demonstrates good form and vigor.
6) No multiple tops or ramiforms.

- In the absence of conifers that meet the above definition for an acceptable crop tree, include any live conifer seedling that is at least three (3) feet tall that falls within the spacing guidelines.

- In the absence of conifer trees, hardwoods will be considered acceptable crop trees. The order of preference will be bigleaf maple, Oregon ash, willow species, any oak species, and Pacific madrone. Space the acceptable conifer and hardwood trees at a variable spacing (12 to 18 feet).

- In all prescription areas, 1/7-acre in size and larger, where overstory trees were marked to release healthy, Douglas-fir seedlings through saplings, the natural regeneration would be precommercially thinned. Seedlings (0-2 inches DBH) should be thinned to a 12 x 12-foot spacing; saplings (2.1 to 4 inches DBH) to an 20 x 20-foot spacing; and poles (4.1 to 7 inches DBH to a 25 x 30-foot spacing.

- Throughout the entire project area, all saplings through pole (7 inch DBH and smaller trees) timber should be slashed within the dripline of the old-growth trees that were released with the 15 to 25-foot crown space.

K. Noise Reduction Project Design Features

Noise disturbance to local residents would be partially mitigated by regulating operating hours, day, and seasons through portions of the project area. Generally, any helicopter logging closer than ½ mile of a residence would be restricted to an operating period of 8:00 AM to 5:00 PM, Monday through Friday. Any helicopter logging located ½ to one (1.0) mile from a residence would be restricted to an operating period of 6:00 AM to 6:00 PM, Monday through Saturday; and no operating time restrictions would be enforced when helicopter operations are greater than one (1.0) mile from a residence.

L. Protection of Terrestrial Wildlife Project Design Features

Threatened/Endangered Wildlife

Northern Spotted Owl

Disturbance

a. Work activities that produce noise above ambient levels will not occur within specified distances (see table below) of any nest site or activity center of known pairs and resident single between 1 March and 30 June (or until two weeks after the fledgling period) unless protocol surveys have determined the activity center to be not occupied, non-nesting or failed in their nesting attempt.

Table 2-12: Northern Spotted Owl Operating Restrictions

Type of Activity	Zone of Restricted Operation
Blast of more than 2 pounds of explosive	1 mile
Blast of 2 pounds or less of explosive	360 feet
Impact pile driver, jackhammer, or rock drill	180 feet
Helicopter or single-engine airplane	360 feet
Chainsaws	195 feet
Heavy Equipment	105 feet

b. Prescribed burning during the nesting season within 0.25 miles of occupied habitat would be dependent upon area biologist review and concurrence. The Service will be notified of all such occurrences.

Habitat

Tree felling and yarding will not occur within 0.25 miles of any **known** nest site or activity center from March 1- September 30, unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in a nesting attempt. Waiver of the seasonal restriction is valid until March 1 of the following year.

Pre-commercial thinning projects in suitable owl habitat will be subject to biologist review of units after initial timber harvest completion. PCT work in suitable habitat may be cancelled if understory trees are needed to provide an element of suitable owl habitat.

Wildlife Trees and Dead and Down Material

Reserve from harvest a minimum of 3 snags greater than 17" DBH per acre where available. Retention of all snags greater than 17 inches DBH within the interior of the stands would mitigate impacts to cavity-dependent species. Do not target large, broken-top trees and large snags with loose bark for removal. Retain and protect these structures where possible.

Cooper's Hawk Nest

A Cooper's hawk nest has been located within the project area in Section 17. The nest tree will receive a no-treatment buffer and a seasonal restriction for disturbance as required in the RMP. A seasonal restriction on disturbance activities will be in effect from March 1 until July 15.

Special Status Species

All applicable Standards and Guidelines of the NWFP are incorporated by reference. Surveys for species identified under the Special Status Species program of the NFP ROD/FSEIS have been conducted for the proposed project area.

Bats – Mine Adit Protection

A mine adit has been located in the SE ¼ of Sec. 25. This adit has not been surveyed for bat use; however it would be assumed that it is occupied and would be protected with a 250-foot buffer. Any additional mine sites that are found would also receive this protection. Appropriate seasonal restrictions would be implemented if needed to reduce disturbance to bats November 1 through September 15 to protect the bats during reproductive and hibernation periods.

Non-commercial Woodland and Shrubland Units

Whenever operationally possible, do not cut or burn units during the height of the spring reproductive period, April 1st through June 30$^{th.}$ This is recommended to lessen short-term effects on nesting birds and other wildlife species during reproductive periods.

Mollusc Buffers

All areas proposed for treatment were surveyed for special status mollusc species. Two sites were found and will receive no-treatment buffers designed to protect microsite conditions including shade and undisturbed forest floor. Locations of the sites are in sections 13 and 15.

Siskiyou Mountains Salamander Reserves

Approximately 289 acres of occupied Siskiyou mountains salamander habitat have been delineated and would be designated as strategic no-treatment areas. This protection is to ensure that the substrate remains intact, and that sufficient tree canopy remains to assure microclimatic conditions are not altered.

M. Protection of Botanical Resources Project Design Features

Special status plant species (Table 2-13)

1. Federal listed, State listed, Bureau Sensitive, and Bureau Assessment species within proposed treatment areas would be protected by establishing variable radius botanical reserves. Botanical reserve boundaries will be based on evaluation of species habitat needs, assessment of site and micro-site conditions, and impact of proposed treatments.
2. Conservation or mitigation measures for Bureau Tracking species is discretionary based on evaluation of species rarity, distribution, and sensitivity to proposed treatments.
3. In commercial units no timber harvest will occur within reserve boundaries and trees will be directionally felled away from reserve edges.
4. Precommercial thinning may occur during the dormant season (varies based on species) within reserves for species that are adapted to more open light conditions (see Reserve specifications in Table 2-10 & 2-11). No piles or slash within reserves.
5. In fuels units slashing of fuels may occur within reserves between July 1st and March 15th (during the dormant season). All slashed material will be piled outside the flagged reserve.

Table 2-13: Project design features for populations of Bureau special status species within proposed treatment areas in the Deadman's Palm project.

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-03W	9	2486B-1A	CYFA	494292	4670473	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			100	No treatment
39S-03W	9	2486B-1B	CYFA	494175	4670460	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			100	No treatment
39S-03W	15	2396B	TRCRC	495850	4668702			PCT	Fuels	30	Fuels treatment OK between 7-1 and 3-15. No piling.
39S-03W	17	2667B	EUVI8	493661	4668826	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			60	No commercial harvest.
39S-03W	17	2666B	EUVI8	493567	4669020	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			60	No commercial harvest.
39S-03W	17	206	EUVI8	493050	4669682	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		40	No commercial harvest. PCT OK 10-1 to 5-30. No piling/burning.
39S-03W	17	143	ZIFO	493077	4669518	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			60	No commercial harvest.
39S-03W	17	134	ZIFO	494045	4669042	Pine Site	Pine Site			80	No commercial harvest.

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-03W	17	140	ZIFO	493559	4669793			PCT		80	No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.
39S-03W	18	185	EUVE	491237	4669644	MOIST DOUGLAS FIR	MOIST DOUGLAS FIR	PCT		80	No treatment
39S-03W	18	2670B	FAPU	492053	4668984	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		80	No commercial harvest. PCT OK. No piling/burning.
39S-03W	18	2427B	FAPU	490926	4668690	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		80	No commercial harvest. PCT OK. No piling/burning.
39S-03W	18	2669B	ZIFO	491880	4669404	Pine Site	Pine Site	PCT		60	No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.
39S-03W	18	2671B	ZIFO	492053	4668984	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		80	No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-03W	18	2367B	ZIFO	491724	4668789	Pine Site	Pine Site	PCT		60	No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.
39S-03W	19	2340B	CRLA10	492483	4667257	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			80	No treatment
39S-03W	19	2341B	EUVE	492483	4667257	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			80	No treatment
39S-03W	19	2342B	RACA	492186	4667289	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			60	No commercial harvest.
39S-03W	19	2709B	ZIFO	492170	4668140	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			60	No commercial harvest.
39S-03W	18	2567B	TRLE6	491499	4669452	MOIST DOUGLAS FIR	MOIST DOUGLAS FIR	PCT		100	No treatment
39S-03W	20	3986	EUVE	492682	4667120	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			80	No treatment
39S-03W	20	2339B	FAPU	492512	4667158	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			80	No commercial harvest.
39S-03W	20	3988	FAPU	492829	4667162	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			80	No commercial harvest.
39S-03W	20	ML02	FAPU	492629	4667040	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			60	No commercial harvest.

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-03W	20	1	RACA	492512	4667043	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			60	No commercial harvest.
39S-03W	20	2371b	RACA	493695	4667403	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		60	No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.
39S-03W	20	2372B	RACA	493582	4667323	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		60	No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.
39S-03W	20	2371B	RACA	493695	4667403	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		60	No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.
39S-03W	21	3992	FAPU	494558	4667924				Fuels	100	Fuels treatment OK between 7-1 and 3-15. No piling.
39S-03W	28	1-28-CYFA	CYFA	494425	4666526	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			100	No treatment

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-03W	28	1-28-ISST2	ENST	494100	4666580	DRY DOUGLAS FIR	DRY DOUGLAS FIR			80	No commercial harvest
39S-03W	28	1C-28-FEEL2	FEEL2	494350	4666565	DRY DOUGLAS FIR	DRY DOUGLAS FIR			100	No commercial harvest.
39S-03W	28	1A-28-FEEL2	FEEL2	494447	4666590			PCT		100	No commercial harvest. PCT OK 10-1 to 5-30. No piling/burning.
39S-03W	29	2379B	EUVI8	492919	4665640	LATE SERAL EMPHASIS 40%+	LATE SERAL EMPHASIS 40%+	PCT		60	No commercial harvest. PCT OK 10-1 to 5-30. No piling/burning.
39S-03W	29	2378B	EUVI8	493274	4666111			PCT		50	No commercial harvest. PCT OK 10-1 to 5-30. No piling/burning.

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-03W	29	2380B	ZIFO	492919	4665640	LATE SERAL EMPHASIS 40%+	LATE SERAL EMPHASIS 40%+	PCT		60	No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.
39S-03W	29	2646B	FEEL2	493592	4666487	LATE SERAL EMPHASIS 40%+	LATE SERAL EMPHASIS 40%+	PCT			No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.
39S-03W	30	148	EUVI8	491313	4666415	POLES	POLES	PCT		40	No commercial harvest. PCT OK 10-1 to 5-30. No piling/burning.
39S-03W	30	145	EUVI8	491050	4666096	POLES	POLES	PCT		40	No commercial harvest. PCT OK 10-1 to 5-30. No piling/burning.

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-03W	30	147	EUVI8	490905	4666482	POLES	POLES	PCT		40	No commercial harvest. PCT OK 10-1 to 5-30. No piling/burning.
39S-04W	12	2632B	FEEL2	490398	4671132	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			60	No commercial harvest
39S-04W	12	2637B-1	TRLE6	490271	4670606	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			100	No commercial harvest.
39S-04W	12	2637B-3	TRLE6	490057	4670582	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			100	No commercial harvest.
39S-04W	13	2434B	CYFA	490067	4669062	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			120	No treatment
39S-04W	13	2432B	FAPU	490471	4669373	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			75	No commercial harvest
39S-04W	13	2430B	RACA	490836	4668771	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		80	No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.
39S-04W	13	2433B	ZIFO	490468	4669384	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			75	No commercial harvest.

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-04W	13	2429B	ZIFO	490836	4668771	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		80	No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.
39S-04W	15	152	CYFA	487081	4669029	LATE SERAL EMPHASIS 60%+				120	No treatment
39S-04W	15	2417B	RACA	487288	4669602	Pine Site	Pine Site	PCT		60	No commercial harvest. PCT OK 7-1 to 3-15. No piling/burning.
39S-04W	15	2533B	CYFA	486468	4669982	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		100	No treatment
39S-04W	16	2445B	CYFA	485778	4669855	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		120	No treatment
39S-04W	16	2448B	CYFA	485709	4669570			PCT		120	No treatment
39S-04W	16	2446B	CYFA	485663	4669667	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			120	No treatment
39S-04W	16	2450B	CYFA	485746	4669109	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			120	No treatment
39S-04W	16	2451B	CYFA	485494	4668669	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			120	No treatment
39S-04W	16	2444B	CYFA	485522	4669098	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			120	No treatment
39S-04W	16	2704B	TRLE6	485800	4669534	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			80	No commercial harvest.

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-04W	16	2447B	TRLE6	485750	4669667	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		120	No commercial harvest.
39S-04W	22	600	CYFA	486973	4667543	MOIST DOUGLAS FIR	MOIST DOUGLAS FIR			100	No treatment
39S-04W	22	2541B	CYFA	486795	4667906	MOIST DOUGLAS FIR	MOIST DOUGLAS FIR			100	No treatment
39S-04W	22	156	CYMO2	487419	4668007	Pine Site	Pine Site	PCT		100	No treatment
39S-04W	22	158	CYMO2	486907	4668040	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			100	No treatment
39S-04W	22	5056	CYMO2	487223	4667782	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		100	No treatment
39S-04W	22	5053	CYMO2	486865	4667625	MOIST DOUGLAS FIR	MOIST DOUGLAS FIR			100	No treatment
39S-04W	22	181	SELAH	487129	4667167	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		50	No treatment.
39S-04W	23	23-2A-CYFA	CYFA	487875	4667658	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			100	No treatment
39S-04W	23	23-3A-CYFA	CYFA	487980	4667680	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			100	No treatment
39S-04W	23	23-3-CYMO	CYMO2	487875	4667658	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			100	No treatment
39S-04W	23	23-1A-EUVI	EUVI8	488122	4667778	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		40	No commercial harvest. PCT OK 10-1 to 5-30. No piling/burning.
39S-04W	23	23-3-LETE13	LETE13	487689	4667323	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		80	No treatment.
39S-04W	23	23-1-LETE13	LETE13	488388	46668578	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		100	No treatment.

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-04W	23	23-1A-C-SELAH	SELAH	487906	4668589	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		40	No treatment.
39S-04W	24	2-24-CRMI	CRMI4	489956	4667443	DRY DOUGLAS FIR	DRY DOUGLAS FIR			80	No treatment
39S-04W	24	8-24-FAPU	FAPU	489893	4667426	DRY DOUGLAS FIR	DRY DOUGLAS FIR	PCT		25	No commercial harvest. PCT OK. No piling/burning.
39S-04W	24	1-24-FAPU	FAPU	490640	4668548	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		25	No commercial harvest. PCT OK. No piling/burning.
39S-04W	24	2-24-FAPU?	FAPU	490425	4667104	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		25	No commercial harvest. PCT OK. No piling/burning.
39S-04W	24	1-24-FEEL	FEEL2	490550	4667630	LATE SERAL EMPHASIS 40%+	LATE SERAL EMPHASIS 40%+	PCT		100	No commercial harvest. PCT OK 10-1 to 5-30. No piling/burning.
39S-04W	24	2-24-FEEL2	FEEL2	490635	4667662	POLES	POLES	PCT		100	No commercial harvest. PCT OK 10-1 to 5-30. No piling/burning.

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-04W	24	J1-24-FEEL2	FEEL2	490268	4667920			PCT		100	No commercial harvest. PCT OK 10-1 to 5-30. No piling/burning.
39S-04W	24	J1-24-LECOH	LECOH2	490303	4667888			PCT		80	PCT OK. No piling/burning.
39S-04W	24	2-24-LETE	LETE13	490550	4667630	LATE SERAL EMPHASIS 40%+	LATE SERAL EMPHASIS 40%+	PCT		100	No treatment.
39S-04W	24	1-24-SEOB	SEOB	489501	4668335	DRY DOUGLAS FIR	DRY DOUGLAS FIR	PCT		10	No treatment.
39S-04W	25	25-2-CYFA	CYFA	490202	4665722	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		120	No treatment
39S-04W	25	25-4-CYMO	CYMO2	490560	4665826			PCT		120	No treatment
39S-04W	25	B1-25-FAPU	FAPU	489472	4667043	MOIST DOUGLAS FIR	MOIST DOUGLAS FIR	PCT		60	No commercial harvest. PCT OK. No piling/burning.
39S-04W	25	B1-25-HEST60	HEST60	489462	4667045	MOIST DOUGLAS FIR	MOIST DOUGLAS FIR	PCT		60	No treatment.
39S-04W	25	B1-25-SEOB	SEOB	489450	4667050	MOIST DOUGLAS FIR	MOIST DOUGLAS FIR	PCT		60	No treatment.
39S-04W	26	2513B	CYFA	488767	4666700	DRY DOUGLAS FIR	DRY DOUGLAS FIR	PCT		100	No treatment
39S-04W	26	2536B	CYFA	488978	4666194	DRY DOUGLAS FIR	DRY DOUGLAS FIR	PCT		100	No treatment
39S-04W	26	2511B	CYFA	488333	4666369	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		100	No treatment

Town Range	Section	ID	Species code	UTM X	UTM Y	Alternative B RX	Alternative C RX	PCT RX	Fuels RX	Reserve Width	Reserve specifications
39S-04W	26	2535B	CYFA	488345	4665937	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		60	No treatment
39S-04W	26	25-1-CYFA	CYFA	489098	4666538	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		100	No treatment
39S-04W	26	613	CYFA	487660	4666579	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			100	No treatment
39S-04W	26	2537B	CYFA	488496	4665783	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		60	No treatment
39S-04W	26	150	CYFA	487887	4666105	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			100	No treatment
39S-04W	26	151	CYFA	487963	4666564	DOUGLAS FIR REGEN	DOUGLAS FIR REGEN	PCT		100	No treatment
39S-04W	26	CYFA01	CYFA	487912	4666500	DOUGLAS FIR REGEN	DOUGLAS FIR REGEN	PCT		100	No treatment
39S-04W	26	165	CYMO2	488454	4665855	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		60	No treatment
39S-04W	26	2510B	CYMO2	488477	4666451	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		100	No treatment
39S-04W	26	2512B	CYMO2	488684	4666383	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		100	No treatment
39S-04W	26	164	CYMO2	488566	4665624	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+	PCT		60	No treatment
39S-04W	26	162	CYMO2	488317	4666079	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			60	No treatment
39S-04W	27	615	CYFA	487104	4666572	DRY DOUGLAS FIR	DRY DOUGLAS FIR			100	No treatment
39S-04W	27	ML017	CYMO2	486992	4666228	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			120	No treatment
39S-04W	27	ML016	EUVI8	486992	4666228	LATE SERAL EMPHASIS 60%+	LATE SERAL EMPHASIS 60%+			120	No commercial harvest.
No treatment =No commercial harvest (timber removal), no PCT (Precommercial thinning), and no fuels treatment.											

To minimize the spread of noxious weeds

1. New roads, helicopter landings, and fill slopes would be seeded with native grasses or approved seed mixes.
2. Disturbed ground on decommissioned roads would be seeded with native grasses or approved seeds.
3. Burn piles would be evaluated to determine susceptibility to weed invasion and seeded when appropriate.
4. Heavy equipment would be cleaned of soil and vegetative material before moving onto the project site. Within the project area, equipment moving from a weed infested site to a non-infested site would be field washed.

CHAPTER III. AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

A. INTRODUCTION

This chapter presents a description of the anticipated effects of the proposed action along with the existing (baseline) physical, biological, human social and economic environment that may be affected by the Proposed Action. The discussion of Affected Environment describes the existing conditions within the Project and Planning Areas associated with the implementation of proposed actions and provides a basis for understanding the consequences associated with implementation of alternatives considered in detail. Only substantive site-specific environmental changes that would result from implementing the proposed action are discussed in this chapter. If an ecological component is not discussed, it should be assumed that the resource specialists have considered effects to that component and found the proposed action or alternatives would have minimal or no effects.

This chapter also describes the effects of implementing the action described in Chapter II. The Council on Environmental Quality (CEQ) regulations direct agencies to succinctly describe the environment that could be affected along with describing the importance of the impacts (40 CFR 1502.15).

For this discussion a direct effect on a resource is considered to be an immediate observable change that occurs at the time and place of project implementation. Indirect effects are changes caused by the action that occur later in time or are farther removed in distance but are still reasonably foreseeable

Within this Chapter, the terms "effect" and "impact" are used interchangeably. An effect/impact is described as any physical, biological, or human social change, which directly or indirectly results from implementation of an action being considered. Impacts may be adverse or beneficial, depending on the type of change and the resource being considered. The focus of this consequence discussion is on the relevant issues identified in Chapter I, and their associated environments.

Effects Assumptions

The current conditions on the lands affected by the proposed action result from a multitude of natural and human actions that have taken place over many decades. A catalogue and analysis, comparison, or description of all individual past actions and their effects which have contributed to the current environmental conditions would be practically impossible to compile and unduly costly to obtain. Ferreting out and cataloguing the effects of each of these individual past actions would be a time consuming and expensive task which will not add any clearer picture of the existing environmental conditions. Instead of incurring these exorbitant costs in terms of time and money it is possible to implement easier, more accurate, and less costly ways to obtain the information concerning past actions which is necessary for an analysis of the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions." (See definition of "cumulative impact" in 40 CFR § 1508.7.)

A description of the current state of the environment inherently includes the effects of past actions and serves as a more accurate and useful starting point for a cumulative effects analysis, than attempting to establish such a starting point by "adding" up the described effects of individual past actions. The importance of "past actions" is to set the context for understanding the incremental effects of the proposed action. This context is determined by combining the current conditions with available information on the expected effects of other present and reasonably foreseeable future actions. Here the cataloguing and

analysis of the effects of other present and reasonably foreseeable actions relevant to the effects of the proposed action is necessary, and has been described below. By comparing this total effect of the "no action" alternative to the effects described when adding the proposed action, we can discern the "cumulative impact" resulting from adding the "incremental impact" of the proposed action to the current environmental conditions and trends.

Watershed analysis, a component of the Aquatic Conservation Strategy developed under the Northwest Forest Plan and incorporated into the Medford District RMP, is a useful analysis for gaining an understanding of ecological processes and how those processes are functioning within a given watershed. Watershed analysis characterizes the human, aquatic, riparian and terrestrial features, conditions, processes, and interactions within a watershed. Knowledge gained through watershed analysis enhances the agency's ability to estimate direct, indirect, and cumulative effects of our management activities (Guide to watershed analysis p. 1). The 1998 Applegate –Star/Boaz Watershed Analysis provided a coarse filter analysis generally using existing data and information, but is useful in identifying issues of importance to analyze in greater detail during project specific analysis. Some issues identified during watershed analysis have been analyzed and addressed at broader scales in association with regional and land use plans, the link from this site specific project to these broader analyses have been noted where applicable in this Environmental Assessment.

Direct, indirect, and cumulative effects analyses completed for resources affected by the Deadman's Palm project, describe indicators of importance along with the spatial and temporal scale of importance (analysis area) for determining the effects of multiple actions (past, current, and reasonably foreseeable) on affected resources. As discussed above, the current condition assessed for each affected resource inherently includes the effects of past actions. For example:

- Road densities occurring within the planning area or various analysis areas and the attributes of the road system (surfaced or unsurfaced, location related to streams, slope position, general condition, etc.) are important for understanding the potential for cumulative effects of the proposed action. This information can easily be obtained from the Districts GIS system, aerial photos, and field reconnaissance. To catalogue each road by year of construction and name of the project would be irrelevant detail for understanding the incremental impact of the Deadman's Palm project when added to other past, present, and reasonably foreseeable future actions.
- Knowing whether a plantation was created in 1975 or 1985 and with what project does not contribute to knowing how that plantation will influence fire behavior, as fuel specialists recognize plantations as a certain fuel type and they are addressed accordingly in the analysis of fuel hazard mapping.
- Silvicultural information is obtained for stands within a planning area providing information on species composition, stand age, growth, vigor, and presence of disease and insects needed to prescribe treatments to maintain productive forest stands. Having the exact stand history does not lead to better silvicultural prescriptions and decisions and would be unnecessary detail.
- Information on vegetation structural components (tree size, canopy closures, snags and coarse woody material, etc.) and species composition can easily be obtained from aerial photography, silvicultural surveys, and vegetation and habitat data layers contained in GIS combined with on-the-ground reconnaissance. This information is used by wildlife biologists to assess current conditions from past actions and determine the effects of a proposal on various wildlife habitats and species.

For the reasons described above, this document does not contain a detailed catalogue (or chronology) of past actions, to do so would provide irrelevant detail and would not contribute to a better

understanding of conditions which are to be addressed through this analysis. Rather, the analysis of direct, indirect and cumulative effects contained in this EA focuses on cause and effect relationships deemed important for determining the impact on the environment which may result from the incremental impact of the Deadman's Palm Project when added to other past, present, and reasonably foreseeable future actions and whether or not there is potential for this proposal to contribute to significant cumulative effects beyond those addressed in programmatic land use plans.

The format for this chapter discusses issues, anticipated effects, past actions and environmental consequences by each major resource.

B. VEGETATION

This section discloses effects on vegetative composition and structure, insects and diseases. Noxious weeds are covered in the Botany section.

Issues/Concerns

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action. These effects may or may not occur as a result of the proposed action but were of concern to members of the public or ID team specialists.

- Density of forest stands are too high for long term forest health
- Declining vigor of forest stands
- Loss of shade intolerant species such as ponderosa pine and sugar pine

Affected Environment

The present day landscape pattern of the vegetation in the Deadman's Palm project area is a result of topography, fires, wind events, timber harvesting, and agricultural/residential land development. There is a natural diversity of vegetation condition classes within stands and between stands whose boundaries are generally dictated by slope, aspect and past disturbance. Aspect is an important determinant in vegetation changes. Ridges with westerly to southerly aspects and areas with shallow soils have severe growing conditions with shrubs and grasses dominating these sites. As a result, the majority of the timber stands are separated by grasslands, shrublands or oak woodlands. These influences create a coarse-grained pattern across the landscape with a mosaic pattern of different vegetation types and seral stages.

There is a total of 12,324 acres of federally-owned land in the Deadman's Palm project area. The project area is presently composed of the following vegetation types: grassland, 153 acres; shrubland, 404 acres; hardwood/woodland, 2,284 acres; seedlings/saplings (0 to 4.9 inches DBH), 1,761 acres; small conifer timber (5 to 11 inches DBH), 1,897 acres; large conifer timber (11 to 21 inches DBH), 4,276 acres; and mature timber, 1,549 acres.

Approximately 4,280 acres of forestland are in need of commercial thinning (45% of the total commercial forestland base). Most of the project area is below 5,000 feet elevation and is composed of dry Douglas-fir and pine tree series forest (35% of the forestland base). Grasslands, shrublands, and woodlands comprise 23 percent of the total project area. Only 12 percent of the forestland base is considered moist Douglas-fir site where large trees could persist for centuries. The forests in this area were created by fires in the nineteenth and early 20th centuries and only relatively small forest stands (approximately 5 to 160 acres) or clumps of trees with old-growth characteristics can be found. Riparian areas serve as corridors

of large diameter trees across the landscape such as along Star Gulch and the larger gulches that flow into it. The diverse topography and aspect changes tend to keep the forest stand size very small across the landscape. In most of the dry Douglas-fir and pine forest there is less than one old-growth tree per acre. One old-growth tree per acre does not necessarily make an old-growth forest. The sites are dry and not conducive to high stocking levels of old trees especially on south facing slopes.

Some of the forest lands within the Deadman's Palm project area have been previously harvested (14 percent of the project area is in an early seral stage). Natural mortality has also created openings in the canopy layer. Natural mortality is a result of Douglas-fir dwarf mistletoe, bark beetles and windthrow. The understory of these stands consists of dense pockets of conifer regeneration, hardwoods, and shrubs. The regeneration ranges from seedling to small pole size trees, with many of these trees being suppressed. These young stands would benefit from precommercial thinning.

In the project area, many of the commercial forest stands originated from fires between 1786 and 1932. Most of the forest stands became established within 10 years after a fire, although the harsher sites may have taken 30 to 40 years to become forested. Because the fires were forest-replacing in nature, individual timber stands now tend to be even-aged. This means that there are many trees of the same age class and almost equal in height, with few older trees scattered throughout. The majority of the trees in the project area are between 28 and 124 years old. However, there are 157 to 405 year old trees in fewer numbers. The oldest trees found were 474 and 500 years old. The age classes greater than 174 are the least frequently found. These older stands or patches of older trees are in the understory reinitiation stage of forest development and vertical stand structure is diverse. The oldest forest stands are found in riparian areas with north to east aspects.

There are some young, healthy forest stands (28 to 95 years of age) scattered among the older, overstocked stands. Some pole stands are suppressed and diameter growth is less than 1 inch per decade. These stands are still in the stem exclusion stage. These stands are characterized by a closed canopy and high stocking levels (sometimes more hardwoods than conifers) with many suppressed trees resulting in poor individual tree vigor. The average canopy closure for the Deadman's Palm project area is 92 percent and ranges from 34 to 100 percent. Some forest stands have been selectively logged, underburned by fire, commercially thinned or have suffered mortality from natural processes. These stands tend to be more diverse in species composition and vertical structure as a result of disturbance.

There are three tree series in the Deadman's Palm project area: Douglas-fir, ponderosa pine, and white oak. Plant association descriptions within these series can be found in Preliminary Plant Associations of the Siskiyou Mountain Province (Atzet and Wheeler, 1984) and Field Guide to the Forested Plant Associations of Southwestern Oregon (Atzet et.al., 1996; see Table 1). Another tree species not described by the above tree series is knobcone pine (*Pinus attenuate*). Historically, this species lived on low fire intensity sites with rapid fire return intervals. Pure stands existed because of frequent fire. Since fire has been suppressed, Douglas-fir has overtopped many knobcone pine stands and now only scattered trees to small patches exist. Knobcone pine is a short-lived species that may die after 110 years or less. Knobcone pine was found in 17 stands in 10 sections of the southwest corner of the project area. In order to perpetuate this species either a natural or prescribed fire would be necessary to prepare a mineral soil seedbed, open the serotinous cones, allowing natural regeneration to take place.

At the highest elevations in the southwest corner of the project area the PSME (Douglas-fir)-ABCO (white fir)/HODI (oceanspray) plant association is present. PSME-ABCO and PSME-ABCO/BENE (dwarf Oregon grape) plant associations are also present. When rainfall is abundant, or the aspect is more

conducive to cooler temperatures, plant associations most often found include PSME-PIPO (ponderosa pine), and PSME/BENE (dwarf Oregon grape).

On the drier sites the PSME (Douglas-fir)/RHDI(poison oak) and PSME/RHDI-BEPI (Piper's Oregon grape) plant associations are most prevalent. Pine and white oak series forests are usually found on south and west aspects and the lowest elevations ((PIPO-QUKE (California black oak) and QUGA(Oregon white oak)-PSME/RHDI)). At higher elevations PIPO-PSME sites are found.

Subtle changes in species composition and stand structure are occurring over the landscape. Many second growth trees and trees with old-growth characteristics are dying as a result of high tree stocking levels. Douglas-fir, referred to as the climax species, is replacing ponderosa pine, sugar pine and incense cedar because of its more shade-tolerant nature. Douglas-fir is encroaching upon the edges of the oak woodlands, and mortality of Douglas-fir along these edges has been noticeable during the last few years. Whiteleaf manzanita and ceanothus species are migrating into the oak woodlands and grasslands and replacing the oaks, pines, and native grass species. In the shrublands mountain mahogany and serviceberry are mature because of the lack of fire disturbance. In the mid-size vegetation condition class, suppressed shrubs and hardwood trees beneath the dominant tree canopy layer are dying. Pacific madrone and oak species have dropped out of conifer stands where light and water have become limiting. Dead whiteleaf and greenleaf manzanita may be found in the understory of some conifer stands and is indicative of a vegetation shift from shrubs to trees. This may also indicate that manzanita is the species that will pioneer the site following future disturbance. Other shrub species dying out of the conifer stands include deerbrush ceanothus, creambrush oceanspray, and serviceberry.

Currently, the stocking levels of stands throughout the project area are high. This is primarily due to the lack of natural disturbance and fire suppression. Trees per acre range from 172 to 3,150. The overall average for the Deadman's Palm project area is 709 trees per acre. Average radial growth for the last decade at the time of inventory is .42 inches. The average relative density for the area is .88 and indicates that physiologically the trees are at the point of suppression and mortality. Vegetation densities are also extremely high in the shrublands and woodlands and indicate an increased potential for fire. The average tree vigor index, as measured by leaf area index is 51 (when the trees were sampled in 2000 and 2001; vigor has probably declined with another year of drought). Trees with vigor indices below 30 will succumb to attack from bark beetles of relatively low intensity. Trees with vigor between 30-70 can withstand progressively higher attacks but are still in danger of mortality from the insect attacks. Trees with vigor between 70-100 can generally survive one or more years of relatively heavy attacks and trees with indices above 100 generally cannot be killed by bark beetles (Waring, 1980).

Bark beetle infestations are present in the project area. Western pine beetles *(Dendroctonus brevicomis*) and pine engraver beetles (*Ips emarginatus*) are attacking the pines while flatheaded fir borers *(Melanophila drummondi*) and Douglas-fir beetles *(Dendroctonus pseudotsugae*) are killing Douglas-fir. Drought conditions and high tree stocking levels are severely stressing the trees physiologically, enabling the beetles to enter and kill the trees.

Forest pathogens are also changing the forest stand structure and forest development pattern. *Phellinus pini* (red ring rot) is affecting Douglas-fir and ponderosa pine. It appears to be more common on dry sites when trees are stressed. Some of the infected trees are beginning to die or are subject to stem breakage thus allowing light to reach the forest floor and the understory reinitiation stage to begin. *Phaelous schweinitzii* (brown cubical butt rot) is also present. Douglas-fir dwarf mistletoe is the most significant pathogen throughout the project area with approximately 398 acres infected to some degree.

In the project area, the overall average amount of coarse woody material (CWM) is approximately 10.7 tons per acre (range; 0 to 30.6 tons/acre). The coarse woody material stem diameters were concentrated in the 3 to 39 inch classes at the large end and averaged 1,337 feet per acre for all decay and diameter classes. Coarse woody material was most often found to be in a decomposition class 3 (twigs and branches gone but bole is still round, hard and in large pieces)and 4 (bark and branches are gone and bole is now round to oval). Mid sized class stands (11 to 21 inches DBH) have an average of 119 snags per acre with an average DBH up to 12 inches, and mature stands (21 inches DBH and larger) have 103 snags per acre with an average DBH of 3.9 to 13.7 inches. Snags over 60 inches DBH were found.

Environmental Consequences

Because no new management is proposed under Alternative A, the effects described reflect current conditions and trends that are shaped by ongoing management and events unrelated to the Deadman's Palm project. Discussions for Alternative B and C reflect the direct and indirect impacts of the alternatives' newly proposed actions. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable.

Alternative A – No Action

Direct and Indirect Effects

No action would allow forest stands to remain overstocked and individual tree vigor and growth would remain poor. A sample of dominant trees showed an average decadal radial growth of .42 inches or .84 inches diameter growth per decade in the Deadman's Palm project area.. During the drought year 2001, the radial growth of dominant trees was less than 1 millimeter. During 2002, radial growth averaged 1 millimeter. When radial growth is less than .5 inches per decade, pine trees cannot pitch-out bark beetles and tree mortality results (Dolph, 1985). Tree mortality represents a reduction in stand volume production and a loss of revenue and poor forest health.

Without action, forest structure and species composition would not be altered On pine sites, Douglas-fir would remain the most prevalent species and stands would remain in the stem exclusion stage of development if mortality does not occur. Old-growth ponderosa and sugar pines and Douglas-fir trees with seedlings through poles within their dripline would continue to die from competition for water. Pine and oak species would continue to decline in number from competition with Douglas-fir because of their shade intolerance. Leaf area index would decline as live tree crowns decrease in size from tree competition. With large tree mortality, forest stand structure would gradually shift to the understory reinitiation stage. This is a transition phase when trees in the main canopy layer start to die, either singly or in small groups, from lightning, wind-throw, or insects and disease. This is ecologically significant in that resources previously used by the dead tree are reallocated to the surviving vegetation. The hundreds of trees per acre also present a high fuel hazard across the landscape. No action contradicts the Medford District Resource Management Plan forest condition objectives in regard to forest health. The plan states that management emphasis be placed on treatments and harvests that restore stand conditions and ecosystem productivity.

Cumulative Effects

With no forest stand density reduction, slow tree growth and vigor will result in individual tree and perhaps stand mortality. If severe stand mortality results, silvicultural options in the future will be reduced. It is possible that after bark beetle attack, there may be less than 16 trees per acre remaining in

some forest stands. If this happens spotted owl habitat would be lost, forest habitat for other species would be lost and future wood products would be lost for 30 to 50 years. The bark beetles may also disperse to adjacent unthinned watersheds and kill more conifer trees. In the openings created by dying trees, hardwood tree, shrub and forb species would become more abundant and provide forage and hiding cover for big game animals. Song bird habitat would be enhanced also.

Pine species would continue to decrease in number if large openings are not created for these shade intolerant species. The more shade tolerant Douglas-fir would continue to dominate the forest and species diversity would decline.

Where dense forest stands persist overtime, canopy closure would remain at 90 to 100 percent. When tree mortality is singular or in small patches, canopy closure may approach 50 to 80 percent. Where large patches of trees die, canopy closure would be 0 to 40 percent. Without reducing the number of trees per acre, some forest stands will fall below 60 percent canopy closure naturally.

Fire hazard would increase with the abundance of dead vegetation and ladder fuels, and would be at maximum levels. Forest fires could burn thousands of acres.

Alternative B – Proposed Action

Direct and Indirect Effects

Under this alternative forest stands designated as nesting, roosting, and foraging habitat within Critical Habitat Units (CHU's) for spotted owls will be managed suing the late seral emphasis 60% prescription to maintain 60 percent or greater canopy closure. Forest stands designated as dispersal habitat within CHU's will be thinned using the late seral 40% prescription to maintain 40 percent or greater canopy closure.

At this time, within the area designated as CHU for spotted owls, there are pine tree series forest stands. As a result of fire exclusion, Douglas-fir became the dominant species under the canopy of old-growth pine and oak trees. In some areas the old-growth pine and oaks have died because of the high stocking levels of Douglas-fir, so only the Douglas-fir trees remain. As a result, these areas have been classified as current spotted owl habitat even though they likely would not have met the same habitat type definitions historically and they are unlikely to be sustainable over time. Most of the Douglas-fir trees on these droughty pine sites will never persist long enough to become old-growth trees because of the dry site conditions. Depending upon the degree of droughtiness of the site, Douglas-fir trees may begin dying as early as 35 years of age. In the Applegate Valley portion of the Ashland Resource Area, a larger percentage of the Douglas-fir have been dying before reaching 120 years of age. Eventually canopy closure may even fall below 40 percent without proper forest management. Without forest management these stands could revert to hardwoods for long periods of time. It must be recognized that we are observing the landscape vegetation of today at one single point in time. The trees and other landscape vegetation are changing constantly because of natural disturbances and plant succession.

In addition to the commercial treatment, approximately 3,000 acres would be pre-commercially thinned. If all road construction is completed, the cost of pre-commercial thinning would be less because of accessibility. The excess, small diameter trees less than 8 inches DBH will be cut from under the drip lines of old-growth trees to help promote their longevity. Elsewhere the excess tree stems will be thinned to a desired stocking level to improve the growth and vigor of the remaining trees. Achieving the desired species composition goals is of equal importance.

Cumulative Effects

The proposed prescriptions to be applied across the forest landscape are based upon the present vegetation structure, species composition, aspect, and vegetation condition class, to allow for the creation of desired old-growth forest structure and the desired tree series over time. Through forest stand treatments tree densities are reduced thus allowing for improved individual tree vigor and growth, and improved forest health. Forest stands receiving low commercial thinning treatments would be less subject to crown fires. Table 2 of the silvicultural prescription shows projected 20-year diameter growth for treated and untreated stands (projections from the southwest Oregon ORGANON growth analysis model). Table 4 shows the growth of one large conifer (11 to 21 inches DBH) and one mature conifer stand with and without management. In the mid sized stands hundreds of trees per acre are lost through natural mortality versus being utilized through timber harvesting at a specified rate as recommended in Table 3.

Table 2 also shows that 10-year diameter growth will increase substantially versus the no treatment alternative if the stands are treated accordingly. Trees will then be vigorous enough to withstand bark beetle attacks. Leaf area index values should begin to increase after the stands are thinned.

With the pine site prescription, pine and cedar species will be favored to increase their prevalence in the forest stands thus enhancing species diversity.

The various prescriptions meet the specifications of restoration thinning and density management as outlined in the Medford District Resource Management Plan.

Forest stands within the CHU's would be managed using canopy closure goals which maintain higher tree stocking levels. This will result in slower conifer tree growth and perhaps more tree mortality over time. Managing forest stands by canopy closure levels is a fleeting goal because canopy closure levels can never be held constant over time. Tree mortality caused by natural disturbances growth and forest succession will all take place. Leaving trees at a higher density can satisfy short term goals of maintaining higher level canopy closure for owl habitat but is not sustainable in the long term. The forest stands would not be as vigorous as they would be if treated by the landscape prescriptions which manage by stocking levels and for desired species composition. Also, group selection harvest will not take place. Managing the forest stands by stocking levels and species composition is needed for the long term health of the forest.

Alternative C – Landscape Treatment With No New Road Construction

Direct and Indirect Effects

This alternative is very similar to Alternative B but fewer acres of forestland will be treated because of restricted access or excessive logging costs that result by not having road access to the units.

Cumulative Effects

The effects are very similar to Alternative B. The primary difference is in the cost short term and long term. Adding the 1.6 miles of new road will allow for more economical harvest now and in the future. Building the 1.6 miles of new road will allow for more cost effective young stand management and other forest management activities.

In summary, changes to vegetation from implementing Alternative B or C are: All acres treated would benefit through improvement in vigor, species composition, and structure as a result of thinning predominantly in the understory. Pine stands will benefit from the creation of stand conditions which allow more sunlight to reach individual trees and create more open conditions which favor the successful reproduction and establish of young vigorous pines. In addition, the byproducts of these thinning and stand improvements contribute to Medford District's Allowable Sale Quantity goal.

The direct and indirect effects of Alternative B or C, when added incrementally to past, ongoing and future actions described above result in those acres treated having a much higher capacity to withstand the stresses of drought and insect attack. Those acres not treated will continue to suffer the consequences described above as a result of competition.

C. FIRE/FUELS MANAGEMENT

This section discloses impacts to fire regimes from fuels and forest health activities such as prescribed fire, thinning, logging, and fuels reduction treatments, and from activities associated with the construction and use of roads. Smoke impacts, as a result of prescribed fire, are discussed in "Air Quality".

Issues/Concerns

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action. These effects may or may not occur as a result of the proposed action but were of concern to members of the public or ID team specialists.

- The Deadman's Palm project proposes commercial logging/thinning as one of the methods to reduce the risk of uncharacteristic and/or unwanted wildfire. Some oppose using commercial logging as a fuels reduction or fire regime restoration method.

- Some believe fuels reduction can occur without the construction of new roads. The Deadman's Palm project constructs new roads.

- Some are opposed to building new roads and opening up forested stands because those actions are perceived to lead to increased fire risk.

- Some believe prescriptions involving pine stands (low severity fire regime) are faulty, because they rely on science which excludes mixed or high severity fire events in pine stands.

- Commercial logging may increases the effects of a potential wildfire (often stated as "logging increases fire risk"), because such activity decreases the number of large, fire resistant trees resulting in stands high in numbers of younger, smaller, more flammable trees; opens the forest canopy which increases growth of shrubby forest floor species and decreases soil moisture (and hence results in drier forest fuels and creation of "ladder" fuels); and leaves logging debris behind which results in increased forest fuels that lead to greater fire intensities.

- Commercial logging in conjunction with continued fire suppression may increase the effects of potential wildfire.

- Road construction may increases fire risk. New roads, along with opening forest stands and brush fields, are perceived to increase OHV use, which is perceived to result in additional fire risk.

For various reasons, other anticipated effects related to fire and fuels management were found to be not relevant to the Deadman's Palm project. These are:

- The potential cumulative effect of livestock grazing and opening forest canopy was not considered because there is no active livestock grazing or plans to have livestock grazing where timber harvest is being proposed.

The *No Action Alternative* describes anticipated effects of not implementing an action at this time.

Affected Environment

Fire is recognized as a key natural disturbance process throughout Southwest Oregon (Atzet and Wheeler 1982). The development of forest stands exhibiting structurally diverse, late-successional conditions depends on the occurrence of mixed-severity fires widely distributed across the landscape (Frost and Sweeny 2000, Taylor and Skinner 1998).

Use of fire by Native Americans prior to about 1860 to manipulate plant composition to enhance basket making, herbs, food, medicine, and ceremonial uses resulted in areas of the forest that were fairly open, and dominated by mostly old growth trees. Native Americans also used fire carefully so as not to deliberately burn with intensities to create large stand replacement events. Miners who followed in the mid to late 1800's also used fire, but with the intent of clearing large tracts of forest for easy access to minerals. So it is that a large portion of Deadman's Palm is about 80-120 years of age, the cumulative aftermath of those historical events coupled with nearly a century of logging practices that targeted old growth trees.

Practices that have profoundly changed the structure and composition of low to mid elevation forests in the project area are historical and current land uses that encompass logging and road construction, in concert with the policies of fire suppression and results of drought events. The advent of fire suppression in the 1930's only fortified the conditions by which small trees became established and became the dominant age group. These structural changes have contributed to the shift from low-intensity surface fires to severe stand-replacing fires (Kauffman 2004). Fire history recorded over the past 20 years in Southwest Oregon indicate a trend for more large fires which burn at higher intensities in vegetation types associated with low to mixed severity fire regimes.

Past actions that have cumulatively contributed to the current wildfire behavior and potential include timber harvesting, fuels reduction and fire suppression. In addition, climate change also contributes to the current situation. Drought, in combination with dense forest stands, has resulted in high tree mortality, especially in the areas of Pine and Dry Douglas-fir stands. This has resulted in increased fuel loads in these areas. Road building and land development (on private lands) have contributed to the current level of risk by expanding human influence further into the wildlands.

Fire Regimes

Climate and topography combine to create the fire regime found throughout the project area. Fire regime refers to the frequency, severity and extent of fires occurring in an area (Agee 1991). Three historic fire regimes are found within the project area (Schmidt et al. In press):

Fire Regime 1: 0-35 years fire return interval, Low Severity
Typical climax plant communities include ponderosa pine, pine-oak woodlands, and oak woodlands. Large stand-replacing fire can occur under certain weather conditions, but are rare events (i.e. every 200 years). Approximately 25% of the project area is classified as Fire Regime 1.

Fire Regime 2: 0-35 years fire return interval, High Severity
Includes true grasslands and savannahs with typical return intervals of less than 10 years and ceanothus and Oregon chaparral with typical return intervals of 10-25 years. Fire severity is generally high to moderate. Approximately 8% of the project area is classified as Fire Regime 2.

Fire Regime 3: < 50 years fire return interval, Mixed Severity
Typical plant communities include mixed conifer and very dry westside Douglas-fir. Lower severity fire tends to predominate in many events. This regime usually results in heterogeneous landscapes. Large, stand-replacing fires may occur but are usually rare events. Approximately 67% of the project area is classified as Fire Regime 3.

Dry pine and mixed-conifer forests comprise most of the western low-severity fire regimes (frequent fire, but low severity). In these fire regimes, fire suppression beginning after 1910 allowed far more trees to persist and logging concentrated on large, old trees (Biswell and others 1973). These forests may have been deprived of 10 or more fire cycles. The historically low-severity fire regime has turned into a high-severity or mixed-severity fire regime over millions of hectares in the West (Morgan and others 1996; Hann and others 1997). Forest canopies in low-severity fire regimes are often closed, fuel loads are both higher and more contiguous, and fire return intervals are longer (McKenzie and others 2000). Higher severity fires in low-severity fire regimes are more apt to have detrimental effects on soils, watersheds, and wildlife habitat (Brown and others 2004).

Mixed-severity fire regimes (mosaics of frequent, low severity and infrequent but high severity) are more difficult to describe due to complexities that result in a mosaics of fire effects. In forests characterized by mixed-severity fire regimes, stand-age maps may be combined with fire-scar reconstructions to characterize both high-severity and low-severity fire cycles (Baker and Ehle 2001). Severe fires currently on the landscape are more apt to result with severe effects than would have occurred historically (Agee 1998; Agee 2002). However, Odion and others (2004) found the proportion of low to high severity fire effects in the Western Klamath Mountains (same bioregion as the Deadman's Palm) to be comparable to both contemporary and historical proportions of low to high fire severity.

Condition Class

The process for making an assessment on how much fire exclusion along with other management activities has affected an ecosystem is through classifying the current condition of the site based on a reference usually pre-dating when fire exclusion became an influence. **Condition class** descriptions are used to describe these affected ecosystems. Condition classes are a function of the degree of departure

from historical fire regimes resulting in alterations of components such as species composition, structural stage, stand age, and canopy closure. There are three condition classes:

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

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

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

Ponderosa pine areas (fire regime 1) proposed for treatment in this project area are in condition classes 2 and 3. The pine sites proposed for treatment have a dense understory of Douglas-fir and brush due to the absence of fire.

The dry westside Douglas-fir stands (fire regime 3) proposed for treatment are in condition class 2. There are small portions of these stands that are in condition class 1 and 3. Stand densities are extremely dense due to the absence of fire.

Effects of Fire Suppression and Fire Exclusion

Human-caused and lightning fires have been a source of disturbance to the landscape for thousands of years. Native Americans influenced vegetation patterns for over a thousand years by igniting fires to enhance values that were important to their culture (Pullen, 1995). Early settlers to this area used fire to improve grazing and farming and to expose rock and soil for mining. Fire has played an important role in influencing successional processes. Large fires were a common occurrence in the area based on fire scars and vegetative patterns and were of varying severities.

In the early 1900s, uncontrolled fires were considered to be detrimental to forests. Suppression of all fires became a major goal of land management agencies. As a result of the absence of fire, there has been a build-up of unnatural levels of fuel and a change to fire-prone vegetative conditions. This is particularly true for ponderosa pine and the dry mixed-conifer forest types. Historically frequent, low intensity fires maintained these forest types in an open condition which were dominated by large-diameter trees. Based on calculations using fire return intervals, five fire cycles have been eliminated in the southwest Oregon mixed conifer forests that occur at low elevations (Thomas and Agee 1986). Species, such as ponderosa pine and oaks, have decreased. Many stands, which were once open, are now heavily stocked with conifers and small oaks which have changed the horizontal and vertical stand structure. Surface fuels and laddering effect of fuels have increased, which has increased the threat of crown fires which were once historically rare.

In addition, ponderosa pine trees that thrive in fire prone environments are quickly shaded out by the more shade tolerant Douglas-fir or white fir species in the absence of fire. As a result, some late-successional forests have undergone a rapid transition from ponderosa pine stands to excessively dense

true fir stands. Trees growing at lower densities, as in ponderosa pine stands, tend to be more fire-resistant and vigorous. Eventually they grow large and tall, enhancing the vertical and structural diversity of the forest. Some populations of organisms that thrive in the more structurally diverse forests that large trees provide are becoming threatened.

Many forests developed high tree densities and produced slow growing trees rather than faster growing trees after abrupt fire suppression became policy in about 1910. In the Douglas-fir series in southwest Oregon there has been an increase in tree basal area with a shift to more shade tolerant species (Atzet 1996). Trees facing such intense competition often become weakened and are highly susceptible to insect epidemics and tree pathogens. Younger trees (mostly conifers) contribute to stress and mortality of mature conifers and hardwoods. High density forests burn with increased intensity because of the high fuel levels. High intensity fires can damage soils and often completely destroy riparian vegetation. Historically, low intensity fires often spared riparian areas, which reduced soil erosion and provided wildlife habitats following the event.

The absence of fire has had negative effects on grasslands, shrublands, and woodlands. Research in the last few decades has shown that many southern Oregon shrub and herbaceous plant species are either directly or indirectly fire-dependent.

Indirectly fire-dependent herbaceous species are crowded out by larger-statured and longer-lived woody species. This is particularly so for grasses and forbs within stands of wedgeleaf ceanothus and whiteleaf manzanita with a high canopy closure. High shrub canopy closure prevents herbaceous species from completing their life-cycle and producing viable seed. Many grass species may drop out of high canopy shrublands in the absence of fire because of their short-lived seed-bank.

Odion and others (2004) argue that the fuel build-up scenario resulting from fire suppression is not appropriate for the Klamath-Siskiyou region. By studying the severity of fire effects in the Northern California area of the Klamath National Forest, the authors concluded that closed canopy forests burned with less severe fire effects, and that forests become less combustible with time since fire. The study does not identify what defines “closed canopy”, nor the role of stand age. The study describes the vegetation as “tall, temperate forest characterized by a relatively open Douglas-fir overstory with a subcanopy of tan oak.” Not knowing what constitutes “closed canopy” makes it unlikely that a meaningful comparison can be made to proposed treatments in Deadman’s Palm. In addition Odion et al uses no local or specific weather data from the 1987 study on stand type and severity except for an acknowledgement that droughty conditions from previous years may have had an effect on burn conditions. The well known inversion conditions during these fires may have had a distinctive effect on the way these landscapes burned.

Odion’s study links open canopies with increased severe fire effects. Because the study concludes that the proportion of high severity fire (resulting in substantial to complete stand mortality) has not changed in the last 80 years (despite increasing human intervention resulting in roads, tree plantations, and opened canopies), one of two situations regarding open canopies must have existed historically. There was less open canopy (because less human manipulation early in the 20th century), so severe fire effects were more abundant in closed canopies; or (2) there has always been a specific proportion of the forest with open canopy, and fire suppression has resulted in increased amounts of closed forest canopy. Without knowing the historic role of forest canopy, the study has limited utility in analyzing the significance of severe fire effects in open and closed canopy forests on a landscape scale.

The authors further describe the role of shade in shaping the effects of wildfire, especially those forests that have not burned within the last 80 years or so. Essentially, the study merely confirms that as timber stands age, they become more fire resilient. This is due to the spatial location of fine fuels (needles, small branches, etc.) in relation to adjacent trees, and other sources of forest fuels such as forest floor debris and brush. Older stands with closed canopies allow little if any light for brushy species and young trees to persist, thereby naturally reducing the flashy fuels that may result in fire "laddering" from the ground to tree canopies resulting in a crown fire. Young stands cannot benefit from the shade phenomena, simply because the young trees themselves provide the flashy, ladder fuels, due to proximity of the tree canopy to the ground. Therefore, stand age is very important, because it relates to tree size and heights to forest crowns/canopies which have a direct bearing on the development of crown fire. Based on the description of the vegetation in the study ("tall…relatively open Douglas-fir overstory…"), one must infer that these are mature to old growth stands. Therefore, the results of this study are not comparable to young stand conditions which are the subject of thinning proposals in Deadman's Palm.

Effects of Logging

The debate over the effects of "logging" on obtaining and/or restoring fire resiliency, is difficult to understand because the term "logging" is often used interchangeably with "thinning". Logging is generally a term used to describe the harvest and removal of forest trees from which lumber products can be recovered. Currently, trees with diameters at breast height (dbh) of 8 inches or greater are considered merchantable in BLM timber sale contracts. Therefore, the cutting and removal of trees 8 inches in diameter and greater is logging. "Thinning" is simply the action of removing a portion of the stems, whether the stems are trees or brush, and without regard for diameter. Thinning may result in "logging", or not. Noncommercial thinning is a term used for stem reduction in stands where trees or brush less than 8 inches diameter are cut, though sometimes this sized material is utilized for firewood, posts, poles, or biomass.

Commercial timber harvesting has occurred in the Deadman's Palm project area on BLM managed land since 1959. Harvest techniques that created the current state of wildfire potential include the harvesting of stands of mostly large diameter trees; leaving behind untreated slash; and clearcutting (which results in young, more flammable stands of trees). Clearcutting was last done on federal lands in Deadman's Palm project area in 1988-1989 when fire killed timber was salvaged from the 1987 Star Gulch fire.

The same is true for past timber harvests, which generally did not treat the slash. The lesson learned, that slash at specific tonnage per acre, will influence wildfire behavior, and will not be changed by knowing the specific date and acres of each past treatment.

Studies that show logging increases the effects or intensities of wildfire attribute these increased fire effects to the harvest of stands of large, more fire-resistant overstory trees along with not treating logging slash. These logging practices also replaced stands of dense canopies with open canopies and clearcutting or even-aged management established plantations.

Unmanaged blocks of contiguous mature and old growth forests generally have sufficient structural diversity to create microclimate effects that inhibit extremely hot fires (DellaSalla 1995). Many of these natural checks to intense fire behavior and high severity effects (large down trees, shade from intact canopies) were removed by prior timber harvest decades ago. This project is not treating forest lands in

this way. The commercial thinnings proposed in this project are generally in stands that are less than 150 years of age and are removing the smaller diameter trees from the understory.

Yet these management and human influences may not have severe fire effects different from those that were present historically and were the drivers of the forest dynamics that shaped the patchy nature of forests in the project area. In a comparison of 1987 fires to other wildfires since 1911 in forests in Northern California of the Klamath-Siskiyou Province, Odion and others (2004) found despite human influences and a fire-suppression policy, most large wildland fires have been dominated by low-severity wildfire, and even though fire size was increasing. While the effects were statistically different in closed canopy areas and plantations, aggregate effects across the landscape were still dominated by low-severity fire. The authors identified the area as generally a mixed fire severity regime.

Timber harvest has increased fire severity, *if not* accompanied by adequate reduction of fuels, by increasing surface dead fuels (SNEP 1996). Studies that correlate logging with increased fire behavior (Weatherspoon and Skinner 1995) are mostly based on the forest practice of not treating logging and thinning debris (slash). Thus it is the added ground fuel which in a drier, hotter microclimate, as a result of opening forest canopy that significantly contributes to fire behavior in a wildfire situation.

Opening forest canopies results in microclimatic changes particularly at the forest floor. A more open stand allows more wind and solar radiation resulting in a drier microclimate compared to a closed stand. This change in fuel moistures plays a major role in fire intensity and crown fire initiation although presence of ladder fuels is a significant factor in crown fire initiation. A drier microclimate generally contributes to more severe fire behavior. The degree of effects of microclimate change on fire behavior is highly dependent on stand conditions after treatment, mitigation to offset the effects of microclimate change, and the degree of openness. For example, Pollet and Omi (2002) found that more open stands had significantly less fire severity, while Weatherspoon and Skinner (1995) found greater fire severity.

In Pollet and Omi's study, more open stands had significantly less fire severity compared to the more densely stocked untreated stands. The degree of openness in the studied treated stands may not have been sufficient to increase fire activity. Weatherspoon and Skinner found commercially thinned stands in a mixed-conifer forest in the South Fork Trinity River watershed of the Klamath NF in northwest CA burned more intensely and suffered higher levels of tree mortality than unlogged areas (Weatherspoon and Skinner 1995). The partial cuts they examined were typically overstory removals, where large (mature and old growth) trees were removed leaving smaller trees. The study simply validates that smaller trees, due to thinner bark and crowns closer to the ground, will suffer more damage than large trees. Logging slash was not treated in the study areas.

Plantations are more susceptible to severe fire effects than unmanaged older forests (DellaSalla and others 1995, Weatherspoon and Skinner 1995). However, the same study indicated substantially less damage from wildfires where surface fuels were also treated. Once again, the structural attributes of young trees (crowns close to ground, crown consisting mostly of fine fuels), and the amount and location of forest floor fuels (logging/thinning debris, forest floor vegetation) are important factors.

Effects of Climate

Shifts in global climate to a warmer climate will create more frequent fire, more extensive events, and greater area burned, resulting in decline of fire dependent species and an increase in annual and weedy species (McKenzie and others 2004). Areas burned will roughly double.

Effects of Roads

Research has shown that 78% of human-caused fires occurred within 265 feet of a road. Other studies have estimated that humans cause 90% of wildfires, and that over half of those are started from roadsides (Noss 1995). While roads provide locations for fires started by humans, microclimate changes which favor increased fire behavior along roads are very localized. Odion and others (2004) found little overall difference in fire severity between roaded and unroaded areas.

Fire Risk

Risk is the probability of when a fire will occur within a given area. Historical records show that lightning and human caused fires have occurred in the project area. Activities within this area such as increased development of homes in the wildland urban interface, dispersed camp sites, recreational use, and major travel corridors add to the risk component for the possibility of a fire occurring from human causes. The time frame most conducive for fires to occur in the project area is from July through September.

Information from the Oregon Department of Forestry database from 1968 to 2001 show a total of 28 fires occurred throughout the project area. Lightning accounted for 69 percent of the total fires and human caused fires accounted for 31%. The following table is a break down of the fires within the project area:

Total Number of Fires	Size Class
22	A (<.25ac)
5	B (.26-10ac)
0	C (10.1-100ac)
0	D (100.1-300ac)
1	F (> 300 ac)

The class F fire was caused by lightning in 1987.

<u>Fire Hazard</u>

Fire hazard assesses vegetation by type, arrangement, volume, condition and location. These characteristics combine to determine the threat of fire ignition, the spread of a fire and the difficulty of fire control. Fire hazard is a useful tool in the planning process because it helps in the identification of broad areas within a watershed in need of fuels management treatment. Hazard ratings were developed for the project area. In general the existing fuel profile within the project area represents a moderate to high resistance to control under average climatic conditions. The following table summarizes the percent acres in each fire hazard rating category.

Fire Hazard Ratings for the Deadman's Palm Project Area	
Fire Hazard Rating	**Percentage of Acres in each Category**
Low hazard	<1%
Moderate hazard	34%
High hazard	66%

Based on local knowledge of fire behavior of southwest Oregon the following factors were determined to be necessary in order to assign a fire hazard rating to an area:.

Fuel Model
Presence of Ladder Fuels
Slope
Aspect
Elevation

A point system was assigned to these factors:

1) Fuel Models
   - Fuel Models 1,2,3,8 — 0 points
   - Fuel Models 5,6,9 — 5 points
   - Fuel Models 11,10 — 10 points
   - Fuel Models 4,12,13 — 15 points

2) Slope
   - less than 20% — 5 points
   - 20%-45% slope — 10 points
   - greater than 45% — 25 points

3) Aspect
   - 315-360 & 0-68 degrees — 5 points
   - 68-135 &293-315 degrees — 10 points
   - 135-293 degrees — 15 points

4) Elevation
   - greater than 4,500 feet — -10 points

5) Presence of Ladder Fuels — 10 points

Hazard ratings were based on the summation of total points assigned to these factors. The following fire hazard rating was utilized.

Hazard Rating Classes

Points	Hazard Rating
0-24	Low
25-50	Moderate
> 50	High

Field inventory and satellite data was used to establish fuel models and the presence of ladder This information was used to produce layers for fuel model and ladder fuels in GIS. These two layers along with layers on slope, aspect and elevation were used to give a hazard rating to all lands within the project area.

Fuels Reduction/Fire Restoration

Restoration to an historical range is inappropriate because the same set of historical conditions no longer exist (i.e. climate, population, species mix). A forest that is fire-resilient has characteristics that limit fire intensity and increase resistance of the forest to mortality. Increasing forest resiliency means managing surface fuels to limit the flame length, removing ladder fuels to keep flames from transcending to tree crowns where trees have no defense against fire; decreasing crown density making tree-tree crowning less probable; and keep large diameter trees, which are more fire resistant.

Logging is not a surrogate for natural fire process. No mechanical means of fuel reduction –grazing, timber harvest, thinning, or biomass utilization—can duplicate the unique ecological effects of wildland fire, such as soil heating, nutrient cycling and alteration of community composition and structure (Kauffman and others 1997).

A number of ecological functions can be corrected by simply re-introducing fire in the ecosystem. However, reintroduction of prescribed fire without thinning will be problematic due to the existing conditions of overly dense stands of trees (Agee and Huff 1986).

Fuel composition, amount and structure are the only drivers of wildfires that can be modified through management activities. Thinning alters the vertical and horizontal vegetative structure. Prescribed fire alters the amount and arrangement of forest floor fuels. Fires burn hotter and spread faster when there is more fuel available to feed it. The basic objective of thinning is to remove material from the stand, thereby reducing the amount of fuel available for burning.

In a recent study on the effects of thinning on fire behavior, Graham and others (1999) concluded that "depending on intensity, thinning from below and possibly free thinning can most effectively alter fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and fire-adapted species." Thinning accompanied by removal of thinning residues and slash and followed by periodic prescribed burning are effective (Carey and Schumann 2003; Omi and Martinson 2002; Pollet and Omi 2002; Graham and Others 1999). Treatments that result in forests with a lower density and larger trees show lower potential for crown fire initiation and propagation and for less severe fire effects (Pollet and Omi 2002).

Thinning is most apt to be appropriate where understory trees are sufficiently large or dense that attempts to kill them with fire (alone) would run a high risk of also killing the overstory trees (Brown and Others 2004). Low-elevation pine and mixed-conifer forests offer the highest priorities for thinning, in conjunction with prescribed fire, to contribute to restoration of wildlife habitat while making forests more resistant to uncharacteristically severe fire. Principles of fire-safe forest are most effective within plant groups assigned to the ponderosa pine series, the Douglas-fir dry plant association group and the grand fir dry association plant group (Brown and others 2004).

Fuels reduction through "commercial thinning" is offered by some to be experimental and controversial (DellaSalla and Frost 2001). DellaSalla and others (1998) recommended an upper diameter limit of 35 cm (13.7 inches) for thinning operations to reduce fire hazard in mixed conifer in southern Oregon. Additionally, DellaSalla and Frost (2001) recommend that only small trees generally less than 12 inches should be considered for removal, and no roads be built to conduct mechanical treatments. The recommendation of thinning trees up to 12 inches includes a substantial "commercial" component (those trees between 8-12 inches). Thus, the applicability of studies regarding the effectiveness of commercial thinning must be carefully examined. The efficacy of 12 inch diameter limits is untested (Brown and others 2004, and is often touted more as a social solution rather than a tested ecological solution.

Anecdotal evidence on the effectiveness of thinning on fire spread and intensity has been mixed. Interpretations and observations of the same fire (e.g. Squires Peak Fire adjacent to the Deadman's Palm area) yield stories of both the success and failure of thinning treatments. This mix of observations cannot be called scientifically valid nor should they be applied as scientific justification, but they can be interpreted as a trend. Anecdotal evidence on Squires fire in Southern Oregon, the Hayman fire in Colorado and Rodeo-Chediski fire in Arizona all show that treatments to reduce fire behavior may have merit.

Patterns of fuel treatments can affect fire intensity or rate of spread, and this topology has implications for designing landscape-level fuel-treatment patterns (Finney 2001). In the 2002 Hayman fire in Colorado, many areas where fuels had been treated before the fire experienced lower-severity effects than adjacent untreated areas (Graham 2003). Areas that had been commercially thinned and the slash removed by prescribed burning experienced lower-severity effects during the Squires Fire in Southern Oregon than untreated areas or areas that had been felled and bucked but the trees had not been removed and fuels treatments had not yet occurred. The same areas that had been thinned and burned also allowed firefighters to use direct attack measures due to the decrease in fire behavior.

Wildland Urban Interface

The entire project area is within or directly adjacent to the Wildland Urban Interface of the Upper Applegate community which has been designated as a Community at Risk. The effect of reducing home ignitions by reducing forest fuels around structures has been demonstrated by Cohen 1998; Cohen 1999). He found that even severe fires will not directly ignite structures at distances beyond 200 feet. However, fire brands from beyond 200 feet may land on combustible surfaces and ignite structures. In cooperation with fire agencies, the community developed the Applegate Fire Plan. Using the Fire Plan as both a guiding document and leverage for obtaining assistance funds, Fire Plan personnel and Applegate Valley Rural Fire Department #9 have spearheaded significant efforts to create defensible space around structures, driveways, and important roads. As a result of education and outreach efforts involving the Fire Plan, 87% of homeowners in the Applegate Valley have created defensible space around their homes (pers. Com., Brett Fillis, Fire Chief, 2005.) A number of private landowners adjoining BLM land in the planning area have requested BLM reduce fuel loading on federal lands adjacent to their private land.. Many local residents have expressed concern for loss of their forest resources to wildfire in addition to their homes. This concern has motivated a number of landowners to perform thinning operations on private forest land in order to create conditions that will allow for less damaging wildfires to occur on their property.

Environmental Consequences

One of the benefits of vegetation treatments in Deadman's Palm is to reduce vegetative horizontal and vertical structure to decrease the probability of uncharacteristic wildfire (increase fire resiliency). Therefore, per acre measurements in the Deadman's Palm Analysis Area of the stand's fire hazard is a reflection of the horizontal (patchiness, fuel continuity) and vertical (age/size, height) structure. Because effects on the ecological and social

environments increase when natural fire return cycles are missed, the percent of each fire regime that has fire restored (albeit prescribed fire and not natural fire) is a relevant measure of the impact on fire behavior. The consequences of reducing fire hazard and restoring fire intervals is displayed in the text below.

Because no new management is proposed under Alternative A, the effects described reflect current conditions and trends that are shaped by ongoing management and events unrelated to the Deadman's Palm project.

Discussion for Alternative B reflect the direct and indirect impacts of the alternatives' newly proposed actions. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable.

Alternative A (No Action)

The ponderosa pine forest types proposed for treatment which are in condition classes 2 and 3 would not be treated. Restoration objectives for these areas would not be accomplished.

The dry westside Douglas-fir stands proposed for treatment that are in condition class 2 would not be treated. Without treatment the condition class of these stands would deteriorate to a condition class 3.

The transition from ponderosa pine stands to excessively dense fir stands would also continue at the lower elevations within the project area. Trees growing under these conditions often become weakened and are highly susceptible to insect epidemics and tree pathogens. Younger trees (mostly conifers) contribute to stress and mortality of mature conifers and hardwoods.

The current trend of increasing stand density which results in increased mortality to the timbered stands would continue. Ladder, surface fuels and aerial fuels (crown density) would also increase within these stands. Increasing stand densities and fuel loadings would increase the chance of more acres that would burn in high intensity fires within the project area. Fire fighter safety would continue to be an issue as well as the potential of resource damage.

Ninety-nine percent of the project area will remain in moderate to high fire hazard resulting in a continued high chance that when a wildfire occurs, a large portion of the burn would exhibit high severity fire effects. As fire is continually excluded and stand densities continue to increase, coupled with expected climatological changes, the chance for higher proportions of high severity fire effects increases. Air quality would be impacted in the event of a large wildfire. Emissions from wildfires are significantly higher than from prescribed burning. The wildfires which occurred in southern Oregon in 1987 emitted as much particulate matter as all the burning that occurred within the state that year.

Based on trends in the last 35 years, humans will continue to be responsible for the majority of wildfires, but be responsible for only a small portion of the total acres burned. On BLM lands, lightning will continue to be the major cause (73%) for fire starts. Most of the human-caused fires will continue to be associated within about 300 feet of roads.

As a result of ongoing programs to implement defensible space around structures, driveways and roads for potential escape/evacuation routes, the risk of structure and human loss during wildfire events continually decreases.

Fire suppression will continue because there are no policies in place or being proposed that will allow fires to burn naturally within the Deadman's Palm project area. An average of 1 fire per year will be suppressed. Defensible space and driveway treatments will continue by nearby private land owners, but the amount is unknown. Though significant in the immediate vicinity of structures, the defensible space work that is ongoing

totals up to a negligible amount of acres, particularly because so much has been accomplished already. There are no expected significant gains in the miles of new roads, except for an occasional private driveway.

Alternative B

A forest that is fire-resilient has characteristics that limit fire intensity and increase resistance of the forest to mortality. Increasing forest fire resiliency means managing surface fuels to limit the flame length, removing ladder fuels to keep flames from transcending to tree crowns where trees have no defense against fire; decreasing crown density making tree-tree crown fire less probable; and keeping large diameter trees that are more fire resistant. Fire resiliency is especially important in dry pine and mixed conifer forests that comprise the low severity fire regime. Fire resiliency is less important in high severity fire regimes and those portions of the mixed severity fire regime that are high severity. This is simply because stand replacement wildfire is ecologically important in those fire types.

Prescriptions for thinning treatments are based not on restoring historic conditions across the landscape, but on increasing forest health and increasing fire resiliency. Thinning treatments in timbered stands focus on reducing tree density and removing ladder fuels, and focusing on smaller diameter trees for removal. Thinning is also necessary before returning fire to the site in the form of prescribed fire.

This alternative results in almost 4,000 acres of timbered stands that are in condition class 2 and 3 being thinned. The thinning prescriptions target suppressed and co-dominant trees. Some of the smaller diameter commercial trees that are proposed for harvest act as ladder fuels.

Recent studies have demonstrated the effectiveness of management activities designed to reduce fuel hazard and minimize the impacts of wildfire in areas with fire regime historically characterized by frequent , low severity fires (Omi and Martinson 2002: Pollet and Omi 2002). Treatments that result in forests with a lower density and larger trees show lower potential for crown fire initiation and propagation and for less severe fire effects (Pollet and Omi 2002).

The proposed commercial thinnings would reduce the overall density of the treated stands. These treatments would reduce the aerial fuels (crown density) present in the stands. Some of the smaller diameter commercial trees that are proposed for harvest also act as ladder fuels. The combination of removing some of the aerial component as well as the ladder and surface fuels would reduce the chance of sustaining a crown fire in these stands (Omi and Martinson 2002). Over time, the commercial thinning would also increase diameter growth of the residual stand. Larger diameter trees are more tolerant to surface fires so there would be less mortality to the stand in the event of a surface fire. The commercial thinning would also favor more fire tolerant species such as pine. Lowering basal area through thinning and prescribed fire can increase the long term vigor in the residual trees within a stand (Agee and Huff, 2000).

Timber harvesting treatments which do not have increased fire resiliency as an objective are 16 acres of regeneration harvest.

Regeneration harvesting is necessary to provide renewal of forest conditions that will grow the next stand of trees for timber harvest. All factors being equal, a small tree is more flammable than a large tree. However, not all trees will be large all the time. Thus, there is an inherent increased risk in forested environments that occurs naturally (when trees are young). The result of 16 acres of regeneration harvest is that in the short term are more fire resilient, but in the long term (after 10 years and after the stand is re-established with small trees) will have an increase in flammability, until the stand once again develops into an older age class.

In addition, the 16 acres of regeneration harvest will not be planted into dense rows of trees (as previously done in the aftermath of a clearcut). Thus the regenerated stand will exhibit more natural spacing and tree density that

is more fire resilient than the replanted clearcuts of past timber harvests. Moreover, the small sized-openings that are being created through regeneration treatments have much less fuel (less density, smaller size to generate heat), and will likely not have the fire effects that are noted with studies of wildfire in large replanted clearcuts. Because the regeneration patches are small, are not replanted to dense plantations, and mimic the more natural regeneration patterns of the stand, the effect of the regeneration units on fire resiliency is minimal, though increased simply because the trees are younger and more flammable.

To restore low intensity fire behavior in the low severity fire regimes requires the removal of some larger Douglas-fir and other species that have proliferated under fire suppression. Fire resilience for ponderosa pine (key species in low severity fire regimes) means keeping fire behavior less intense. The larger the ponderosa pine, the greater its resilience to fire due to increasing bark thickness. It's bark is one of the key defense mechanisms against mortality from low intensity fire. Thus, removal of larger non-pine species, in this context, improves the ecological role of fire and subsequent fire resiliency of the stand.

Fire resilience based on tree size is very contextual, i.e. the tree's juxtaposition with other trees, position on slope and aspect, plus other factors determines its fire resilience. Many large trees succumb to fire, hence the debate and protests over numerous current fire salvage projects (Biscuit, for example). Most studies on resilience of large trees are related to removal of substantial numbers of large trees in stands rather than as scattered individuals. Since this alternative cuts some larger trees that are not part of large stands of old growth or large-sized fire resilient stands, the decrease in fire resiliency is much less than the effects if the "large" trees cut are part of entire stands of large trees.

Additional large trees are removed during road construction and for logging operations (landings, cable corridors, etc.). In the event that the removal of large trees and the creation of young trees in regeneration units do decrease fire resilience, the gain in acreage thinned to lower hazard levels by creating stand level fire resilience in the project more than offsets potential loss of fire resiliency from both harvesting large trees, and from regeneration harvesting.

Monitoring timber sale cruise data from past BLM timber sales in the Applegate that have utilized the same silviculture prescriptions as proposed for this project clearly indicates the emphasis on the removal of small diameter trees. Thinning treatments will reduce tree canopies to an average of 50% to 70% canopy closure. Monitoring past thinning operations that occurred five to seven years ago in the Applegate, show stands that were thinned to a residual basal area of 100 square feet with an average canopy closure of 40% to 50% showed no increase in understory vegetation. The surface fuel models in these stands are a fuel model 8 and 9 which are the targeted fuel models after commercial thinning and fuels treatment. The same observations have been made in stands that were thinned from below and left canopy closures from 60% to 75%.

Treatments designed to reduce canopy fuels through density management, increase and decrease fire hazard simultaneously. Slash generated from the commercial thinning of timber stands, if not treated, would create surface fuels that would be greater than current levels. The existing surface fire behavior fuel model in the majority of stands proposed for commercial thinning are represented by a Timber Group fire behavior fuel model. Fuel amounts are measured in tons per acre for different size material. Material up to 3 inches in diameter has the greatest influence on the rate of spread and flame length of a fire, which has direct impacts on fire suppression efforts.

It is anticipated that fuel loadings (material 3 inches and less) after logging would be temporarily increased by approximately 3-11 tons to the acre prior to the scheduled fuel disposal activities to be completed. This would change the existing fuel model of most of the timbered stands to a Logging Slash Group which in turn would create higher rates of spread and greater flame lengths in the event of a wildfire. However, despite the temporary increase in ground fuels, recent research indicates that a reduction in crown fuels outweighs any increase in surface fire hazard (Omi and Martinson 2002). *This temporary increase in surface fuels is usually*

less than one year. One year is the time period that it takes to implement the fuel treatments to dispose of the surface and ladder fuels in these stands.

Treatment of slash created from commercial thinning as well as the treatment of noncommercial size material (ladder fuels) and existing surface fuels are proposed for stands that are commercially thinned. By treating the noncommercial sized material in these stands, ladder fuels would be reduced. The reduction of this material along with the treatment of surface fuels would reduce fire behavior such as flame length, rate of spread and fire duration. With the reduction of flame length and fire duration the chance of a crown fire initiating in these stands would be greatly reduced. Also, mortality of the smaller diameter conifers would be reduced. The reduction of flame length would also increase the chance that direct attack of a wildfire could occur which would reduce acres burned in the event of a wildfire.

Thinning and subsequent slash treatments are followed with prescribed burns. The reduction in stand density would make it possible to use prescribed fire as a tool to further reduce fire hazard in these stands. Fuel treatment for stands that are commercially thinned are proposed for treatment within two years after a unit is harvested. Most units would be treated within one year of harvest. Treatments would take place where slash three inches in size and less exceeds 5 to 6 tons per acre. Treatments should ensure that under most climate conditions, flame lengths would be less than three feet allowing for direct attack of a wildfire. Because research indicates that thinning followed by prescribed fire is effective in reducing fire behavior, those acres treated by thinning and followed by fire will be more fire resilient.

The season in which underburning is implemented is based on achieving hazard reduction objectives while minimizing impacts to the site. Fall underburning is utilized when fuel loadings are low enough to allow for a low intensity burn similar to that which was historically common in these fire regimes. Due to the long absence of fire, fuel loadings in most cases are too high to initially burn a unit in the fall.

The surface fuel loading in a unit dictates fire intensity. A common method to reduce fuel loadings before underburning is implemented is to use manual treatment (slashing, hand piling and burning). Even after manual treatments surface fuel levels in the 1, 10 and 100 hour fuels (1/4" to 3") are often so high that a low intensity burn is not possible. When this is the case underburning is done in the spring.

Burning in the fall with high surface fuel loadings would have adverse impacts to numerous resources due to fires being of higher intensity. Large down woody debris consumption is higher in the fall. Duff consumption is higher and soil heating tends to be higher. Mortality to the residual stand as well as other vegetation is higher due to higher intensity fires low live fuel moisture. Snag retention is difficult due to the low dead fuel moistures and higher fire intensity. With higher fire intensities and lower live and dead fuel moistures the risk of escape is greatly increased.

Prescriptions are developed for spring burning to consume the smaller fuels (1/4" - 3") and retain the majority of large down woody debris due to the higher dead fuel moistures. Soil moisture is also higher in the spring so duff consumption is also minimal. Burning under these conditions keep fire intensity low so impacts to residual vegetation is minimal and the chance of escape is also minimized. Visual observations of areas that have been underburned in the spring in the Applegate over the past six years have not shown any negative impacts to the site.

Other activities associated with underburning such as fireline construction and mop-up operations after the burn have minimal impacts to the site. Firelines are 1 to 2 feet in width and are waterbarred to minimize soil erosion. Re-growth of vegetation on the firelines normally occur within one growing season. Mop-up operations are normally limited to a 100 foot perimeter around a burned unit. Soil disturbance is scattered in localized areas within this perimeter. Because prescribed fire will occur in the spring if fall burning conditions might result in

unwanted intensities, damage from prescribed fire will be minimal, and benefits from prescribed fire will be maximized.

Logging and thinning actions would not significantly increase fire behavior because large, fire resistant trees are generally retained; the effects of canopy reduction are minimal or nonexistent due to treatment of surface fuels; slash is being treated; and large, flammable plantations are not being created. Improving fire resiliency decreases the effects on fire severity caused by global climate change.

Reducing overall stand density impacts canopy closure of a stand. The silvicultural prescriptions proposed for the Douglas fir sites (Dry and Moist) will leave canopy closures in the 50-60% range. The pine prescriptions will open stands up a little more and will leave canopy closures in the 40-50% range. The late seral emphasis 60% prescription will leave canopy closures at 60% or greater and the late seral emphasis 40% will leave canopy closures at 40% or greater. Over time the trees will grow and the canopy closure will increase again. Canopy closure impacts fuel moisture in surface fuels within a stand.

Estimates of fuel moisture can be made from measured dry bulb temperature and relative humidity. An example of this is with a dry bulb temperature of 90 to 109 degrees and a relative humidity of 15 to 19 percent, the fuel moisture of 1 hour time lag fuels would be 3%. To get the fuel moisture of 10 hour fuels you add 2% to the 1 hour time lag fuels which would be 5%. To get the 100 hour fuel moisture you add 4% to the 1 hour time lag fuels (7%).

Corrections to fuel moistures are needed to account for slope, aspect, time of day, month, and percent shading. Percent shading is calculated by using greater than 50% shading (shaded) or less than 50% shading (exposed). Cloud cover as well as timber overstory (canopy closure) is utilized in calculating percent shading.

Utilizing the example from above (1 hour time lag fuels at 3%) to correct fuel moisture on a site that has the following attributes you would add 3% to the fuel moisture for a total of 6%.:

- north slope
- slope greater than 31%
- 12:00 pm in August
- shading greater than 50%

Utilizing the same parameters but for an area that has shading that is less than 50% you would add 4% for a fine fuel moisture of 7%. The difference between the two sites is 1% which would have minimal impacts to fire behavior.

Treatments designed to reduce canopy fuels through density management, increase and decrease fire hazard simultaneously. Slash generated from the commercial thinning of timber stands, **if not treated**, would create surface fuels that would be greater than current levels. The existing surface fire behavior fuel model in the majority of stands proposed for commercial thinning are represented by a Timber Group fire behavior fuel model. Fuel amounts are measured in tons per acre for different size material. Material up to 3 inches in diameter has the greatest influence on the rate of spread and flame length of a fire, which has direct impacts on fire suppression efforts. It is anticipated that fuel loadings (material 3 inches and less) after commercial thinning would be increased by approximately 3-11 tons to the acre. This would change the existing fuel model of most of the timbered stands to a Logging Slash Group which in turn would create higher rates of spread and greater flame lengths in the event of a wildfire. However, despite the temporary increase in ground fuels, recent research indicates that a reduction in crown fuels outweighs any increase in surface fire hazard (Omi and Martinson 2002). This temporary increase in surface fuels is usually less than one year for that is the time period that it takes fuel treatments to dispose of the surface and ladder fuels in these stands.

Treatment of slash created from commercial thinning as well as the treatment of noncommercial size material

(ladder fuels) and existing surface fuels are proposed for stands that are commercially thinned. By treating the noncommercial material in these stands, ladder fuels would be reduced. The reduction of this material along with the treatment of surface fuels would reduce fire behavior such as flame length, rate of spread and fire duration. With the reduction of flame length and fire duration the chance of a crown fire initiating in these stands would be greatly reduced. Also, mortality of the smaller diameter conifers would be reduced. Surface fuel management lowers potential fire severity in an area (Ryan and Noste, 1985). The reduction of flame length would also increase the chance that direct attack of a wildfire could occur which would reduce acres burned in the event of a wildfire.

The reduction in stand density would make it possible to use prescribed fire as a tool to further reduce fire hazard in these stands. Fuel treatment for stands that are commercially thinned are proposed for treatment within two years after a unit is harvested. Treatments would take place where slash three inches in size and less exceeds 5 to 6 tons per acre. Treatments should ensure that under most climate conditions, flame lengths would be less than three feet allowing for direct attack of a wildfire.

The objective of the restoration of shrublands and Oak woodlands would be achieved under these alternatives. The high fire hazard which exist in these areas would also be greatly reduced by removing the large brush component.

This project prioritizes fuels reduction work adjacent to private structures. This fuels reduction work would provide a large defensible space adjacent to these structures which would aid in the protection of private homes as well as public safety.

Impacts of Spring versus Fall Burning

The season in which underburning is implemented is based on achieving hazard reduction objectives while minimizing impacts to the site. Fall underburning is utilized when fuel loadings are low enough to allow for a low intensity burn which was historically common in these fire regimes. Due to the long absence of fire, fuel loadings in most cases are too high to initially burn a unit in the fall.

The surface fuel loading in a unit dictates fire intensity. A common method to reduce fuel loadings before underburning is implemented is to use manual treatment (slashing, hand piling and burning). Even after manual treatments surface fuel levels in the 1, 10 and 100 hour fuels (1/4" to 3") are often high so that a low intensity burn is not possible. When this is the case underburning is done in the spring.

Burning in the fall with high surface fuel loadings would have adverse impacts to numerous resources due to fires being of higher intensity. Large down woody debris consumption is higher in the fall. Duff consumption is higher and soil heating tends to be higher. Mortality to the residual stand as well as other vegetation is higher due to higher intensity fires low live fuel moisture. Snag retention is difficult due to the low dead fuel moistures and higher fire intensity.
With higher fire intensities and lower live and dead fuel moistures the risk of escape is greatly increased.

Prescriptions are developed for spring burning to consume the smaller fuels (1/4" - 3") and retain the majority of large down woody debris due to the higher dead fuel moistures. Soil moisture is also higher in the spring so duff consumption is also minimal. Burning under these conditions keep fire intensity low so impacts to residual vegetation is minimal and the chance of escape is also minimized. Visual observations of areas that have been underburned in the spring in the Applegate over the past six years have not shown any negative impacts to the site.

Other activities associated with underburning such as fireline construction and mop-up operations after the burn have minimal impacts to the site. Firelines are 1 to 2 feet in width and are water barred to minimize soil erosion.

Re-growth of vegetation on the firelines normally occur within one growing season. Mop-up operations are normally limited to a 100 foot perimeter around a burned unit. Soil disturbance is scattered in localized areas within this perimeter.

At this time , there is very limited OHV use in the Star Gulch drainage. OHV use is not expected to be increase significantly because the net effect of road construction and closing roads is a net loss of roads resulting in minimal additional access; 1.6 miles new roads vs. 4.3 roads to be decommissioned. It is unknown whether vegetation treatments in Deadman's Palm will increase OHV use. In some areas, reducing vegetation has resulted in an increase in trails. In other areas no change in use patterns after treatement has occurred. Primarily, no significant connection has been made between OHV use and increased fire risk, especially since the Deadman's Palm area is not a destination overnight area for OHV's. Consequently camping and associated use of campfires is limited. Emission of sparks is regulated by laws, as is offroad use (and campfire use) during times of extreme fire danger. Fire records for the last 35 years (as OHV use has increased) indicate a very low number of fires that might even be construed to be related to OHV use with very low number of acres burned. Therefore, OHV use is not expected to have an impact on increased fire risk.

The thinning proposed within the urban interface reduces the chances that embers originating beyond the immediate defensible zone will ignite structures. In combination with homeowner treatments, fuels reduction beyond the home defense zone is reducing the chance of structural loss or damage in a wildfire situation.

The thinning treatments proposed increase the Deadman's Palm area's fire resiliency to the extent that these treatments are effective during a large, wildfire event. Since little is known about the landscape level effectiveness of individual stand treatments to alter potential wildfire effects, the net result of Alternative B is unknown, especially with the relatively unknown effects of global climate change. As large wildfires burn in mosaic patterns of stand replacement to mild underburns, the net effect of the fuels reduction treatments in wildfire situations are determined by numerous factors in a complex situation.

In summary, direct and indirect effects of Alternative B are:

- Increased fire resilience in stands that are thinned followed by prescribed burning.
- No anticipated change in fire risk because there is a net loss of road miles.
- No anticipated change in fire risk due to the use of OHVs.

Because tree cutting prescriptions and slash treatments proposed in this project are vastly different than those of the past which resulted in the current status of poor fire resiliency, the proposed treatments will result in conditions favoring increased fire resiliency in Deadman's Palm. As discussed above, the direct and indirect effects of current thinning (logging and prescribed fire) proposals is an increase in fire resilience.

Activities outside the scope of the Deadman's Palm project and future planned activities that alter fire risk or hazard within the project area potentially include thinning, timber harvesting logging on private lands, fuels reduction, road construction and private land development.

There are no other vegetation projects known (timber sales, Slashbuster fuels reduction, etc.) except thinning of brush and small trees for fuels reduction on private lands. Most homeowners in the area already have completed defensible space fuels reduction, so very little additional work is anticipated. Road construction is limited to potential development of private lands, but is considered to be minor because roads are for private, limited use, and generally very short. Thus foreseeable future actions are very narrow in scope and potential cumulative impact to the proposed actions under Alternative B are equally narrow and minor.

As a result of past actions that have created younger, dense forest conditions with missing fire return cycles, fire suppression will continue to increase potential fire behavior in stands which are not treated by Alternative B. Because the thinned stands are placed on a maintenance schedule, fire suppression will not have much

cumulative effect to treated stands because fire will be continually applied over time, as needed. Maintenance burns will continually reduce accumulated forest debris and new plant growth.

Alternative C

Effects from Alternative C are the same as Alternative B with the following discussion:

Access to an area plays a critical role in determining if fuels treatments can occur and the type of fuels treatment. The risk of escape is a major factor when conducting burning operations especially underburning and broadcast burning. Limited or no access increases the risk of escape due to the lack of availability and mobility of people, equipment and water. Limited or no access would preclude the use of underburning and broadcast burning. Cost associated with manual treatment of units (slashing and handpiling) increases when access is limited. Future treatment of units with limited access would be with manual treatments which have significantly higher cost than underburning or broadcast burning. In some cases limited access would preclude the manual treatment of areas due to the risk of escape in the wildland urban interface and the higher cost of follow up treatments.

Human caused fires could increase with more roads. This can be mitigated to a large degree by blocking roads. Human caused fires over the past 33 years has been a minor component of fires that have occurred within the project area. The majority of fires that have started have been caused by lightning (69%). Roads also play an important role in the suppression of fires. Access into an area allows for quicker response time to a fire which can help minimize the size of a fire.

D. AIR QUALITY

This section discloses the impacts to air quality from prescribed fire and activities related to the construction and use of unpaved roads and trails.

Issues/Concerns

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action. These effects may or may not occur as a result of the proposed action but were of concern to members of the public or ID team specialists.

Some are opposed to road construction, because new roads are perceived to attract more OHV use, which is perceived to decrease air quality.

Excessive smoke in the air as a result of fuel reduction and slash disposal pose a nuisance and a health risk to humans in the area.

Fuels management activities generate particulate pollutants (smoke) in the process of treating natural and activity related fuels. Smoke from prescribed fire has the potential to effect air quality within the project area as well as the surrounding area. Fine particulates in smoke can travel many miles downwind potentially impacting air quality in local communities, causing a safety hazard on public roads, impairing visibility in class I areas, and/or causing a general nuisance to the public.

Other activities that contribute to particulates in the air include use of unpaved roads and trails, and road construction.

The *No Action Alternative* describes anticipated effects of not implementing an action at this time.

Affected Environment

Air pollutants--called particulates--include dust, dirt, soot, and smoke. Particulates are emitted directly into the air by sources such as motorized vehicles, construction activity and fires, natural or prescribed. In 1987 the EPA promulgated annual and 24-hour standards for particulate matter, using a new indicator, PM-10. Particulate matter smaller than 10 micrometers (PM-10) is a term used to describe airborne solid and liquid particles. Because of its small size, PM-10 readily lodges in the lungs, thus increasing levels of respiratory infections, cardiac disease, bronchitis, asthma, pneumonia, and emphysema.

The fate of PM emissions from prescribed burning is twofold. Most (usually more than 60%) of the emissions are 'lifted" by convection into the atmosphere where they are dissipated by horizontal and downward dispersion. The "unlifted" balance of the emissions (less than 40%) remain in intermittent contact with the ground. This impact is dissipated by dispersion, surface wind turbulence and particle deposition on vegetation and the ground. The risk of impact on the human environment differs between the two portions of smoke plume.

Until recent decades, the impact of the lifted portion of smoke was ignored because it seemed to "just go away." These impacts are generally not realized until the mechanisms of dispersal bring the dispersed smoke back to ground level. Because the smoke has already dispersed over a broad area, the intensity of ground-level exposure is minimal. The duration of exposure may include the better part of a day, however, and the area of exposure may be large.

Unlike smoke aloft, the potential for ground level smoke to create a nuisance is immediate. This part of the smoke plume does not have enough heat to rise into the atmosphere. It stays in intermittent contact with the human environment and turbulent surface winds move it erratically. Also in comparison to smoke aloft, human exposure is more intense, relatively brief (a few hours) and limited to a smaller area. Smoke aloft is already dispersed before it returns to the human environment while ground level smoke must dissipate within that environment. Dissipation of ground level smoke is accomplished through dispersion and deposition of smoke particles on vegetation, soil and other objects.

The Oregon State Forester manages the operational guidance for the Oregon Smoke Management Program. The policy of the State Forester is to regulate prescribed burning operations on forestland, achieve strict compliance with the smoke management plan, and minimize emissions from prescribed burning. The Smoke Management Plan is designed, in part, to protect visibility in Crater Lake National Park and neighboring wilderness smoke sensitive Class I areas (Kalmiopsis and Mountain Lakes) during the visibility protection period (July 1 to September 15).

For the purpose of maintaining air quality, the State Forester and the Department of Environmental Quality shall approve a plan for the purpose of managing smoke in areas they designate. The authority for the State administration is ORS 477.513(3)(a). ORS468A.005 through 468A.085 provides the authority to DEQ to establish air quality standards including emission standards for the entire State or an area of the State. Under this authority the State Forester coordinates the administration and operation of the plan. The Forester also issues additional restrictions on prescribed burning in situations where air quality of the entire State or part thereof is, or would likely become adversely affected by smoke.

In compliance with the Oregon Smoke Management Plan, prescribed burning activities on the Medford District require pre-burn registration of all prescribed burn locations with the Oregon State Forester. Registration includes specific location, size of burn, topographic and fuel characteristics. Advisories or restrictions are received from the Forester on a daily basis concerning smoke management and air quality conditions.

Past Actions

Prior to Euro-American settlement, Native Americans created long periods of smoke by frequently burning the forests to create the necessary conditions to satisfy food, ceremonial, and cultural needs. With the advent of mining in the 1850's, miners burned off large tracts of forest generating smoke. In the 1930's to present day, organized wildland fire suppression resulted in much less smoke than prior to organized firefighting, except during wildfire events, especially in 1987 and 2002. As community development occurred in the Medford/Ashland Air Quality Management Area, increasing amounts of smoke (wood stoves, agriculture, and dust, from users on forest roads) increased particulates reducing air quality. Industrial particulates increased as lumber mills and the agricultural industry grew. An increase in the use of prescribed fire for fire and fuels management in the 1980's added smoke to the Medford/Ashland area.

In the recent past, the population centers of Grants Pass, Medford/Ashland (including Central Point and Eagle Point), and Klamath Falls have been in violation of the national ambient air quality standards for PM-10 and are classified as nonattainment for this pollutant. The nonattainment status of these communities was not attributable to prescribed burning. Major sources of particulate matter within the Medford/Ashland nonattainment area is smoke from woodstoves, dust, and industrial sources. The contribution to the nonattainment status of particulate matter from prescribed burning is less than 4% of the annual total for the Medford/Ashland air quality management area. Over the past eight years the population centers of Grants Pass and Medford/Ashland have been in compliance for the national ambient air quality standards for PM-10.

Environmental Consequences

Because no new management is proposed under Alternative A, the effects described reflect current conditions and trends that are shaped by ongoing management and events unrelated to the Deadman's Palm project. Discussions for Alternative B and C reflect the direct and indirect impacts of the alternatives' newly proposed actions. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable.

Alternative A

Though sources of particulates vary, air quality standards measure particulates regardless of their source.

Prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan (OSMP) and the Visibility Protection Plan. Therefore, air quality standards for the communities of Grants Pass and Medford/Ashland will continue to be met, as current pollution standards and air quality measures continue to control the amount of PM-10 emissions.

Dust from unpaved roads and trails will occur concurrent with the levels of use, but their effects are very localized. Some homes may be affected. Localized effects from such dust would be greatest during the summer (dry) months. As observed by lack of dust on vegetation far from the edge of forest roads in the project area, dust from unpaved roads, new road construction and maintenance of older unpaved roads normally settles within a short distance from the point of origin. Thus, effects are limited to those immediately adjacent to forest roads. Effects range from being a nuisance (more effort to keep home clean) to affecting people's breathing (though no persons were identified in the scoping process).

Alternative B & C

Alternatives B & C both propose to use prescribed fire so consequently there would be some smoke related impacts.

Under these alternatives, prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan (OSMP) and the Visibility Protection Plan. Prescribed burning under alternatives I and II is not expected to effect visibility within the Crater Lake National and neighboring wilderness smoke sensitive Class I areas (Kalmiopsis and Mountain Lakes) during the visibility protection period (July 1 to September 15). Prescribed burning is not routinely conducted during this period primarily due to the risk of an escape wildfire.

Prescribed burning emissions, under these alternatives is not expected to adversely effect annual PM10 attainment within the Grants Pass, Klamath Falls, and Medford/Ashland non-attainment areas. Any smoke intrusions into these areas from prescribed burning are anticipated to be light and of short duration.

The greatest potential for impacts from smoke intrusions is from underburning to localized drainages within and adjacent to the project area. Underburning requires a low intensity burn that would not have the energy to lift the smoke away from the project site. Smoke retained on site could be transported into portions of non-attainment areas if it is not dispersed and diluted by anticipated weather conditions. Localized concentration of smoke in rural areas away from non-attainment areas may continue to occur during prescribed burning operations.

Prescribed burning would be scheduled primarily during the period starting in January and ending in June. This treatment period minimizes the amount of smoke emissions by burning when duff and dead woody fuel have the highest moisture content, which reduces the amount of material actually burned. Smoke dispersal is easier to achieve due to the general weather conditions that occur at this time of year.

Other measures to reduce the potential level of smoke emissions from proposed burn sites would include mop-up to be completed as soon as practical after the fire and covering hand piles to permit burning during the rainy season where there is a stronger possibility of atmospheric mixing and/or scrubbing. The use of aerial ignition (helicopters) in broadcast burn units reduces the total emissions by accelerating the ignition period and reducing the total combustion process due to the reduction in the smoldering stage.

Prescribed burning would comply with the guidelines established by the Oregon Smoke Management Plan (OSMP) and the Visibility Protection Plan. Prescribed burning is not expected to effect visibility within the Crater Lake National and neighboring wilderness smoke sensitive Class I areas (Kalmiopsis and Mountain Lakes) during the visibility protection period (July 1 to September 15) because the burning is not routinely conducted during this period primarily due to the risk of an escape wildfire.

Prescribed burning emissions are not expected to adversely effect annual PM10 attainment within the Grants Pass, Klamath Falls, and Medford/Ashland non-attainment areas because . Any smoke intrusions into these areas from prescribed burning are anticipated to be light and of short duration.

The greatest potential for impacts from smoke intrusions is from underburning to localized drainages within and adjacent to the project area. Alternative B proposes approximately 4,000 acres of commercial logging and 440 acres of woodland thinning which could be underburned in the future. Because underburning requires a low intensity burn, there is not the energy to lift the smoke away from the project site. Smoke retained on site could be transported into portions of non-attainment areas if it is not dispersed and diluted by anticipated weather conditions. Localized concentration of smoke in rural areas away from non-attainment areas may continue to occur during prescribed burning operations.

However, the effects of smoke are minimized because prescribed burning would be scheduled primarily during the period starting in January and ending in June. This treatment period minimizes the amount of smoke emissions by burning when duff and dead woody fuel have the highest moisture content, which reduces the

amount of material actually burned. Smoke dispersal is easier to achieve due to the general weather conditions that occur at this time of year.

Smoke effects are further reduced because burn sites would include mop-up to be completed as soon as practical after the fire, and hand piles will be covered to keep the material dry to permit burning during the rainy season when there is a stronger possibility of atmospheric mixing and/or scrubbing, thus dispersing the smoke. Furthermore, the use of aerial ignition (helicopters) in broadcast burn units reduces the total emissions by accelerating the ignition period and reducing the total combustion process due to the reduction in the smoldering stage.

Finally, prescribed burning operations would follow all requirements of the Oregon Smoke Management Plan and the Department of Environmental Quality Air Quality and Visibility Protection Program.

Because of actions to minimize smoke effects and because of DEQ smoke regulations, smoke associated with Alternative B will not reduce the air quality of the Medford/Ashland Area. However, despite these measures, a few individuals may still be affected by a few hours (short duration) of smoke perhaps causing discomfort. Relief for theses individuals is simply leaving the area for a short duration. While smoke effects to these individuals are real, the effect of smoke from this alternative is very minor because it may affect only a few out of 150,000+ people (approximate population in the Medford/Ashland area).

Truck traffic associated with the logging and road construction of this alternative will increase, but dust abatement measures as part of the timber sale contract (see Project Design Features, Chapter II) will negate dust caused by this alternative to immeasurable levels.

In addition, Alternative B results in 2.7 miles of fewer open roads than exist currently. Therefore, dust impacts from new roads are reduced simply because there are fewer miles of total roads.

Because smoke impacts are well within PM-10 standards, and because dust impacts are reduced below current levels, there are no direct or indirect effects of any consequence to incrementally add to past, ongoing, and reasonably foreseeable air quality impacts. Hence, there are no cumulative effects from this alternative.

E. SOILS

This section discloses impacts resulting from potential actions that may result in ground disturbance that affect soil erosion and soil productivity. While this section discloses disturbances resulting in erosion and possible sediment production, the “Water Resources” section discusses the fate of those sediments as they relate to water quality. The “Water Resources” section also discloses the effects of altered hydrological functions as a result of soil compaction and disturbance.

Issues/Concerns

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action. These effects may or may not occur as a result of the proposed action but were of concern to members of the public or ID team specialists.

- Some people are opposed to road construction due to perceived increase in soil erosion and production of sediments that may affect water quality. Additionally, roads provide access to Off-Highway Vehicles (OHV) which creates additional trails that may lead to further soil disturbance and erosion.

- Some people are opposed to vegetative treatments that would require the use of ground-based logging equipment because of perceived consequences of soil disturbance and compaction, which leads to soil erosion and reduced soil productivity.

Logging, using ground based machinery, is perceived to disturb and compact the soil, which has been demonstrated to result in increased erosion and reduced soil productivity.

Under undisturbed forest conditions, surface erosion processes are generally unimportant and considered a natural part of the ecological processes. Because of the importance of surface protection, the degree of soil disturbance has often been used as an index to compare surface erosion hazards for alternative log yarding systems. Studies have shown that in the western United States, the degree of soil disturbance is closely correlated to the amount of activity on the site. In a study of thinnings and partial cutting by yarding systems, tractor logging causes soil disturbance on about 21 percent of the site resulting in 13 percent displacement and 8 percent compaction. Skyline cable yarding disturbed about 7 percent of the site, with 7 percent displacement and <1 percent compaction (Landsberg, 2003, p.29). Helicopter yarding in a clearcut showed 2 percent deep disturbance, 17 percent slightly disturbed and no measurement for compaction (Clayton, 1981, p.6). It is estimated that the natural erosion rates for soils in the Applegate geomorphological erosion response unit (GERU) is approximately 0.7 $yd^3/ac/yr$. Erosion rates increased slightly in harvest areas to 0.8 $yd^3/ac/yr$ (Amaranthus, 1985, p.230).

Many studies have shown that compacted soils often have characteristics that are generally considered unfavorable for plant growth. These characteristics include high bulk density and reduced porosity, aeration, and drainage. Root penetration and growth is often decreased in soils of high density, since the relatively high strength of these soils offers physical resistance to expanding root systems. Supplies of air, water, and nutrients that roots need can also be unfavorably changed when compaction decreases soil porosity and drainage (Adams and Froehlich, 1981, p.5). In studies comparing tree growth on compacted sites from the time they were seedlings, Power (1974) estimates a 40 percent reduction in volume growth on heavily compacted sites while Perry (1964) found approximately 50 percent less cubic volume in trees growing on compacted sites (Froehlich and Berglund, nd, p.3). Persistence of compacted soil and, presumably, long-term consequences of compaction for tree growth depend on the severity of the initial compaction, the ability of the species to cope with compacted soils, and rates of processes that de-compact the soil. Recovery processes vary greatly with soil texture and clay type, and their interaction with climatic processes such as cycles of freezing-thawing and wetting-drying. Soil compaction endured for at least 70 years in soils derived from volcanic ash (Landsberg, 2003p.30). When soil compaction occurs under western Oregon conditions it is likely to be a long-term impact. A study in Evans Creek (Jackson County, OR) suggests that the granitic soils will take from 35-40 years to recover from natural forces (Froehlich, nd). Preplanned trails with trees felled for most efficient skidding would aid in reducing the amount of area compacted (Froehlich and Berglund, nd. p.15).

Logging may have a high correlation to landslides.

Part of a soil mass's strength is due to anchoring effect of tree roots. Therefore, it seems reasonable that susceptibility to landslides would gradually increase as these roots decay after logging. A review of the scientific literature, including research from Alaska, Utah, Oregon, and Japan, demonstrated that clearcutting on slopes increased the frequency of mass soil movement events (landslides, earthflows, slips, etc.). The cutting of trees, by itself, does not significantly increase erosion, but clearcutting on steep unstable slopes may lead to increased mass erosion. Therefore, on steep slopes, slope stability requirements as well as silvical considerations should weigh heavily in the selection of silvicultural systems (Rice, 1972. pgs.326-328).

Road construction is perceived to result in increased soil erosion and loss of productivity.

The amount of disturbance created by road construction depends upon its design standard, steepness of slope, and total mileage of road. Frequently, they cross steep topography of varying degrees of stability, where they often are a major source of erosion. On steep mountainous topography, roads undercut upslope soils and may alter the natural drainage from the hillside. By exposing formerly buried material to weathering they may also change the strength of the slope. Road fills place additional weight on the underlying soil mass. The fills themselves are frequently over-steepened slopes of reduced strength and are prone to failure. Consequently, it is not surprising that roads are frequently associated with landslides. On unstable geological formations, roads can trigger mass movements even on less steep topography. On gentle, stable topography roads may cause little disturbance (Rice, 1972. pgs.323,326).

Geomorphic effects of forest roads range from chronic and long-term contributions of fine sediment into streams to catastrophic effects associated with mass failures of road fill material during large storms. The interactions of roads and land surfaces are often complex; for example, on one part of the hillslope, roads may trigger mass failures, and roads downslope from them may trap material derived from these failures. Roads affect geomorphic processes by four primary mechanisms: accelerating erosion from the road surface and prism itself by both mass and surface erosion processes; directly affecting channel structure and geometry; altering surface flow paths, leading to diversion or extension of channels onto previously unchannelized portions of the landscape; and causing interactions among water, sediment, and woody debris at engineered road-stream crossings (Gucinski et.al.,2001 pg.12). In the Applegate geomorphological erosion response unit (GERU), areas where roads and landings were constructed on steep unstable slopes, it was estimated that erosion rates were about 7.28 yd^3/ac/yr. (Amaranthus, 1985. p. 232).

<u>Prescribed fuel treatments are perceived to increase soil erosion.</u>

Broadcast burning increases the amount of mineral soil exposed by a varying amount, depending on the depth and consumption of the litter layer on the forest floor. Additional soil exposure, beyond that due to logging, can be as little as eight percent or over forty percent (Perry et. al., pg.111). Observations leave little doubt that accelerated erosion is a common result of fire on forested lands. In slash disposal fires, by regulating burning, it is possible to control the amount of litter consumed and, presumably, the resulting erosion. During a wildfire, litter and other fuels are so dry that almost all fine organic matter is consumed leaving virtually the entire soil surface exposed to erosion (Rice et al, 1972).

Piled slash burns hotter than broadcast slash, increasing consumption of organic matter and nutrient losses. High soil temperatures generated under burning piles (typically, about 5-10 % of the harvested area) severely and negatively affect soil properties by physically changing soil texture and structure and reducing nutrient content (Perry et al, p. 115).

Affected Environment

The Deadman's Palm Project area consists mainly of the Palmer Creek drainage, Star Gulch drainage and frontal drainages to the Applegate River from Beaver Creek down to the confluence with the Little Applegate River. Refer to the Water Resources section for a description of the analysis area. Soils series identified in the project area are Caris, Offenbacher, Manita, McMullin, Shefflein, Tallowbox, Vannoy, and Voorhies. Soils in the project area are generally moderately sensitive to disturbance activities like road construction, log yarding and prescribed fire. Tallowbox, Caris and Offenbacher soils on slopes over 65 percent may exhibit signs of instability and raveling. Tallowbox and Shefflein soils are formed from granite parent material and have a high potential for erosion on slopes over 35 percent. A map showing the location of the soils in the project area is on file at the Medford District office. A description and characteristics of the soils identified in the project area is in Appendix A of this soils report.

There are approximately 65 total miles of road in the 12,324 acre project area, most on BLM land, and a total of 157 miles in the 22,883 acre analysis area. There are about 68 miles of roads in the Star Gulch drainage that are administered by BLM. Private roads occupy the majority of roads in most of the frontal drainages along the Applegate River and Forest Service controls most of the Palmer Creek analysis area. Most of the roads have some degree of surfacing but there are about 20 miles of natural surface roads in the Star Gulch drainages and about 26 miles of natural surface road in the frontal drainages. All roads on BLM managed lands are established roads (10+ years) that are in stable condition with only small areas of cutbank sloughing associated with the road system. This confirms that the dominant source of road related sedimentation is from road surfaces, cutbanks and ditches.

There are approximately 2,065 acres of potentially unstable ground identified in the project area. Soils identified as potentially unstable are the Caris and Offenbacher soils or soils from granite parent material on slopes over 65 percent. In addition, there are about 850 acres of soils formed from granite parent material on less than 65 percent slope that have high erodibility potential when disturbed.

Past Actions

A catalogue of past actions with specific dates and units of treatments/events is not necessary, nor is it relevant. The relevant part of analyzing past actions is determining what events or actions previously occurred, whether current proposals repeat those actions or events, and whether current proposals have similar or different anticipated effects. A detailed catalogue of past actions is not necessary to obtain that information. In addition, past events are manifested in current conditions, the starting point for the addition of cumulative effects. The lessons learned from past actions are that roads were historically poorly designed and located without regard to erosion and sedimentation impacts. Clearcutting and broadcast burning created highly erosive conditions, especially when ground-based yarding systems were used without much regard for the location and number of skid trails, or without regard to steepness of slope.

The most recent timber harvest involving the entire analysis area was between 1991 and 1993 with a single tree mortality salvage using helicopters. Timber harvesting occurred in the Star Gulch drainage in 1988 when timber was salvaged after the 1987 wildfires. The frontal drainages were last entered for timber harvest around 1989 when approximately 255 acres were harvested using a cable system. The following table lists past disturbances by analysis area. All drainages have recovered nicely from previous management activities with erosion rates being near natural levels in most areas except where roads exist. The table below lists past management actions in the drainages of the proposed project area. Numbers in table denote acres of that type of activity.

Table 3-1. Past Management in Deadman's Palm Project Area

Cutting History by Analysis Area				
Sale Name/yr	Palmer Creek above Nine Dollar Gulch	Applegate River between Beaver Creek and Star Gulch	Star Gulch	Applegate River between Star Gulch and Little Applegate River
Alexander Gulch/1975			240-cable 52-tractor	
Benson Gulch/1975			251-cable 120-tractor	
Boaz Gulch/1975		44-cable		89-cable
Star Gulch Commercial Thin/1978			11-cable 24-tractor	
Palmer Peak/1980			134-cable 10-tractor	
Alex-Palmer/1983			44-cable	
Burton Butte/1983				175-cable 12-tractor
Lightning Ben/1984			440-cable 89-tractor	
Alexander Gulch/1986			165-cable	
Star Gulch Salvage/1988			351-cable 186-heli	
Cinnabar West/1989		85-cable		170-cable
South Apple Salvage/1991	15-heli	261-heli	4,205-heli	102-heli
Total BLM	15-heli	129-cable 261-heli	1,636-cable 295-tractor 4,391-heli	434-cable 12-tractor 102-heli
Forest Service	335-cable	cable-255	cable-20	cable-25
Private		cable-30	tractor-205	tractor-640

Environmental Consequences

Because no new management is proposed under Alternative A, the effects described reflect current conditions and trends that are shaped by ongoing management and events unrelated to the Deadman's Palm project.

Discussions for Alternatives B and C reflect the direct and indirect impacts of the proposed action(s) of this alternative. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable.

The appropriate scale for measuring soil productivity criteria (compaction, erosion, etc.) is site specific or on a unit by unit basis. The appropriate scale for measuring erosion or compaction that may affect water resources would be the designated analysis area (see Water Resource section for analysis areas). Short-term impacts (or affects) are those being ten years or less and long-term more than ten years.

Alternative A

The effect of the no action alternative on the soil resource would be the continuance of existing erosion rates coming from existing conditions throughout the analysis area. Erosion rates are near natural levels throughout the project area except for areas where roads and trails exists. Table 3-2 identifies possible future actions in the drainages within the next five to ten years. There is no way to be certain that possible future actions will occur on private land. Most of the possible future action is a result of the Bald Lick project. These actions would increase the amount of compacted acres in the drainages possibly affecting peak flows. A discussion of compacted acres and road impacts is included in the Water Resources section.

Table 3-2. Possible Future Mechanized Management in Deadman's Palm Project Area

Analysis Area	Ownership	Unit Size (acres)	Type of Mgt. Activity	Management System	Year
Applegate River between Beaver Creek and Star Gulch	BLM	4	Timber Harvest	Tractor (designated)	2006
	BLM	41	Timber Harvest	Cable	2006
	BLM	229	Timber Harvest	Helicopter	2006
	Private	57	Timber Harvest	Tractor	<10 yrs.
Applegate River between Star Gulch and Little Applegate River	BLM	42	Timber Harvest	Tractor (designated)	2006
	BLM	269	Timber Harvest	Cable	2006
	BLM	305	Timber Harvest	Helicopter	2006
	Private	75	Timber Harvest	Tractor	<10 yrs.

The risk of catastrophic fire in the drainage is projected to increase (see Fire/Fuels Management section). Almost a century of fire exclusion has occurred in this area and, consequently, "natural" conditions no longer exist. Fuel loading is greater and duff/litter layers are often greater than would naturally occur. Given the natural fire frequency in this area, many low-severity fire events have likely been suppressed over the past century. Fire exclusion in mixed conifer forests has increased the risk of fire due to decades of fuel accumulation (Taylor, 2003 p.704). Consequently, the inevitable but unpredictable, uncontrolled natural burn (wildfire) could be of such intensity as to severely increase erosion and sedimentation, and severely set back the community of microorganisms. When compared to the proposed action alternative(s), there would be no increase in erosion rates short-term but long-term erosion from roads would probably increase due to lack of road maintenance and the risk of a catastrophic wildfire would increase as a result of the no action alternative.

Alternative B

Under this alternative, about 1.6 miles of road will be constructed, 1.7 miles of road would be mechanically decommissioned, about 2.6 miles of road would be naturally decommissioned, about 43 miles of existing road would be renovated and about 0.7 miles of previously decommissioned road will be reopened. Approximately 211 acres would be tractor logged using designated skid trails, 1,263 acres would be skyline-cable logged using partial suspension, and 2,517 acres would have the logs removed with a helicopter. Approximately 554 acres of

cable logging would occur on potentially unstable ground. A skyline cable system would provide for maximum suspension decreasing the ground disturbance. About 896 acres of helicopter logging would occur on potentially unstable ground. Slash created by the logging would be treated by burning to reduce the total fuel loading on-site.

Impacts associated with roads would have the greatest impact on the soil resource as approximately six acres of land is disturbed and taken out of vegetation production for every one mile of road construction proposed. There would also be about fifteen new helicopter landing areas built along new and existing roads near ridgetops. These helicopter landings would be about one acre in size and would have similar impacts to new road construction. There is approximately 1.6 miles of new road construction proposed in this alternative. The new roads would be surfaced with about 8 inches of rock. There is about 1000 feet of new road construction proposed which would extend the 39-4-24.1 road in the southwest corner of section 13 (T.39S., R.4W.). This new road would be midslope but the slopes are less 45 percent and soils appear stable. The first 200 feet of the road are within the riparian reserve which may result in a slight to moderate amount of sedimentation reaching the streams during the first few substantial rainfall events after construction. Additionally, there is about 800 feet of road construction in the middle of section 39 (T.39S.,R.3W.) that would extend the 39-3-30 road. This new construction would be located on the upper one-third of the hillslope for about 500 feet before approaching the ridge. The soil is stable in this location and the slope is around 45 percent which would result in a slight (<15%) increase in erosion potential the first few substantial rainfall events after construction but most particle should remain on site. The geomorphology of the terrain where road construction would occur consists of metasedimentary and metavolcanic rocks of the Applegate formation in the Klamath Mountains. The soils in this area are the Caris, Offenbacher and Vannoy series. Roads built in similar slope locations in this area show little soil movement.

The rest of the proposed road construction is near the ridge lines and on very stable topography thus minimizing the likelihood of disturbed soil reaching stream channels. Roads in ridgetop positions may have a small affect on the local drainage network by initiating new channels or extending the existing drainage network by concentrating runoff. Although concentrated road runoff channeled in roadside ditches can extend the channel network by eroding gullies or intermittent channels on hillslopes, the probability of this occurring is low as much of the new roads are designed to be outsloped with few ditchlines.

There would be a noticeable increase in soil erosion the first few significant rain events after construction. Typically, newly constructed roads lose the most soil, primarily during the short period before grass becomes established and the roadbed is graveled or compacted. Soil loss from fully graveled roadbeds was only 3 to 8% of that from the bare soil roadbed of otherwise similar construction (Swift, 1988. p.321). All new construction would be fully surfaced.

The mechanical decommissioning of approximately 1.7 miles of road in Ladybug Gulch would decrease erosion rates to near natural rates within a ten-year period. There would be a moderate (15-50%), short-term increase in erosion rates the first few rain events after road decommissioning work is completed. These effects would be minimized by deferring road decommissioning until the end of the project (not in conjunction with road construction) and in the dry season, restoring natural drainages, and using straw bale check dams where culverts are displaced. A slight to moderate, long-term decrease in erosion rates associated with the roads in Ladybug Gulch area would result from the decommissioning project.

The road renovation that would occur consists of surfacing of about 12.3 miles of existing natural surface roads and increasing the surfacing on 30.4 miles of previously surfaces roads. This road work will help in reducing surface erosion from roads and decrease sediments reaching local waterways, which is a slight, positive direct, indirect and cumulative effect.

It is estimated the commercial timber harvest activities planned in this alternative would disturb, on average, about six percent of the ground in the proposed harvest units. As a result of implementing designated skid trails, the units tractor logged would result in approximately twelve percent or less of the area compacted (USDI, 1995. p.156). Designating skid trails would most likely minimize the area that would be deeply disturbed during tractor logging operations. In a study of thinnings and partial cutting by yarded systems, tractor logging caused soil disturbance on about 21 percent of the site resulting in 13 percent displacement and 8 percent compaction. Skyline cable yarding disturbed about 7 percent of the site, with 7 percent displacement and <1 percent compaction (Landsberg, 2003. p.29). Helicopter yarding in a clearcut showed 2 percent deep disturbance and no measurement for compaction (Clayton, 1981, p.6).

Short-term erosion rate potential would increase moderately in the tractor units where slopes exceed 20 percent and where the skid trails are not on the contour. Most of the eroded particles would remain on site as a result of Riparian Reserves, waterbars and yarding operations being fragmented. The decrease in soil pore space, as a result of the compacted skid roads, causes a slower infiltration rate and larger amounts of surface runoff. On slopes less than 20 percent and skid roads that follow the contour, runoff velocity tends to be reduced and soil particles transported only a short distance. Erosion rates in the cable or helicopter units would exhibit only a slight increase over natural levels. In the cable units, disturbance other than compaction in the yarding trails would not be extensive. The yarding trails are usually narrow, shallow compacted troughs of surface soil partially covered by scattered litter and slash. On steeper slopes with higher erosion potential, waterbars would be constructed manually to direct water off the yarding trails. Although erosion rates would increase, most soil particles would remain on-site and return to near normal rates usually within 5 years as vegetative cover is reestablished.

Findings suggest that surface erosion resulting from the logging operation itself is not serious. In most operations, most of the area remains essentially undisturbed. Even logging systems that cause the most disturbances seldom bare more than 30 percent of the soil surface. Since surface erosion depends primarily on extent and continuity of bare areas, soil loss is usually slight (Rice, 1972). For most silvicultural regimes on most sites, soil productivity decline should not be expected as a short-term effect, as a result of harvest per se. Short-term declines are likelier to result from associated effects such as compaction, loss of organic layers, or erosion. The probability of productivity decline resulting from forestry practices is least when regimes of low intensity are performed on sites with high productivity or favorable conditions (Beschta, n.d.).

The presence of compaction, an on-site effect, can contribute to the occurrence of offsite effects, the most obvious of which is erosion and sedimentation. Infiltration of precipitation into compacted soil is impeded, increasing the efficiency and concentration of runoff, which increases its depth, velocity, and erosivity. This suggests that semi-permanent or permanent compaction may contribute to chronic or cumulative surface erosion. Geppert (1984) concluded that cumulative surface erosion should result from the construction and existence of road networks, but that forest harvest and site preparation should not result in cumulative erosion, except when poorly applied on poor or harsh sites (Beschta, n.d.). There are no harsh or poor sites being treated in this proposed alternative.

Prescribed burning planned under this alternative would be in the form of handpile burning or broadcast burning. As the broadcast burning planned in this project would be an underburn, the intensity of the burn would be light to moderate and have slight direct short-term effect on soil properties. A light surface fire will generally only char the litter, leaving most of the mineral soil at least partially covered. Most soil and ash movement occurs during the first rainy season after the slash is burned and quickly diminishes as vegetation cover re-establishes. A recent study concluded that prescribed restoration fires did not have a significant effect on soil solution and stream chemistry or stream sediment concentrations and that low-intensity, low-severity fires could be used effectively as a tool to restore vegetation structure and composition (Elliot, 2005. p.5).

The increase in erosion rates over present levels would be minimal as a result of burning handpiles because the piles would be spaced throughout and occupy approximately 3 to 5 percent of the total area. The increased potential of soil particles reaching the local waterways as a result of the prescribed burning would be low as underburning would be avoided and handpiling of slash would not occur near waterways. High soil temperatures generated by burning piles would severely and negatively affect soil properties in the 3 to 5 percent of the unit by physically changing soil texture and structure and reducing nutrient content. Duff and woody debris represent a storehouse of minerals and protection for the soil surface. Since Nitrogen losses are roughly proportional to the amount of duff consumed, burn prescriptions that allow greater retention of woody debris benefit long-term site productivity. Burning volatizes organic Nitrogen or changes it into a readily available form. Large proportions of the total Nitrogen budget can be lost through volatilization. Total foliar Nitrogen content also is reduced (14% in moderate burns, 33% in intense burns), and the effects last at least 4 years (Atzet, 1987 p.193). Overall, soil productivity would experience a slight, negative decrease short-term but potential long-term positive effects would be realized from the proposed actions as the risk of catastrophic fire is diminished.

In summary, there would be a slight(<15%), short-term increase in erosion rates as a result of timber harvesting activities which would return to near pre-harvest levels within 5 years. There would be a net increase in compacted area in the tractor harvest units averaging about 12 percent which would slightly decrease soil productivity long-term. Based on research and past monitoring of operational activities, it is assumed there would be a 5 percent loss of productivity on all lands that would be tractor harvested. The loss is accounted for in the (Medford District) non-declining timber harvest calculations (PRMP 1994. p.4-13). Soil productivity would experience a slight, negative decrease short-term but potential long-term positive effects would be realized by thinning and prescribed fire. No appreciable increase in OHV use from the roads being constructed is anticipated. There would be a moderate, short-term cumulative increase in erosion rates as a result of harvesting timber and fuel reduction activities (i.e., slashing, prescribed burning) which would last about three to five years. A slight long-term decrease in erosion rates would occur as the affected harvest units re-establish ground cover, land that was once occupied by roads are put back into producing vegetation (ground cover), and the risk of catastrophic wildfire is reduced.

There would be a slight net decrease in the amount of roads in the Star Gulch drainage which would result in a slight to moderate short-term increase in erosion rates but a slight long-term positive effect as the decommissioned roads become re-vegetated. The decommissioning of the Ladybug Gulch road (39-4-23.0) would moderately decrease erosion rates coming from this road long term. The bottom portion of the Ladybug Gulch road is virtually in the high-water area and becomes part of the stream channel during intense runoff events. The newly constructed roads would have a slight increase soil erosion rate potential locally, particularly the first few years after construction and use. Most of these roads are on or near ridge tops and most eroded soil particles should remain on site. A very slight increase in the cumulative erosion rate potential would occur the first five years after construction/decommissioning but after that cumulative erosion rate potential would decline as the Ladybug Gulch decommissioning becomes stable and vegetated.

Most of the significant past actions occurred nearly 20 years ago. The effects of those actions, except for the roads, have long since diminished and soil erosion rates in all drainage are most likely near the 0.7 $yd^3/ac/yr$ reported by Amaranthus (1985). Most of the actions in the reasonably foreseeable future would occur as a result of the Bald Lick project (2006) and are describe in table 2. The possible future actions on private land are relatively small and dispersed across the landscape. These actions should have a minimal effect on soil erosion potential. The cumulative effects of these actions on soil compactions could increase the peak flow potential and this topic is addressed in the Water Resources section.

Cumulatively, there is currently little direct evidence to indicate that harvest removals in themselves lead to soil depletion over several succeeding rotations (Beschta, nd). A crucial aspect that affects soil productivity is cutting intensity. Cutting intensity means the proportion of standing trees harvested, i.e., clearcutting vs. shelter

wood vs. selection cutting. The less intense the cutting intensity results in lower effect on the soil. Another critical aspect of a silvicultural regime is the rotation or cycle length. Rotation length determines the intervals at which the site is entered and disturbed and nutrients are removed, redistributed or lost. Rotation length is especially significant from the point of view of cumulative effects since it determines the time periods allowed for recovery between harvests. Soil productivity decline should be least likely when low silvicultural intensity is combined with high inherent productivity and favorable conditions. Soil erosion may prove cumulative through time if periodic disturbances occur (that result in soil leaving the site) at intervals too short for the site to stabilize to bring about recovery. This should not be the case as a result of the Deadman's Palm project as soil disturbance would not result in a significant amount of soil leaving the site and erosion rates would return to near normal within about five years. Past harvest that had a substantial affect on soil erosion rates was nearly twenty years ago and the site has recovered from those events. Therefore, cumulative effects to the soil resource would remain minimal if the soil resource is allowed enough time to recover from the disturbance of this project.

Overall, the effects to the soil resource as a result of this proposed action could be described as slight, short-term negative effects leading to slight, long-term positive effects.

Alternative C

Under Alternative C, approximately 211 acres would be tractor logged, 1,132 skyline cable logged and 2,292 would be helicopter logged. Approximately 1.7 miles of road would be mechanically decommissioned, almost 2.6 miles of road naturally decommissioned while no new road would be constructed. About 12.3 miles of existing natural surface roads would have surfacing added, 0.7 miles of previously decommissioned road will be reopened and about 43 miles of road would be renovated which would add surfacing and improve some drainage facilities. There would be about ten new helicopter landing constructed adjacent to existing roads which would disturb about one acre of land each. The landings would be surfaced with rock during construction or seeded and mulched after use to minimize off-site erosion potential. The table below compares the respective action alternatives.

Table 3-3. Acres treated by harvest system

Alt	tractor (ac)	cable (ac)	helicopter (ac)	new road	road renovate	road decommission
B	211	1,263	2,517	1.6 mi.	42.7 mi.	4.3 mi. (1.7 mechanical)
C	211	1,132	2,292	0 mi.	42.7 mi.	4.3 mi. (1.7 mechanical)

Overall for the project area, comparing Alternative C to the proposed action (Alternative B) shows the same amount of acres tractor logged. Alternative B would cable yard about 131 acres more than Alternative C and about 225 more acres of helicopter logging. The effects to the soil resource as a result of Alternative C would be very similar to Alternative B with the biggest difference being that no road construction would occur in Alternative C which would keep about 6 acres undisturbed. Cumulatively, Alternative C would have a slightly less soil erosion increase across the landscape than Alternative B due to the lack of new road construction and less amount of area disturbed during timber harvesting. Alternative C would have a slight positive cumulative effect as decommissioning Ladybug Gulch road without building additional new road would have a net reduction in erosion from roads long-term.

F. WATER RESOURCES

Characterization

Two watershed analysis documents provide general water resources background information for the project area: The *Applegate-Star/Boaz Watershed Analysis* (USDI 1998) and the *Beaver Palmer Watershed Analysis* (USDA 1994).

Project Area Description

The proposed 19.3 square mile Deadman's Palm project area is within the lower portion of the Applegate River-McKee Bridge Watershed. The land within the project area drains into the portion of the Applegate River from Palmer Creek to the confluence of the Little Applegate River.

Map 3-1 shows an outline of the project area (bold line) as well as the analysis areas associated with the project area. The solid shade areas denote BLM-managed lands, the dotted shade areas symbolize U.S. Forest Service-managed lands, and the unshaded areas represent private lands. For purposes of analyzing the affected environment and the proposed project, the project area is stratified into four analysis areas that are composed of hydrologic units and use drainage boundaries.

Map 3-1: Analysis Areas Associated with the Deadman's Palm Project area

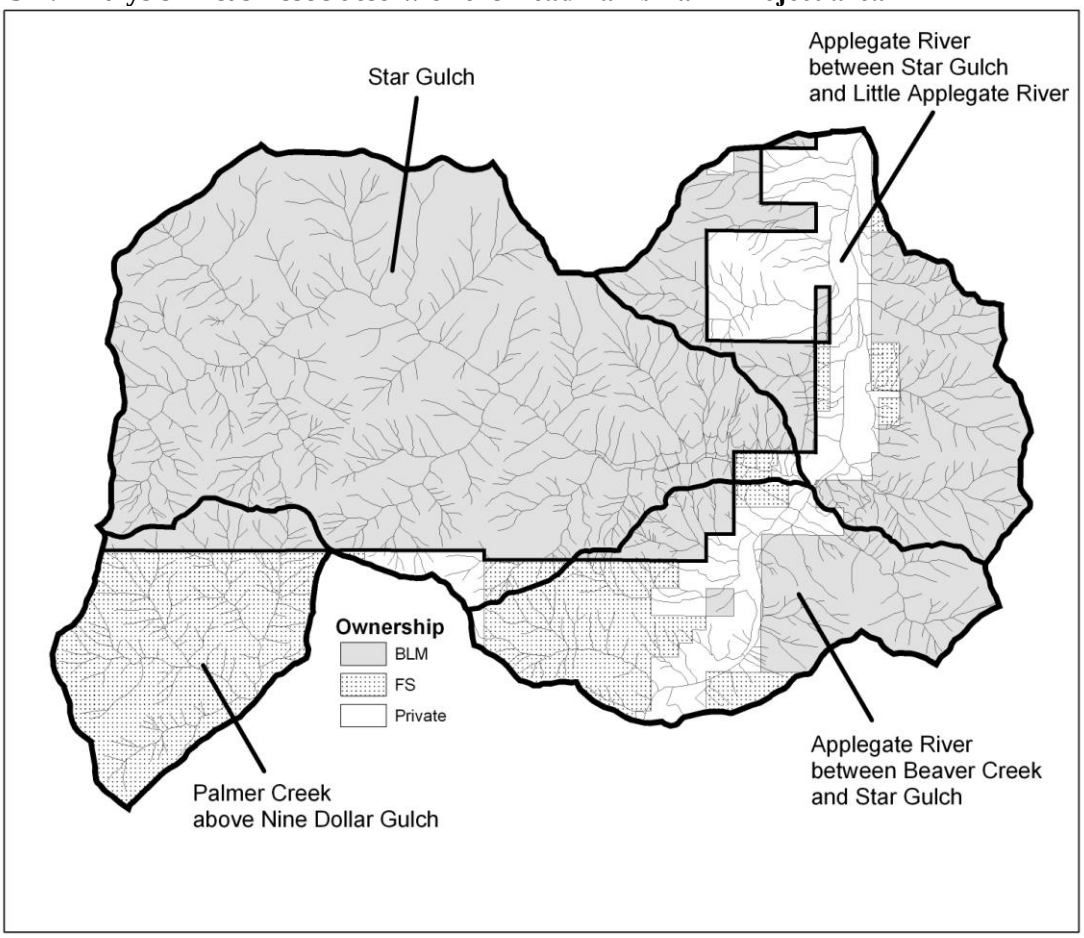


Table 3-4. Analysis Areas Associated with the Deadman's Palm Project Area

Analysis Area	BLM Acres within Project Area	Non-BLM Acres within Project Area	Total Acres within Project Area	BLM Acres within Analysis Area	Non-BLM Acres within Analysis Area	Total Acres within Analysis Area
Palmer Creek above Nine Dollar Gulch	401	0	401	401	2,371	2,772
Applegate River between Beaver Creek and Star Gulch	348	0	348	1,734	2,284	4,018
Star Gulch	10,390	0	10,390	10,390	450	10,840
Applegate River between Star Gulch and Little Applegate River	1,177	24	1,201	3,253	2,000	5,253
Totals	12,316	24	12,340	15,778	7,105	22,883

The analysis areas range in size from 2,772 to 10,840 acres (Table 3-4). All four analysis areas are partially outside the project area. This size of analysis watershed is large enough to assess the cumulative effect of actions that, taken individually (site scale) may not be significant, but when combined with effects from everything else going on in the drainage, may have a potential significant impact ("cumulative effect"). The drainage areas are small enough to avoid "drowning out" evidence of adverse effects. As the size of the analysis area increases, there is an increasing possibility of the analysis indicating that there is "no problem" when in fact individual drainages may have issues of concern.

The Palmer Creek Analysis Area drains the upper portion of Palmer Creek into a single outlet point below Nine Dollar Gulch. The Star Gulch Analysis Area drains into a single outlet point at the confluence with the Applegate River. The two Applegate River analysis areas are frontal watersheds that drain directly into both sides of the Applegate River along the entire river interface either by means of surface flow in small, individual channels or by subsurface flow. Major tributaries in the Applegate River between Beaver Creek and Star Gulch Analysis Area include Flumet and China gulches on the west side of the Applegate River and Boaz Gulch on the east side. Lime Gulch is the only named tributary in the Applegate River between Star Gulch and Little Applegate River Analysis Area and it is on the west side of the Applegate River. Note that both of these analysis areas contain lands on the east side of the river that are not included in the project area. Obviously these areas would not be directly affected by the proposed Deadman's Palm project activities that would occur on the west side of the river, but are considered for cumulative effects analysis.

The Palmer Creek Analysis Area is predominantly managed by the U.S. Forest Service (USFS) with the small amount of BLM-managed lands located in the upper elevation along the northern analysis area boundary. The Palmer Creek Analysis Area is entirely within the Palmer Creek Key Watershed as designated in the *Northwest Forest Plan* (USDA and USDI 1994). The Star Gulch Analysis Area is predominantly managed by the BLM with the USFS and private land owners managing small areas in the upper elevation on the south side and near the Star Gulch confluence with the Applegate River. For the two Applegate River analysis areas, the BLM and USFS manage land located in the higher elevations while the private lands dominate the lower valley along the Applegate River. Some of the private lands are owned by timber companies and their management is guided in part by the Oregon Forest Practices Act. Most of the private land use along the river is either residential or agricultural.

Surface Water

Surface water in the proposed Deadman's Palm project area includes streams, ditches, springs, wetlands, and reservoirs. Streams in the project area are classified as perennial, intermittent with seasonal flow (long duration intermittent), intermittent with ephemeral flow (short duration intermittent), and dry draws with ephemeral flow.

Streams categorized as perennial or intermittent on federal lands are required to have Riparian Reserves (see Fisheries section) as defined in the Northwest Forest Plan (USDA and USDI 1994). Dry draws do not meet requirements for streams needing Riparian Reserves because they lack the combination of a defined channel and annual scour and deposition (USDI 1995:27). Streams on private forest lands are managed according to the Oregon Forest Practices Act. Stream types on BLM-managed lands were identified through site visits; USFS and non-federal land stream types were estimated using aerial photo interpretation and extrapolation from information on adjacent BLM-managed lands (Table 3-5). There are a total of 150.1 stream miles within the proposed project area boundaries, 149.8 miles are on BLM-administered lands and 0.3 miles are on non-federal lands. Within the proposed project area, there are 26.8 miles (18%) of perennial streams, 13.8 miles (9%) of long duration intermittent streams, 7.4 miles (5%) of short duration intermittent streams, and 102.1 miles (68%) of dry draws.

Table 3-5. Stream Miles by Analysis Area, Stream Type, and Ownership

Analysis Area[1]	In / Out[2]	Miles of Stream by Type and Ownership												Total Stream Miles			
		Perennial			Long Duration Intermittent			Short Duration Intermittent			Dry Draw						
		BLM	FS[3]	PV[3]	BLM	FS	PV	BLM	FS	PV	BLM	FS	PV	BLM	FS	PV	All Lands
Palmer	I				0.04			0.6			3.7			4.3			4.3
Palmer	O		5.1			5.7			0.8			18.4			30.0		30.0
AR 1	I				1.2						5.2			6.4			6.4
AR 1	O	2.2	1.2	4.1	3.6	1.4	3.8	0.7		0.2	9.9	14.4	5.3	16.4	17.0	13.4	46.8
Star	I	26.3			10.4			4.4			83.9			125			125
Star	O		0.5	0.4		0.6	0.1		0.3	0.2		1.8	2.6		3.2	3.3	6.5
AR 2	I	0.5			2.1		0.1	2.4			9.1		0.2	14.1		0.3	14.4
AR2	O	1.8		7.0	6.9	0.3	6.6	3.2	0.9	2.8	19.5	1.4	6.8	31.4	2.6	23.2	57.2
Totals		30.8	6.8	11.5	24.2	8.0	10.6	11.3	2.0	3.2	131.3	36.0	14.9	197.6	52.8	40.2	290.6

1/ Analysis Areas: Palmer = Palmer Creek above Nine Dollar Gulch; AR 1 = Applegate River between Beaver Creek and Star Gulch; Star = Star Gulch; and AR 2 = Applegate River between Star Gulch and Little Applegate River.
2/ In (I)/Out(O) refers to stream miles that are in or out of the proposed Deadman's Palm project area.
3/ FS = U.S. Forest Service and PV = private.

Ditches found on BLM-administered lands in the project area are historical mining ditches that have been abandoned. They are in the Star Gulch and lower Applegate River analysis areas.

Numerous springs, one small wetland, and one small impoundment on BLM-administered lands within the project area have been identified and mapped in GIS. These features are less than one acre and are contained within Riparian Reserves.

On BLM-administered lands, locations of water developments used for diverting, storing, and/or transporting water were identified during stream survey or a search of the Oregon Water Resources Department website[1]. BLM records were also checked to determine any right-of-ways or other authorizations for diversion structures, water storage, or water transport facilities in this drainage. Landowners who have obtained water rights from the State of Oregon for use of the water must also secure the required right-of-way from the BLM for installation and use of these facilities on public land. Landowners must initiate application for, and are usually granted, a right-of-way for water sources located on BLM lands if the landowner has a valid existing water right for the water source. Without a right-of-way for the transport facilities, the pipeline or ditch is in trespass, and the Bureau technically is not liable for damages that may occur to the facilities in the course of the Bureau's land management activities.

Groundwater

[1] http://egov.oregon.gov/OWRD/

Groundwater supplies in the project area are limited and primarily found in valley bottom alluvium of the Applegate River corridor (USDI 1998:29). Well water quality problems are prevalent throughout the Rogue basin, arising from natural sources such as arsenic, boron, and fluoride. Surface contaminants such as nitrate and fecal matter may enter ground water through improperly constructed wells. Increasing demand from rural population density increases and years with below-normal precipitation have been identified as factors affecting ground water supplies in Jackson County (USDI 1994:3-13). The Medford District PRMP/EIS identified that an increase in rural population density has been accompanied by an increase in ground water diversion, and this trend is expected to continue (USDI 1994:3-13). None of the proposed Deadman's Palm project area has been identified as a critical groundwater area by the Oregon Water Resources Department (OWRD 1989).

Water Quantity

This section discloses the impacts from various vegetation treatments and ground disturbing activities on water quantity. Impacts to water quality are discussed in the Water Resources section. Habitats and wildlife related to water are discussed in the Fisheries section.

Issues/Concerns

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the proposed action. These effects may or may not occur as a result of the proposed action but were of concern to members of the public or ID team specialists.

- Some oppose logging and aggressive forms of thinning and fuels reduction because such treatments may affect streamflows.
- Some oppose logging and road construction due to the potential effects of compaction on streamflows.
- Some oppose road construction because roads alter the natural drainage patterns.

Anticipated Effects

Reduction in vegetation canopy (from timber harvest, roads, fuels reduction, prescribed fire and wildfire) has the potential to cause the following hydrologic process changes: reduced interception and transpiration (i.e. more precipitation reaches the soil surface and less water consumption by plants); increased snow accumulation in transient snow zone (see Affected Environment this section); increased snow melt rate; decreased snow melt time in transient snow zone; and increased soil water content (Chamberlin, et al. 1991). Possible effects on the streamflow regime from these hydrologic process changes include reduced time to hydrograph peak; increased frequency of peak flows; and increased magnitude of peak flows. Altered peak flows may affect stream channel condition by eroding streambanks, scouring streambeds, and transporting and depositing sediments. These are normal occurrences in a dynamic, properly functioning stream system; however, increases in the magnitude and frequency of peak flows due to human-caused factors can intensify the effects. A summary of paired watershed studies in the Cascade Range of Oregon found that there were no changes to small or large peak flows when 30% or less of the watershed was harvested (Beschta et al. 2000).

The transient snow zone is of interest to land managers since greater snow accumulation can occur in clearings, producing the potential for higher peak flows during rain-on-snow events. The Oregon Watershed Assessment Manual (OWAM) that was developed by Watershed Professionals Network (WPN 1999:IV-9-11) for the Governor's Watershed Enhancement Board (now known as the Oregon Watershed Enhancement Board) provides a method for assessing the potential risk for peak flow increases from runoff originating in the transient snow zone. This risk assessment method indicates that drainages with more than 25% of the area in the transient snow zone may be at risk for possible peak flow increases.

Removal of vegetative canopy can also increase water yield and discharge during the normal low-flow period, although absolute increases are small (Harr 1976b) and the effect is short term (Hicks et al. 1991:225). When stands are only thinned, the residual stand may increase its use of water, so changes in streamflow following thinning are likely to be less than might be expected from counts of trees alone (Meehan 1991:186).

Soil compaction (due to ground-based logging equipment, ground-based fuels treatment machinery, and the existence of forest roads and trails) may increase the frequency and magnitude of peak streamflows (Harr 1976a). Compaction can reduce the infiltration properties of the soil, resulting in increased runoff. Soil compaction can also impede the subsurface movement of water as it moves downslope in shallow aquifers. Peak flows for small, headwater streams appear to be increased where at least 12% of a watershed was seriously compacted by road building, tractor skidding, or tractor windrowing of slash (Harr 1976a). Factors that influence the contribution of a compacted area to increased runoff include: proximity of compacted area to streams, connectivity of compacted areas to streams, and watershed characteristics (Harr et al. 1979). Severe fire can also reduce the infiltration properties of the soil, resulting in increased runoff.

Roads, trails, and ditches can intercept both surface and subsurface flow thereby changing the local drainage pattern (Wemple 1994). This is of particular concern if they force the natural drainage system that has developed over millennia, to adjust to a new regime. For example, a road might intercept storm flow and transport it into a different drainage. The channel in the drainage receiving the additional flow must start an adjustment process to accommodate this flow increase while the original channel responds to a reduction in water. Roads connected to stream channels through ditch lines effectively extend the stream channel network, changing runoff timing and ultimately increasing the magnitude of peak flows (Wemple et al. 1996). Roads that cross dry draws have the potential to route storm flow into the dry draw, and subsurface flow through the colluvium can also be intercepted by a road cut or compaction from a road that crosses the bottom of a dry draw, initiating surface flow with scour and deposition in the draw. This has the potential to change the downstream flow characteristics of the draw to a short-duration intermittent stream, affecting the size of downstream peakflows due to the more rapid delivery of storm flow to downstream reaches (water flows much faster through the defined surface channel of a short-duration intermittent stream than it does subsurface through the colluvium of a dry draw). Well-designed roads and trails with a properly functioning drainage system attempt to mimic the local natural drainage pattern by keeping the local downslope movement of water similar to the pre-road condition. However, during extreme events (drought or peak flow) any hydrologic differences between the artificial drainage associated with the road system and the natural system become more critical and can cause noticeable effects to the local environment.

BLM's management as analyzed for in the Medford District RMP/EIS would cause no measurable changes in ground water. This was the case for even the most management-intensive alternatives that were considered in the RMP/EIS. Because one of the more environmentally conservative alternatives (relating to water resources) in the RMP/EIS was ultimately selected (USDI 1995:4) and is being implemented (USDI 1995:6), concerns over potential impacts to ground water from BLM activities are negligible (USDI 1994:4-18).

Affected Environment

Average annual precipitation in the Deadman's Palm project area ranges from 26 near the Applegate River (elevation 1,440 feet) to 52 inches at Palmer Peak (elevation 4,736) (USDI 1998:17, 160). Precipitation falls predominately from November through March and summer months are typically very dry (USDI 1998:18). The rain patterns in the winter months are wide based with relatively low intensity and long duration in contrast to localized, short duration, and high intensity summer storms that occasionally occur.

Within the project area, precipitation generally falls in the form of rainfall below 3,500 feet elevation (Table 3-6). Between 3,500 and 5,000 feet elevation (USDI 1998:17, USDA 1994:1-9), alternating warm and cold fronts

drop a mix of snow and rain. Shallow snow packs often build-up in this elevation range, and then are quickly melted by rain and warm winds (rain-on-snow event). This area is typically referred to as the transient snow zone (Table 3-6). The entire project area is below 5,000 feet elevation.

Table 3-6. Percentage of Analysis Areas within the Transient Snow Zone.

Analysis Area	Acres by Precipitation Zone			Percent in Transient Snow Zone
	Rainfall Zone	Transient Snow Zone	Snow Zone	
Palmer Creek above Nine Dollar Gulch	1,303	1,470	0	53%
Applegate River between Beaver Creek and Star Gulch	3,922	96	0	2%
Star Gulch	7,294	3,546	0	33%
Applegate River between Star Gulch and Little Applegate River	5,102	151	0	3%

A U.S. Geological Survey (USGS) gaging station located on the lower reach of Star Gulch has collected streamflow data since 1983. Within the proposed Deadman's Palm project area, moderate to high streamflows usually occur from December through March, with runoff peaking in January and February (USDI-USGS 2003:491). The maximum discharged recorded at the Star Gulch gaging station was 1,050 cubic feet per second on January 1, 1997. Significant flows can also be produced by local, high intensity summer storms, though these events are relatively rare and their effect is limited to the local area. The lowest streamflows generally occur July through September with the lower reaches of Star Gulch and many of the tributary streams in the project area having no flow in late summer. Streamflows in the Applegate River are partially regulated by Applegate Dam (upstream of the project area) which controls the flow from 223 square miles of the Applegate Subbasin. There is a USGS gaging station below the Applegate Dam and records show that the dam has moderated the extreme values of both high and low flows in the mainstem Applegate River resulting in reduced peak flows and less extreme low flow conditions (USDI 1998:32).

Past Actions

Water quantity in the four analysis areas is a function of natural and human-caused factors. Natural site factors include climate, geology, and geographic location. Natural processes that have influenced water quantity include floods, wildfires, and drought. Past human activities that have altered water quantity in the analysis areas include: land clearing (for agricultural and residential use), timber harvest, road operations, water withdrawals, and fire suppression. These past actions and their effects on hydrologic processes and water quantity in the four analysis areas are described in this section.

The degree to which hydrologic processes are affected by vegetation canopy reduction (e.g. land clearing or timber harvest) depends on the extent and location. Extent refers to the amount of a drainage area that is below the historic crown closure. Location refers to whether or not canopy reduction occurs within the transient snow zone.

The historic crown closure for the project area was greater than 30% (WPN 2001:A-219), except for the lower elevation oak woodlands where natural crown closures were less than 30% (WPN 2001:A-207). Vegetation condition class is used to estimate percent crown closure for BLM-managed lands (Table 3-7). For this analysis, forest lands that are in the early-seral/seedling/sapling and pole classes are considered to have crown closures that are 30% or less (Haupt 2005). The pole class includes trees that are 5-11 inches dbh. This may result in an overestimation of acres in young stands, because trees 11 inches in diameter likely have crown closures that are greater than 30%.

Table 3-7. BLM Vegetation Condition Class by Analysis Area for BLM-Administered Lands

Analysis Area	Acres and % of BLM Vegetation Condition Class							
	Grass	Shrubs	Woodland	Early- Seral	Poles	Mid- Seral	Mature	Total
Palmer Creek above Nine Dollar Gulch	17.2	0	325	0.3	0	12.0	10.8	366
	4.7%	0	89.0%	0.1%	0	3.3%	3.0%	100%
Applegate River between Beaver Creek and Star Gulch	86.5	0.1	628	76.2	68.2	704	164	1,726
	5.0%	0%	36.4%	4.4%	4.0%	40.8%	9.5%	100%
Star Gulch	131	24.7	2,434	1,358	983	3,900	1,553	10,384
	1.3%	0.2%	23.4%	13.1%	9.5%	37.6%	15.0%	100%
Applegate River between Star Gulch and Little Applegate River	81.3	408	839	249	272	1122	282	3,253
	2.5%	12.5%	25.8%	7.7%	8.3%	34.5%	8.7%	100%

Forest stands with crown closures that are 30% or less on non-BLM lands in the four analysis areas were estimated using 2001 aerial photos and combined with the BLM vegetation condition classes for early seral and poles (Table 3-8).

Table 3-8. Percent of Analysis Area in Early Successional Stage (≤ 30% crown closure)

Analysis Area	BLM		USFS		Private		Total	
	Acres ≤ 30% cc[1]	% Acres ≤ 30% cc	Acres ≤ 30% cc	% Acres ≤ 30% cc	Acres ≤ 30% cc	% Acres ≤ 30% cc	Acres ≤ 30% cc	% Acres ≤ 30% cc
Palmer Creek above Nine Dollar Gulch	0	0%	55	2.0%	0	0%	55	2%
Applegate River between Beaver Creek and Star Gulch	144	3.6%	50	1.2%	10	0.2%	204	5%
Star Gulch	2,341	21.6%	50	0.5%	135	1.2%	2,526	23%
Applegate River between Star Gulch and Little Applegate River	521	10%	0	0%	200	3.8%	721	14%

1/ cc = crown closure

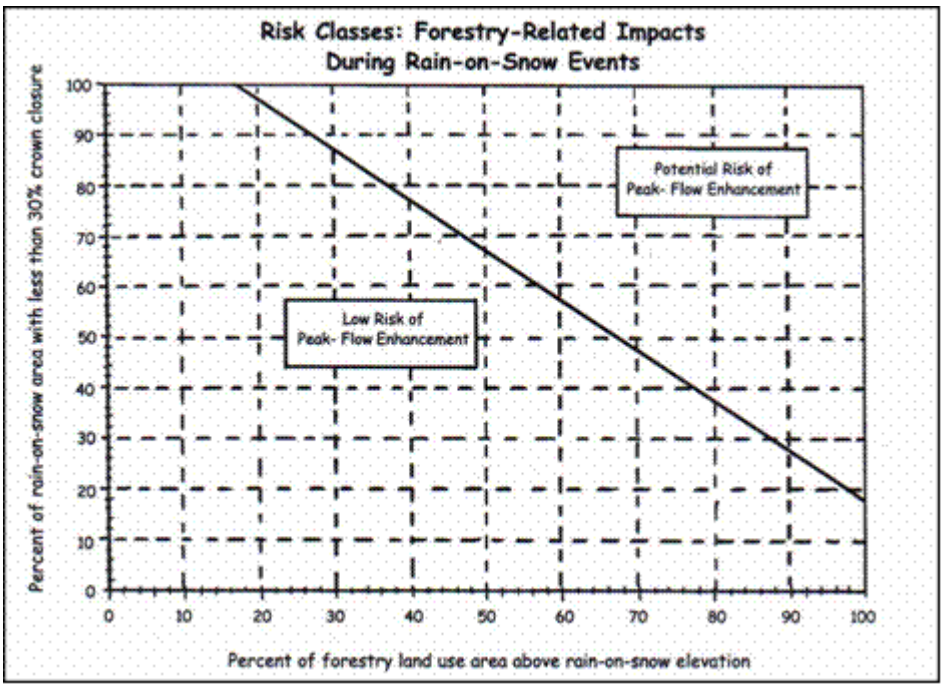
The range of natural variability for early successional (early seral and poles) vegetation with snags in the Applegate Subbasin is estimated to be from 10 to 40% for National Forest lands (USDA 1993:28). Using this range for the analysis areas would be a conservative estimate, since these hotter, drier, lower elevation lands would have experienced a higher fire frequency and thus more early successional stands than the USFS lands in the higher elevations. The percent of all lands in the early successional stage (≤ 30% crown closure) is within the range of natural variability for Star Gulch and the Applegate River between Star Gulch and Little Applegate River analysis areas (Table 3-8), and less than the range of natural variability for the Palmer Creek and Applegate River between Beaver Creek and Star Gulch analysis areas.

In summary, the extent of early successional vegetation in the analysis area due to past canopy reducing activities is less than the maximum identified in the range of natural variability and has not likely had a measurable affect on the streamflow regime.

Openings in the transient snow zone and potential risk for peak flow increases are analyzed using the OWAM (WPN 1999:IV-9-11). This risk assessment method indicates that drainages with more than 25% of the area in the transient snow zone may be at risk for possible peak flow increases. The transient snow zone occupies more than 25% of two analysis areas associated with the proposed project: Palmer Creek above Nine Dollar Gulch (53%) and Star Gulch (33%) (Table 3-6).

The OWAM risk assessment chart (Figure 3-1) indicates that more than 64% of the area in the transient zone would have to have less than 30% crown closure to indicate a potential risk of peak flow enhancement in the Palmer Creek Analysis Area and more than 85% of the area in the transient zone would have to have less than 30% crown cover to indicate a potential risk of peak flow enhancement in the Star Gulch Analysis Area.

Figure 3-1. Graph for estimation of the risk of peak-flow enhancement from forestry-related impacts during rain-on-snow events (WPN 1999:IV-11).



Vegetation condition class is used to estimate stands with crown closure less than 30% for BLM-managed lands in the transient snow zone (Table 3-9). For this analysis, forest lands that are in the early-seral/seedling/sapling and pole classes are considered to have less than 30% crown cover (Haupt 2005). The pole class includes trees that are 5-11 inches dbh. This may result in an overestimation of acres with less than 30% crown cover, because many pole stands have crown closures 30% or greater. The 2001 aerial photos were used to estimate the area with less than 30% crown cover on USFS and private lands in the transient snow zone (Table 3-9). Canopy openings due to roads in the transient snow zone were also included in the analysis (Table 3-9). A factor of 2 acres/mile was used to convert miles of natural surfaced roads to acres and 6 acres/mile was the conversion factor applied to rocked or unknown surfaces.

Table 3-9. Percent of Transient Snow Zone (TSZ) with Less than 30% Crown Closure

Analysis Area	BLM		USFS		PVT		TOTAL
	% TSZ < 30% crown cover	% TSZ with road openings	% TSZ < 30% crown cover	% TSZ with road openings	% TSZ < 30% crown cover	% TSZ with road openings	% TSZ < 30% crown cover & road openings
Palmer Creek above Nine Dollar Gulch	0.02%	0.4%	3.1%	0.9%	0%	0%	4.4%
Star Gulch	14.5%	2.5%	0.3%	0.1%	3.8%	0.3%	21.5%

The current crown closure for the two analysis areas with over 25% in the transient snow zone does not indicate that there is a potential risk of peak flow increases. For the Palmer Creek above Nine Dollar Gulch Analysis Area, the 4.4% of the transient snow zone with less than 30% crown cover is well below the 64% that would indicate a potential risk of peak flow increases. Likewise, the Star Gulch analysis area has less than 30% crown cover across 21.5% of the transient snow zone, which is much less than the 85% that would indicate a potential risk of peak flow increases. Consequently, the risk of increased peak flows from the transient snow zone is low under current conditions.

Large areas of compacted soil, such as occur from roads, tractor yarding, or ground-based fuel treatments, can be a concern from a hydrologic perspective because such areas can decrease the infiltration properties of the soil, resulting in increased surface runoff. This can also contribute to decreased soil moisture within and downslope of the compacted area. Past soil-compacting treatments on BLM-administered lands were identified from timber sale records and those on non-BLM lands were identified from aerial photo analysis (see Soils section). The following assumptions were used to calculate the compacted area resulting from past treatments (Table 3-10): 1) roads are assumed to be permanently compacted at the rate of 2.4 acres per mile of road (20 foot compacted width on all roads); 2) 25% of the harvest acreage is compacted for all units tractor logged on private lands and those on BLM-managed lands tractor logged prior to 1983 (Swanston and Dyrness 1973:266; Adams and Froehlich 1981:10); 3) 12% of the BLM tractor units harvested in 1983 or later is considered compacted (USDI 1979); 4) 4% of the harvest acreage is compacted for cable units (Dyrness 1967:266); and 5) 1% of helicopter units is compacted (Clayton 1981:6).

The Applegate River between Star Gulch and the Little Applegate River Analysis Area has the highest percent compacted area (5%), and the Palmer Creek above Nine Dollar Gulch Analysis Area has the lowest percent compacted area (2%) (Table 3-10). The existing percent compacted area in all the analysis areas associated with the Deadman's Palm project is well below the 12% level of concern identified for potential increases in peak flows (Harr 1976a).

Table 3-10. Estimated Existing Soil Compaction by Analysis Area for All Lands

Analysis Area	Compacted Area From Past Treatments			Compacted Area From Roads[1] (Acres)	Total Compacted Area (Acres)	Total Compacted Area (%)
	Cable (Acres)	Tractor (Acres)	Helicopter (Acres)			
Palmer Creek above Nine Dollar Gulch	13	0	0	37	50	2%
Applegate River between Beaver Creek and Star Gulch	17	0	0	86	103	3%
Star Gulch	66	113	2	172	353	3%
Applegate River between Star Gulch and Little Applegate River	18	160	0	86	264	5%

1/ Based on 20 ft. road width for compacted surface.

Road miles were determined from the BLM GIS data base and from an aerial photo survey (Table 3-11). Many roads such as those hidden by tree canopy, jeep and OHV trails and recently new private roads are not included in the table. It is estimated that the percentage of undetected roads may be as much as 30% on private lands and 10% on federal lands (Squyres 2003).

Road density provides a general index of relative extent of the amount of road in the project drainages (Table 3-11). Areas with higher road densities will generally experience more road-related effects, however, many other factors such as design, location, maintenance, use, surface type, and geology can influence the effect of any particular road. High road densities are found in the four analysis areas associated with the project area (Table 3-11). Overall road density is 4.4 mi./mi.^{2}.

The percentage of the drainage area in roads is a similar index. The OWAM (WPN 1999:IV-16) suggests that rural drainages with more than 8% roads have a high potential of experiencing more than a 10% increase in peak flows. Drainages with 4-8% roaded area have a moderate risk and those with less than 4% roads have a low risk. All analysis areas have less than 4% roaded area and thus have a low risk of peak flow increases (Table 3-11). The Applegate River between Beaver Creek and Star Gulch Analysis Area is the only area that would change to the moderate risk category if the area in roads was increased by 30% for undetected roads.

Table 3-11. Road Miles, Road Density, and Percent of Area Roaded by Analysis Area, Project Area and Ownership

Analysis Area	Road Miles From GIS Data						Additional Road Miles From Aerial Photos						Total Road Miles	Road Density (mi./mi.^{2})	Percent of Area in Roads[1]
	Within Project Area			Outside Project Area			Within Project Area			Outside Project Area					
	BLM	USFS	Pvt	BLM	USFS	Pvt	BLM	USFS	Pvt	BLM	USFS	Pvt			
Palmer Creek above Nine Dollar Gulch	1.0	0.0	0.0	0.0	9.8	0.0	0.5	0.0	0.0	0.0	3.8	0.0	15.1	3.5	2.0%
Applegate River between Beaver Creek and Star Gulch	0.1	0.0	0.0	7.9	6.2	12.0	0.0	0.0	0.0	1.0	2.5	5.8	35.5	5.7	3.2%
Star Gulch	58.5	0.0	0.0	0.0	1.1	1.6	7.4	0.0	0.0	0.0	0.3	2.1	71.0	4.2	2.4%
Applegate River between Star Gulch and Little Applegate River	6.2	0.0	0.1	4.9	0.2	12.7	1.5	0.0	0.0	0.5	0.5	9.0	35.6	4.3	2.5%
Total	**65.8**	**0.0**	**0.1**	**12.8**	**17.3**	**26.3**	**9.4**	**0.0**	**0.0**	**1.5**	**7.1**	**16.9**	**157.1**	**4.4**	**2.5%**

1/ Based on 30 foot average width.

Roads located near a stream or mid-slope generally have a greater chance of directly affecting the hydrologic function of the stream system. The number of stream crossings by stream type for each analysis area is used as an indicator of road location (Table 3-12). The stream crossing density (crossings/mi.^{2}) is high for all four analysis areas. Of the 715 total stream crossings identified, 68% are over dry draws that are generally located nearer to the ridgetop. Another 9% of the stream crossings intersect ephemeral short duration streams, for a total of 77% that cross ephemeral drainages and are generally located in the upper slopes.

Table 3-12. Stream Crossings[1] by Analysis Area, Stream Type, and Ownership

Analysis Area	Number of Stream Crossings by Stream Type and Ownership												Total	Crossings/ mi^2
	Perennial			Long Duration			Short Duration			Dry Draw				
	BLM	USFS	Pvt	BLM	USFS	Pvt	BLM	USFS	Pvt	BLM	USFS	Pvt		
Palmer Creek above Nine Dollar Gulch	0	2	0	0	6	0	0	0	0	5	45	0	58	13.4
Applegate River between Beaver Creek and Star Gulch	8	0	11	13	0	24	1	0	2	25	27	40	151	24.1
Star Gulch	33	0	0	24	0	2	12	1	3	262	7	9	353	20.8
Applegate River between Star Gulch and Little Applegate River	4	0	11	7	0	22	17	1	24	42	1	24	153	18.6
Total	**45**	**2**	**22**	**44**	**6**	**48**	**30**	**2**	**29**	**334**	**80**	**73**	**715**	**20.0**

1/ Stream crossing information obtained from the BLM GIS database and 2001 aerial photos.

Environmental Consequences

Because no new management is proposed under Alternative A, the effects described reflect current conditions and trends that are shaped by ongoing management and events unrelated to the Deadman's Palm project. Discussion for Alternatives B and C reflects the direct and indirect impacts of the proposed actions. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable. Short-term effects are defined as those lasting ten years or less and long-term effects last more than ten years (USDI 1994:4-4).

Alternative A

There are no actions proposed under Alternative A (the No Action Alternative); therefore direct and indirect effects are the current conditions in the project area which are the result of past actions not related to the Deadman's Palm project. Alternative A describes anticipated effects of not implementing an action at this time.

Under Alternative A, there would be no changes in percent of area in non-recovered openings within the transient snow zone, areas of compacted soil, road densities, percent of area in roads, or number of stream crossings. There would therefore be no changes to the magnitude and frequency of peak flows.

Older roads in the area would be maintained but not upgraded or decommissioned and would continue to influence local runoff and groundwater flow. In the long term, older roads with limited drainage capability are more likely to experience a road failure during an extreme precipitation event causing subsequent adjustments to local flow and groundwater conditions. For example, a channel may become diverted and an alternative drainage developed.

Past events in the project area that currently have the potential to influence peak streamflows include past timber harvesting, wildfire, road construction, and land development. These activities potentially influence peak streamflows through canopy removal, soil compaction, or alteration of drainage networks. Risk assessments for potential increased peak flows consider the effects of these past actions in their methodology. For example, roads from past construction events (developing private land, logging, mining, etc.) are included in the percent of an area in roads (Table 3-11) for the Worm's determination of potential for peak flow increases. There has been one major wildfire in the analysis area within the past 30 years. The Star Fire in 1987 burned approximately 1,486 acres in the Star Gulch Analysis Area and 162 acres in the Applegate River between Star Gulch and Little Applegate River Analysis Area. The burned area within the analysis area occurred on BLM-administered land and its current condition is accounted for in the BLM vegetation condition class analysis (Table 3-7).

In summary, there is virtually no risk to increased peak flows as a result of past management activities in the project area. Substantial removal of vegetation is not a factor that currently contributes to altered peak flows because: 1) the extent of early successional vegetation in the analysis area due to past canopy reducing activities is less than the maximum identified in the range of natural variability and has not likely had a measurable affect on the streamflow regime; and 2) the current crown closure for the two analysis areas with over 25% in the transient snow zone does not indicate that there is a potential risk of peak flow increases. The percent compacted area is low in all analysis areas and is not a concern for increased peak flows. The percent of the area in roads is less than four percent indicating that past road construction has resulted in a low potential of peak flow increases in all four analysis areas. Therefore, the factors that would result in increased peak flows (low crown cover, high percentage of compacted area, and high percentage of area in roads) are minimal.

Reasonably foreseeable future actions planned for BLM-administered lands in the analysis area include the Bald Lick Landscape Project (USDI 2005a), a culvert replacement on Star Gulch, a habitat restoration project in Star Gulch, and continued small scale placer mining. The Bald Lick Landscape Project is the only future BLM action that would have the potential to affect water quantity in the analysis area. The other foreseeable future actions are discussed in the water quality section. Reasonably foreseeable future actions for non-BLM-administered lands in the analysis area include a hazardous fuel reduction project on Forest Service-managed lands and timber harvest on private lands.
Alternative 2 from the BLM's proposed Bald Lick Landscape Project is used for analysis of the reasonably foreseeable future actions since it would have the most road construction and the most extensive vegetation treatments. The proposed Bald Lick Landscape Project would include the following activities within the Deadman's Palm analysis area: 274 acres of commercial timber harvest, 0.5 mile of mechanical road decommissioning, 1.1 miles of natural decommissioning, and 4.6 miles of road renovation within the Applegate River between Beaver Creek and Star Gulch Analysis Area; and 269 acres of commercial timber harvest, 1.0 mile of new road construction, 1.9 miles of mechanical road decommissioning, and 2.8 miles of road renovation within the Applegate River between Star Gulch and Little Applegate River Analysis Area.

It is assumed that private lands would continue to be intensively managed for timber production on approximately a 60-year rotation (USDI 1994:4-5). The actual timing of any private lands timber harvest is dependent on many factors, including valuations based on supply/demand, ownership, etc. Any potential future wildfire would likely accelerate harvesting/salvage on non-BLM lands. Using aerial photos and assuming a 60-year rotation for private timber lands, a reasonably foreseeable future scenario was developed for private timber harvest within the Deadman's Palm analysis area. The following estimates of harvest on private land are used for the reasonably foreseeable future scenario: 5 acres in the Applegate River between Beaver Creek and Star Gulch Analysis Area; 70 acres in the Star Gulch Analysis Area; and 440 acres in the Applegate River between Star Gulch and Little Applegate River Analysis Area. Most areas that could be harvested on private lands are accessible by existing roads, so no new road construction is likely in the reasonably foreseeable future scenario.

All harvest prescriptions under the proposed BLM Bald Lick Landscape Project would maintain canopy closure within each unit at greater than 30% and would not increase the amount of early successional vegetation. The proposed USFS hazardous fuel reduction project would remove understory vegetation and not affect the overstory canopy closure. It is assumed that crown closures would be 0% after the reasonable foreseeable future timber harvest on private lands. The projected change in crown closures that would be 30% or less is estimated by analysis area (Table 3-13).

Table 3-13. Percent of Analysis Area in Early Successional Stage (≤ 30% crown closure) after Reasonably Foreseeable Future Timber Harvest[1]

Analysis Area	BLM		USFS		Private		Total	
	Acres ≤ 30% cc[2]	% Acres ≤ 30% cc	Acres ≤ 30% cc	% Acres ≤ 30% cc	Acres ≤ 30% cc	% Acres ≤ 30% cc	Acres ≤ 30% cc	% Acres ≤ 30% cc
Palmer Creek above Nine Dollar Gulch	0	0%	55	2.0%	0	0%	55	2%
Applegate River between Beaver Creek and Star Gulch	144	3.6%	50	1.2%	15	0.4%	209	5%
Star Gulch	2,341	22%	50	0.5%	205	1.9%	2,596	24%
Applegate River between Star Gulch and Little Applegate River	521	10%	0	0%	640	12%	1,161	22%

1/ Reasonably foreseeable future timber harvest that would reduce the crown closure to 30% or less is only anticipated for private lands.
2/ cc = crown closure

A comparison of Table 3-13 with Table 3-8 shows that the percent of area with 30% or less crown closure in the Palmer Creek above Nine Dollar Gulch and Applegate River between Beaver Creek and Star Gulch analysis areas would not change as a result of reasonably foreseeable future timber harvest on private lands. The percent of area with crown closure of 30% or less would increase by one percent in the Star Gulch Analysis Area and by eight percent in the Applegate River between Star Gulch and Little Applegate River Analysis Area after the predicted timber harvest occurred on private lands. Both these analysis areas would remain within the range of natural variability for early successional vegetation.

No reasonably foreseeable future timber harvest is projected for private lands in the transient snow zone. Under the Bald Lick Landscape Project, proposed future timber harvest on BLM-administered lands in the transient snow zone would maintain canopy closures of at least 30% and no road construction is proposed in the transient snow zone. Therefore, the percent of transient snow zone with less than 30% crown closure would remain the same as the existing condition (Table 3-9) for the analysis area.

The private lands identified for future harvest have been previously entered using tractors and were included in the existing compacted area calculations (Table 3-10). It is assumed for this analysis that existing skid roads would be used and no additional compaction would occur from future yarding activities. The hazardous fuel reduction project proposed by the Forest Service would consist of manual treatments and not involve any ground-based equipment. Compacted area would increase minutely (less than 0.5%) in two analysis areas as a result of the reasonably foreseeable future harvest activities on BLM-administered lands from the proposed Bald Lick Landscape Project (Table 3-14). The same assumptions used to determine the existing percent compacted area for tractor (12%), cable (4%), and helicopter (1%) logging systems and roads (20 foot road width) were applied to the foreseeable future harvest units and road construction. Road surfaces proposed for mechanical decommissioning under the Bald Lick Landscape Project are deducted from the existing compacted area.

The total percent compacted area would remain very low in each of the analysis areas after adding the reasonably foreseeable future activities that could result in soil compaction (Table 3-14) and would still be well below a level of concern for peak flow increases.

Table 3-14. Estimated Soil Compaction by Analysis Area for All Lands after Reasonably Foreseeable Future Soil Compacting Actions[1]

Analysis Area	Estimated Compacted Area From Foreseeable Future Treatments				Existing Compacted Area (Acres)	Existing and Future Compacted Area (Acres)	Total Compacted Area (%)	Increase in Percent Compacted Area (%)
	Cable (Acres)	Tractor (Acres)	Heli-copter (Acres)	Roads[2] (Acres)				
Palmer Creek above Nine Dollar Gulch	0	0	0	0	50	50	1.8%	0%
Applegate River between Beaver Creek and Star Gulch	2	0	2	-1	103	106	2.6%	0.1%
Star Gulch	0	0	0	0	353	353	3.3%	0%
Applegate River between Star Gulch and Little Applegate River	2	2	2	-2	264	268	5.1%	0.2%

1/ Reasonably foreseeable future soil compacting actions only anticipated on BLM-administered lands.
2/ Based on 20 ft. road width for compacted surface. The negative road acre values reflect the mechanical decommissioning that would minimize the compacted road surface.

The BLM Bald Lick Landscape Project proposes to mechanically decommission 0.5 miles of road in the Applegate River between Beaver Creek and Star Gulch Analysis Area. The proposed Bald Lick project would also construct approximately 1.0 miles of road (mostly on or near a ridge) and mechanically decommission 1.9 road miles in the Applegate River between Star Gulch and Little Applegate River Analysis Area. The road density in both analysis areas would be reduced by 0.1 mi./mi.^{2} and the percent of the area in roads would decrease by less than 0.1 percent. These analysis areas would remain in the low risk category for peak flow increases according to the OWAM peak flow risk assessment (WPN 1999:IV-16).

In the long term, with no stand management on BLM-administered lands, a severe, stand-replacement fire would likely occur (see Fire section) and it could drastically alter the surface water and groundwater regime. Immediately after a severe fire, the loss of vegetation would make more groundwater available for streamflow and low summer flows would likely increase. However, the absence of vegetation would also result in an increased risk of higher peak flows. In a relatively short time vegetation would reestablish and less water would be available for summer flow. It would take a longer period of time for vegetation to recovery sufficiently for peak flows to return to their normal range.

In conclusion, past and present actions within the project area have not resulted in any major increase in the magnitude and frequency of peak streamflows because the factors most likely to cause increased peak flows (high percent of area in roads, high percent compacted area, and low crown cover) are not a concern in the analysis areas evaluated. Of the reasonably foreseeable future actions analyzed, a large, severe, stand-replacement wildfire would be the greatest concern for potential increases in the magnitude and frequency of peak streamflows in the four analysis areas. A severe, stand-replacement fire in the Palmer Creek above Nine Dollar Gulch or Star Gulch analysis areas would be of particular concern since more than 25% of these two areas is within the transient snow zone.

Alternative B

Alternative B could indirectly affect streamflows in the project area as a result of changes in vegetative cover, soil compaction, percent of the area in roads, and road drainage.

Alternative B proposes to commercially harvest approximately 3,991 acres; pre-commercially thin (PCT) approximately 3,035 acres, of which 2,346 acres are within and 689 acres are outside the commercial harvest units; and non-commercially thin approximately 441 acres of oak woodlands for fuel reduction. The proposed non-commercial thinning would occur in lower elevations where historic crown closures were less than 30%. These units would be treated in three analysis areas: Applegate River between Beaver Creek and Star Gulch (69 acres), Star Gulch (247 acres), and Applegate River between Star Gulch and Little Applegate River (125 acres). Existing crown closures in the proposed woodland treatment units are variable with some greater and some less than 30%. Most of the proposed fuel reduction treatments would remove brush and small trees, having minimal effect on the overstory crown closure, thus these proposed units are not included in the following discussion.

The majority of the vegetative treatments would occur in the Star Gulch and the Applegate River between Star Gulch and Little Applegate River analysis areas (Table 3-15). The **minimum** post treatment crown closure would range from 40-60% (Table 3-15) depending on the harvest prescription. The predominant harvest prescription, Douglas-fir late seral retention (2,239 acres), would leave a minimum of 60% crown closure. Harvest and thinning prescriptions are described in Chapter 2. Prescribed burning proposed under Alternative B would not affect the crown closure.

Table 3-15. Alternative B Proposed Commercial Harvest[1] and PCT Treatments

Analysis Area	DF Poles (60%)* (Acres)	DF Regen (40%)* (Acres)	Dry DF (50%)* (Acres)	Moist DF (50%)* (Acres)	DF LSR (60%)* (Acres)	Pine LSR (40%)* (Acres)	Pine Regen (40%)* (Acres)	PCT[2] (50%)* (Acres)	Total Area Treated (Acres)	% of Analysis Area Treated
Palmer Creek above Nine Dollar Gulch				11.7	5.7			0.1	17.5	1%
Applegate River between Beaver Creek and Star Gulch			8.7		27.7	102.1	47.7	1.6	187.8	5%
Star Gulch	340.6	16.4	517.4	150.1	1,982.7	121.6	155.8	659.6	3,944.2	36%
Applegate River between Star Gulch and Little Applegate River	158.7		43.2	3.2	223.0	29.2	45.0	27.4	529.8	10%
Total	**499.3**	**16.4**	**569.3**	**165.0**	**2,239.2**	**252.9**	**248.6**	**688.6**	**4,679.4**	**20%**

1/ See Chapter 2 for description of harvest prescriptions (DF = Douglas-fir, LSR = late seral retention).
2/ Pre-commercial thinning (PCT) acres do not include PCT treatments within commercial harvest units.
* Value denotes minimum post-treatment crown closure.

Under Alternative B, proposed commercial and pre-commercial treatments would maintain the average crown closure above the natural minimum of 30% for all four analysis areas. On BLM-administered lands, the proposed treatments would tend to reduce the risk of severe fire while keeping the canopy cover well above the natural minimum of 30%. No noticeable increase in the magnitude or frequency of peak streamflows would be expected as a result of crown closure reductions proposed under Alternative B.

Openings in the transient snow zone have a greater potential to influence changes in peak flows than reductions outside the transient snow zone. Under Alternative B, commercial harvest in the transient snow zone is proposed on 1,014 acres (970 acres in the Star Gulch Analysis Area) and pre-commercial thinning outside of commercial units is proposed on 189 transient snow zone acres (188 acres in Star Gulch Analysis Area). According to the OWAM (WPN 1999:IV-9-11), forested crown closure in the transient snow zone would have to be less than 30% to cause a detectable increase in peak flows. No commercial or pre-commercial treatments proposed under Alternative B would reduce the crown closure below 30%; therefore no increased risk of peak flows associated with rain-on-snow events is expected to occur as a result of the proposed vegetation treatments.

Alternative B proposes 211 acres of tractor yarding, 1,263 acres of cable yarding, and 2,517 acres of helicopter yarding, which could potentially compact approximately 101 acres. Tractor yarding would be limited to

designated skid trails, minimizing the compacted area to 12%. Compaction is assumed to be 4% from cable yarding and 1% from helicopter yarding (Dyrness 1967; Clayton 1981). The maximum soil compaction resulting from proposed logging systems in an analysis area would be 83 acres in the Star Gulch Analysis Area (Table 3-15). No ground-based mechanized fuel treatments are proposed under Alternative B. Proposed new roads would potentially compact approximately four acres in three analysis areas and the proposed mechanical road decommissioning in the Star Gulch analysis area would decrease the compacted area by approximately four acres for a net increase of 0.5 compacted acres (Table 3-15). Under Alternative B, the greatest increase in soil compaction (0.8%) would occur in the Star Gulch Analysis Area. For each analysis area, the projected total of the existing percent compacted area and compaction due to Alternative B would still remain well below the 12% level of concern for increases in peak streamflows. Thus, peak streamflows are not expected to be affected by soil compaction resulting from this project**.** Project design features such as no yarding in Riparian Reserves, water barring tractor skid trails, and avoiding tractor skid trails on slopes over 35 percent, would prevent surface flow from traveling very far down skid trails or reaching stream channels.

Table 3-16. Estimated Compacted Area Resulting from Alternative B

Analysis Area	Estimated Compacted Area From Alternative B			Compacted Area From Proposed Roads[1] (Acres)	Total Compacted Area From Alternative B (Acres)	Total Compacted Area From Alternative B (%)	Total Compacted Area (Alt. B and Existing) (%)
	Cable (Acres)	Tractor (Acres)	Heli-copter (Acres)				
Palmer Creek above Nine Dollar Gulch	0.2	1.6	0	0	1.8	0.1%	1.9%
Applegate River between Beaver Creek and Star Gulch	1.0	0	1.6	0.1	2.7	0.1%	2.6%
Star Gulch	41	21	21	-1.1	82	0.8%	4.0%
Applegate River between Star Gulch and Little Applegate River	8.8	2.6	2.6	0.5	15	0.3%	5.3%

1/ Based on 20 ft. road width for compacted surface. The negative value for the Star Gulch analysis area reflects the proposed mechanical decommissioning that would minimize the compacted road surface.

Alternative B would include the construction of approximately 1.6 miles of new road to access the Deadman's Palm project sites, mechanical decommissioning of 1.7 road miles, natural decommissioning of 2.6 road miles, and improvement of approximately 43 miles of access road. In addition, 0.7 miles of a road that had been naturally decommissioned previously would be opened up for temporary use and then mechanically decommissioned.

New road construction under Alternative B would occur at five different locations in the Star Gulch Analysis Area. Three of the proposed new road segments (38-3-32.0, 39-3-8.0, and 39-4-26.1), totaling 1.2 miles, would be located on or near ridges and have very little effect on the hydrologic network, as there are no drainage crossings and soils are stable. Proposed new road segment 39-3-30.0 (0.2 miles) would be located in the upper third of the slope just above a Riparian Reserve for a short duration intermittent stream that flows into Star Gulch approximately 1.4 upstream from the mouth. This new road would cross three dry draws on moderate slopes (45%). Drainage on this road would be achieved through out sloping and waterbars, thus minimizing any concentrated flows in the short duration intermittent stream below. The fifth proposed new road segment (39-4-

24.1) would extend an existing road by approximately 0.2 miles across a moderately steep (45% or less) midslope on stable soil. The start of this road would cross a dry draw and cut across the outer edge of a Riparian Reserve for approximately 280 feet. A culvert would be installed in the dry draw and a rolling water dip placed a short distance from the culvert to minimize concentrated flows in the dry draw. The road would be outsloped to disperse any water that collects on the road surface. The 0.7 mile long decommissioned road that would be reconstructed for the proposed project is located on or near a ridge and crosses two dry draws. The road would be outsloped to reduce impacts to the streamflow regime.

Under Alternative B, 1.7 miles of a road in the Ladybug drainage of the Star Gulch Analysis Area would be mechanically decommissioned to reduce the road surface compaction. The first 1.1 miles of this road are located within the Riparian Reserve and the road is immediately adjacent to Ladybug Gulch in the lower reach. The proposed decommissioning would include removing four culverts: two on Ladybug Gulch (a perennial stream), one on a perennial tributary to Ladybug Gulch, and one on a short duration intermittent tributary to Ladybug Gulch. This action would tend to reduce the influence of the road on the local drainage and local flows (both groundwater and surface) by disconnecting the stream system from the road network. In the long term, the decommissioned road would tend to approach the pre-road flow patterns, reducing the potential for increased peak flows. An additional 0.7 mile of a temporary road (that is currently decommissioned) would be mechanically decommissioned at the end of the timber sale work. This road is located on or near a ridge and the proposed reconstruction/decommissioning would not involve any culverts. The 2.6 miles of road proposed for natural decommissioning are located at two locations within the Star Gulch Analysis Area. These roads would be barricaded and left to decommission naturally. One road is a jeep road along the ridge on the north side of the Star Gulch Analysis Area. There are no stream or dry draw crossings and no culverts to be removed over the 2.2 mile length. The other road is 0.4 miles long and is adjacent to 1917 Gulch. This road has been blocked for several years and has become well vegetated. There are no culverts to be removed and the only work proposed is to improve the existing barricade. These two roads would continue affecting the flow regime until vegetation becomes fully established; they are considered part of the road network for the effects analysis.

Road renovation of approximately 43 miles would consist of putting rock surfacing on 12.3 miles of natural surfaced roads, adding rock to the existing base on 30.4 miles, and installing some ditch relief culverts. Of the 43 road renovation miles, approximately 5.7 miles would be renovated outside the project area, with 5.3 miles in the Rock Gulch drainage (northwest of the Applegate River between Star Gulch and Little Applegate River Analysis Area) and 0.4 miles in the Thompson Creek Sub watershed (west of the Star Gulch Analysis Area). These areas are within the Middle Applegate River Watershed. The rock surfacing would reduce the likelihood of runoff concentrating on the road surface and forming gullies that would affect the peak flow regime. The road drainage improvements would further disperse road runoff and decrease the rapid, concentrated routing of water to streams during storm events. This would help to minimize the impact of roads on the timing and magnitude of peak streamflows.

Under Alternative B, a total of 1.6 miles of new road construction, 0.7 miles of reconstruction of an existing decommissioned road, and 2.4 miles of mechanical road decommissioning would occur, resulting in a net decrease of 0.1 mile in the Star Gulch Analysis Area (Table 3-17). There would be no measurable change in road density or percent of the area in roads. There would be four stream crossings removed and one culvert added in a dry draw for a net decrease of three crossings.

Table 3-17. Changes in Road Density, Percent of Area in Roads, and Stream Crossings under Alternative B

Analysis Area	Added Road Miles	Decommissioned[1] Road Miles	Net Change (Miles)	Change in Road Density (Mi/Mi^2)	Change in Percent of Area in Roads	Change in # Stream Crossings
Star Gulch	+ 2.3	- 2.4	- 0.1	0.0	0.0	-3

1/ Only mechanical decommissioning is included in the road density determination, since roads proposed for natural decommissioning would continue affecting flow patterns until vegetation is fully established.

With no change in the percentage of the analysis area in roads, the proposed action would not change the potential for peak flow increases due to roads. All of the analysis areas would continue to have a low potential for increased peak flows. In conclusion, the proposed road work is not expected to raise the peak flow risk rating for any analysis area affected by the proposed project.

Alternative B is not expected to noticeably increase peak flows in any of the analysis areas affected by the proposed project because: 1) the crown closure on BLM-administered lands (including lands within the transient snow zone) would remain well above the minimum natural crown cover of 30% (except possibly in the oak woodlands where historic crown cover was less than 30%); 2) the increase in compacted area would not go above the 12% level of concern for peak flow increases; 3) there would be 1.6 miles of new permanent road construction on stable soils, with 1.2 miles located on or near ridgetops and 0.4 miles located on stable, moderately steep slopes (45% or less) with only dry draw crossings; 4) there would be 0.7 miles of reconstruction of an existing decommissioned road that is located on stable soils on or near a ridge and it would be mechanically decommissioned following the timber sale; 5) all new road construction and reconstruction would utilize an outsloped road design, thus minimizing the concentration of runoff; 6) mechanical decommissioning is proposed for 2.4 road miles (including the proposed reconstructed road) resulting in a net decrease of 0.1 road mile; 7) there would be no measurable change in the percent roaded area and therefore would not affect the potential for peak flow increases; 8) there would only be one new stream crossing culvert installed and it would be across a dry draw; and 9) four stream crossings (three on perennial streams and one on a short duration intermittent) would be removed.

The analysis of the direct and indirect effects of Alternative B on water quantity incorporates past and present actions that may affect watershed conditions. For the cumulative effects analysis, the direct and indirect effects of Alternative B need to be added to the reasonably foreseeable future actions identified under Alternative A. Reasonably foreseeable future actions in the analysis area are assumed to be the same as under Alternative A.

Because Alternative B would result in no change of crown closures below 30% (except possibly in the oak woodlands where historic crown closure was less than 30%), the cumulative effects would be the same as that identified for the reasonably foreseeable future actions identified under Alternative A (Table 13). Likewise, there would be no reduction in crown closure below 30% in the transient snow zone under Alternative B, therefore the cumulative effects on the transient snow zone would be the same as described for the reasonably foreseeable future actions under Alternative A.

Increases in compacted area as a result of reasonably foreseeable future harvest activities on all lands are identified under Alternative A. The cumulative effect of compacted area changes that would result from reasonably foreseeable future timber harvest on all lands and Alternative B are determined from combining Tables 3-10, 3-14, and 3-16 (Table 3-18). Under this scenario, the percent compacted area for each analysis area would remain below the 12% level of concern for peak flow increases.

Table 3-18. Percent Compacted Area with Implementation of Alternative B on BLM-Administered Lands and Reasonably Foreseeable Future Soil Compacting Actions on All Lands

Analysis Area[1]	Existing Compacted Area (Acres)	Estimated Compacted Area From Alternative B (Acres)	Estimated Compacted Area From Future Treatments on All Lands (Acres)	Total Compacted Area (Acres)	Total Compacted Area (%)	Increase in Percent Compacted Area (%)
Palmer Creek above Nine Dollar Gulch	50	1.8	0	52	1.9%	0.1%
Applegate River between Beaver Creek and Star Gulch	103	2.7	2.8	109	2.7%	0.1%
Star Gulch	353	82	0	435	4.0%	0.8%
Applegate River between Star Gulch and Little Applegate River	264	15	3.8	283	5.4%	0.3%

Changes in road density and percent of area in roads due to reasonably foreseeable future actions would only occur in two analysis areas: the Applegate River between Beaver Creek and Star Gulch Analysis Area and the Applegate River between Star Gulch and Little Applegate River Analysis Area. The road density in both analysis areas would be reduced by 0.1 mi./mi.^{2} and the percent of the area in roads would decrease by less than 0.1 percent. Under Alternative B, new road construction and mechanical decommissioning would only occur in the Star Gulch Analysis Area and the change in road density and percent of area in roads would be negligible (Table 3-17). Based on percent of area in roads, all four analysis areas would remain in the low risk category for peak flow increases according to the OWAM peak flow risk assessment (WPN 1999:IV-16).

In conclusion, the cumulative effect of adding the incremental impact of Alternative B to the past, present, and reasonably foreseeable future actions would not result in a discernable change in peak flows at or beyond the mouths of the individual analysis areas analyzed. Streamflows in the Applegate River would not be affected by cumulative effects.

Alternative C

Effects on water quantity from Alternative C would be less than from Alternative B, as there would be approximately 141 fewer acres treated and no new road construction. Alternative C proposes to commercially harvest approximately 3,635 acres; pre-commercially thin (PCT) approximately 3,035 acres, of which 2,131 acres are within and 904 acres are outside the commercial harvest units; and non-commercially thin approximately 441 acres of oak woodlands for fuel reduction. The proposed fuel reduction treatment in the oak woodlands would be the same as under Alternative B and would not contribute to changes in the flow regime. The majority of the vegetative treatments would occur in the Star Gulch and the Applegate River between Star Gulch and Little Applegate River analysis areas (Table 3-19).

Table 3-19. Alternative C Proposed Commercial Harvest[1] and PCT Treatments

Analysis Area	DF Poles (60%)* (Acres)	DF Regen (40%)* (Acres)	Dry DF (50%)* (Acres)	Moist DF (50%)* (Acres)	DF LSR (60%)* (Acres)	Pine LSR (40%)* (Acres)	Pine Regen (40%)* (Acres)	PCT[2] (50%)* (Acres)	Total Area Treated (Acres)	% of Analysis Area Treated
Palmer Creek above Nine Dollar Gulch	0	0	0	12	6	0	0	0	18	1%
Applegate River between Beaver Creek and Star Gulch	0	0	9		28	102	48	2	188	5%
Star Gulch	305	16	509	143	1826	122	95	789	3805	35%
Applegate River between Star Gulch and Little Applegate River	73	0	43	3	221	29	45	113	528	10%
Total	**378**	**16**	**561**	**158**	**2081**	**253**	**188**	**904**	**4539**	**20%**

1/ See Chapter 2 for description of harvest prescriptions (DF = Douglas-fir, LSR = late seral retention).
2/ Pre-commercial thinning (PCT) acres do not include PCT treatments within commercial harvest units.
* Value denotes minimum post-treatment crown closure.

Like Alternative B, proposed commercial and pre-commercial treatments under Alternative C would maintain the average crown closure above the natural minimum of 30% for all four analysis areas. No noticeable increase in the magnitude or frequency of peak streamflows would be expected as a result of crown closure reductions proposed under Alternative C. Similarly, no increased risk of peak flows associated with rain-on-snow events is expected to occur as a result of the Alternative C proposed vegetation treatments.

Alternative C proposes 211 acres of tractor yarding, 1,132 acres of cable yarding, and 2,292 acres of helicopter yarding, which could potentially compact 95 acres. Tractor yarding would be limited to designated skid trails, minimizing the compacted area to 12%. Compaction is assumed to be 4% from cable yarding and 1% from helicopter yarding (Dyrness, 1967; Clayton, 1981). The maximum soil compaction resulting from proposed logging systems in an analysis area would be 77 acres in the Star Gulch Analysis Area (Table 3-20). No ground-based mechanized fuel treatments are proposed under Alternative C. Mechanical decommissioning of the Ladybug Gulch road in the Star Gulch Analysis Area would reduce the compacted area by approximately 4 acres (Table 3-20). Under Alternative C, the greatest increase in soil compaction (0.7%) would occur in the Star Gulch Analysis Area. For each analysis area, the projected total of the existing percent compacted area and compaction due to Alternative C would still remain well below the 12% level of concern for increases in peak streamflows. Thus, peak streamflows are not expected to be affected by soil compaction resulting from Alternative C. Project design features such as no yarding in Riparian Reserves, water barring tractor skid trails, and avoiding tractor skid trails on slopes over 35 percent, would prevent surface flow from traveling very far down skid trails or reaching stream channels.

Table 3-20. Estimated Compacted Area Resulting from Alternative C

Analysis Area	Estimated Compacted Area From Alternative C			Compacted Area From Proposed Roads[1] (Acres)	Total Compacted Area From Alternative C (Acres)	Total Compacted Area From Alternative C (%)	Total Compacted Area (Alt. C and Existing) (%)
	Cable (Acres)	Tractor (Acres)	Heli-copter (Acres)				
Palmer Creek above Nine Dollar Gulch	0.2	2	0	0	2	0.1%	1.9%
Applegate River between Beaver Creek and Star Gulch	0	0	2	0	2	0.0%	2.6%
Star Gulch	37	21	19	-4	73	0.7%	3.9%
Applegate River between Star Gulch and Little Applegate River	9	3	2	0	14	0.2%	5.3%

1/ Based on 20 ft. road width for compacted surface. The negative value for the Star Gulch Analysis Area reflects the mechanical decommissioning that would minimize the compacted road surface.

Alternative C would include mechanical decommissioning of 1.7 road miles, natural decommissioning of 2.6 road miles, and improvement of approximately 43 miles of access road. In addition, 0.7 miles of a road that had been naturally decommissioned previously would be opened up for temporary use and then mechanically decommissioned. Effects of these proposed road activities on water quantity are described under Alternative B. There would be no change in the percentage of the drainage area in roads and all of the analysis areas would continue to have a low potential for increased peak flows.

Alternative C is not expected to noticeably increase peak flows in any of the analysis areas affected by the proposed project because: 1) the crown closure on BLM-administered lands (including lands within the transient snow zone) would remain well above the minimum natural crown cover of 30% (except possibly in the oak woodlands where historic crown cover was less than 30%); 2) the increase in compacted area would not go above the 12% level of concern for peak flow increases; 3) there would be no new road construction; 4) there would be 0.7 miles of reconstruction of an existing decommissioned road that is located on stable soils on or near a ridge and it would be mechanically decommissioned following the timber sale; 5) mechanical decommissioning is proposed for 2.4 road miles (including the proposed reconstructed road) resulting in a decrease of 2.4 road miles; 6) there would be no change in the percent roaded area and therefore would not affect the potential for peak flow increases; and 7) four stream crossings (three on perennial streams and one on a short duration intermittent) would be removed.

The cumulative effects resulting from Alternative C would be slightly less than from Alternative B. As with Alternative B, the incremental impact of Alternative C when added to other past, present, and reasonably foreseeable future actions would not result in a discernable change in peak flows at or beyond the mouths of the individual analysis areas analyzed. Streamflows in the Applegate River would not be affected by cumulative effects.

Water Quality

This section discloses the impacts from various vegetation treatments and ground disturbing activities on water quality. Soil erosion is addressed in the Soils section and habitats and wildlife related to water are discussed in the Fisheries section.

Issues/Concerns

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action. These effects may or may not occur as a result of the proposed action but were of concern to members of the public or ID team specialists.

- Some oppose logging and road construction due to perceived water quality degradation.

Anticipated Effects

Riparian Reserve implementation would maintain or reduce water temperatures of perennial streams (USDI 1994, USDA and USDI 2005).

Timber harvesting operations have variable effects on sediment production (Everest et al. 1987). Excluding commercial harvest from Riparian Reserves prevents disturbance to stream channels during the felling and yarding operations. Yarding operations can cause extensive ground disturbance in harvested areas; however, cable systems that partly or fully suspend logs generally cause minimal disturbance to the soil surface (Everest et al. 1987). Increased surface erosion can result from ground disturbance and soil compaction caused by tractor logging (Sidle 1979). A buffer width of 100-200 feet is sufficient to prevent most sediment from reaching streams (A.C. Kin dig and Bedrock 2003).

The amount of surface erosion generated by slash burning is generally proportional to the severity and extent of the burn (Sidle 1979). Severe broadcast burns on clearcut units in the Oregon Coast Range and western Cascade Range resulted in significant increases in suspended sediment loads for up to 5 years (Sidle 1979).

Most of the increase in sedimentation associated with forestry activities is attributed to forest roads (Sullivan 1985). There are two processes by which roads increase sediment loads in streams: 1) by increasing the incidence of mass failures; and 2) by erosion of the road surface, cut banks, and ditches and subsequent transport of this material to the stream (Duncan et al. 1987). In the Deadman's Palm project area, surface erosion from road surfaces, cut banks, and ditches represents the dominant source of road-related sediment input to streams (see Soils section).

There is high variability in sediment production from road segment to road segment. Most segments produce little sediment, while only a few produce a great deal (Luce and Black 1999). Sections of road having a steep gradient, being heavily used, and draining directly into larger streams have the highest potential to produce and deliver material of a size most apt to deposit on or in the streambed (Bilby et al. 1989). Older roads in mid-slope positions dominate the production of sediment during extreme storms (Wemple et al. 2001). Ridgetop roads usually have the least effect on streams (Furniss et al. 1991).

A study of soil loss from forest roads in the southern Appalachian Mountains (Swift 1984) concluded that soil loss rates from a non-surfaced roadbed were eight times greater than from roadbeds with six to eight inches of gravel. New fill slopes, although uncompacted and unvegetated, eroded only where storm runoff from culverts or dips flowed over loose soil. Vegetation on the cutslope and ditch was shown to be effective in reducing erosion from forest roads in the Oregon Coast Range (Luce and Black 1999). Road segments where vegetation

was cleared from the cutslope and ditch produced about seven times as much sediment as road segments where vegetation was retained.

Studies conducted in western Washington and Oregon found that 80 percent of the road runoff points emptied directly into the drainage system (Duncan et al. 1987). Of the stream entry drainage points, 88 percent entered first or second order channels while only 13 percent emptied directly into permanent water. Thus, the delivery of road sediment to larger streams often depended on its transport through these smaller, often ephemeral channels. Woody material in these small channels acted to trap and hold sediment, thus preventing it from reaching larger channels downstream.

Sediment production from forest roads declines substantially with time. A study of 74 road segments with road surfaces graded in western Oregon found 70 percent recovery by the second year and 90 percent recovery by the third year (Luce and Black 2001).

Stream sediments may negatively impact aquatic species such as salmonids, amphibians and insects (see Fisheries section), and may impair the quality of domestic water supplies. Sediment suspended in water increases turbidity, limiting the depth to which light can penetrate if turbidity is increased to a sufficient degree. High turbidity levels can severely limit the ability of sight-feeding fish to find and obtain food.

Affected Environment

The Oregon Environmental Quality Commission has adopted numeric and narrative water quality standards to protect designated beneficial uses. In practice, water quality standards have been set at a level to protect the most sensitive uses. Cold-water aquatic life such as salmon and trout are the most sensitive beneficial uses in the Applegate Subbasin (ODEQ 2003b:9). The Oregon Department of Environmental Quality (DEQ) is required by the federal Clean Water Act (CWA) to maintain a list of stream segments that do not meet water quality standards for one or more beneficial uses. This list is called the 303(d) list because of the section of the CWA that makes the requirement. DEQ's 2002 303(d) list is the most recent listing of these streams (ODEQ 2003a).

The BLM in cooperation with the Forest Service, DEQ, and the Environmental Protection Agency is implementing the *Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters* (USDA and USDI 1999). Under the Protocol, the BLM will protect and maintain water quality where standards are met or surpassed, and restore water quality limited water bodies within their jurisdiction to conditions that meet or surpass standards for designated beneficial uses. The BLM will also adhere to the State Antidegradation Policy (OAR 2005; 340-041-0004) under any proposed actions. The BLM will continue to work with DEQ to implement the *Applegate Subbasin Total Maximum Daily Load* (TMDL) *and Water Quality Management Plan* (WQMP) completed in 2003 (ODEQ 2003b) and the *Water Quality Restoration Plan* (WQRP) for BLM and U. S. Forest Service-administered lands in the Applegate Subbasin (USDI and USDA 2005). Recovery goals focus on protecting areas where water quality meets standards and avoiding future impairments of these areas, and restoring areas that do not currently meet water quality standards. Necessary federal and state permits would be obtained for any proposed instream work.

Within the proposed Deadman's Palm project area, Star Gulch is the only stream included on DEQ's 2002 303(d) list. It is listed for exceeding the summer temperature standard from the mouth to 1918 Gulch (ODEQ 2003b:16). BLM stream temperature monitoring indicates that Star Gulch summer temperatures meet the state standard above Lightning Gulch, which is about 1 mile below 1918 Gulch. BLM monitoring has also shown that the major perennial Star Gulch tributaries (Benson Gulch, Lightning Gulch, Alexander Gulch, and Ladybug Gulch) have summer temperatures that are well below the state standard. Outside the proposed project area, but

within the two Applegate River analysis areas, the Applegate River is listed for summer temperature. Palmer Creek is on the 303(d) list for summer temperature within the Palmer Creek Analysis Area.

The *Applegate Subbasin TMDL* (ODEQ 2003b) establishes the temperature TMDL load capacity and allocations for the Applegate Subbasin. The load allocation for temperature is allocated 100 percent to natural sources. Any activity that results in anthropogenic-caused heating of the stream is unacceptable (ODEQ 2003b:2). The *Water Quality Restoration Plan* for the Applegate Subbasin (USDI and USDA 2005:32) identifies percent-effective shade targets for perennial and fish-bearing streams on federal lands. Thirteen streams within the analysis area were evaluated for current and target shade (ODEQ 2000:14, USDA 2003). Where current shade is 80% or greater, streams are considered recovered. Current shade is less than 80% for seven of the thirteen streams assessed (Table 3-21).

Table 3-21. Percent-Effective Shade Targets for Federal Lands in the Analysis Area (ODEQ 2000:14, USDA 2003)

Stream Name	Current Shade	Target Shade	Years to Recovery
Applegate River	61	79	88
Palmer Creek	84	92	0
Nine Dollar Gulch	93	93	0
Nine Dollar Gulch Trib.	96	94	0
Palmer Creek Trib.	96	98	0
Star Gulch	61	86	73
1917 Gulch	63	89	76
1918 Gulch	62	90	83
Alexander Gulch	75	92	72
Benson Gulch	64	94	103
Deadman Gulch	94	97	0
Ladybug Gulch	70	92	125
Lightning Gulch	82	93	0

Road densities are high in all four analysis areas and range from 3.5 to 5.7 mi./mi.^{2} (Table 3-11). Roads built in riparian areas can adversely affect both stream temperature and sediment. There are approximately 20.5 road miles located within Riparian Reserves on BLM and Forest Service-administered lands within the analysis area (Table 3-22). The Star Gulch Analysis Area has 83% of the road miles in Riparian Reserves.

Table 3-22. Road Miles within Riparian Reserves on Federal Lands

Analysis Area	Road Miles within Riparian Reserves
Palmer Creek above Nine Dollar Gulch	2.0
Applegate River between Beaver Creek and Star Gulch	0.4
Star Gulch	17.0
Applegate River between Star Gulch and Little Applegate River	1.1
Total	**20.5**

Road stream crossings can also be a source of sediment to streams and the interconnection of roads with streams is considered an indicator of potential for sediment impacts to be conveyed to the stream. Stream crossing densities in the four analysis areas are high and range from 13.4 to 24.1 crossings/mi.^{2} (Table 3-12). Based on the fact that 68% of the BLM stream crossings are dry draws, it is estimated that the majority of the roads on BLM-administered lands are located near or on the ridgetops. There are approximately 228 road stream crossings on perennial and intermittent streams within the analysis area.

Sedimentation associated with channel erosion is ongoing to a limited extent in the analysis area. During BLM stream surveys, the tendency for streambank failure was evaluated with a "slump potential" rating (Table 3-23). The four analysis areas show high slump potential ratings for 0-4% of the stream lengths surveyed. In general, channel stability is expected to improve as Riparian Reserves mature and additional structural material is added to the channel area.

Table 3-23. Slump Potential Ratings for Stream Reaches Surveyed by BLM.

Analysis Area	Slump Potential Ratings		
	Low	Medium	High
Palmer Creek above Nine Dollar Gulch	100%	0%	0%
Applegate River between Beaver Creek and Star Gulch	49%	48%	4%
Star Gulch	85%	13%	2%
Applegate River between Star Gulch and Little Applegate River	60%	39%	1%

Roads on BLM-administered lands in the analysis area are stable with no failures present (see Soils section). Road sediment sources are primarily surface erosion from natural surfaced roads and road ditches that connect to streams. Roads that are paralleling stream channels are a concern as they confine the channels and lead to streambank erosion. The road adjacent to Ladybug Gulch is a major source of sediment in the Star Gulch Analysis Area.

Placer mining is ongoing at eight active claims in Star Gulch and several of its tributaries from July 1 to September 15. Mining methods include panning and suction dredges that result in localized turbidity.

Turbidity has been measured by the BLM in Star Gulch and its major tributaries since 1982 (USDI 2005b). Average and maximum turbidities from grab samples collected between 1982 and 2005 show that turbidity is generally very low except for higher turbidities associated with storm events and subsequent larger flows (Table 3-24).

Table 3-24. Average and Maximum Grab[1] Sample Turbidities for Star Gulch and Tributaries (USDI 2005b)

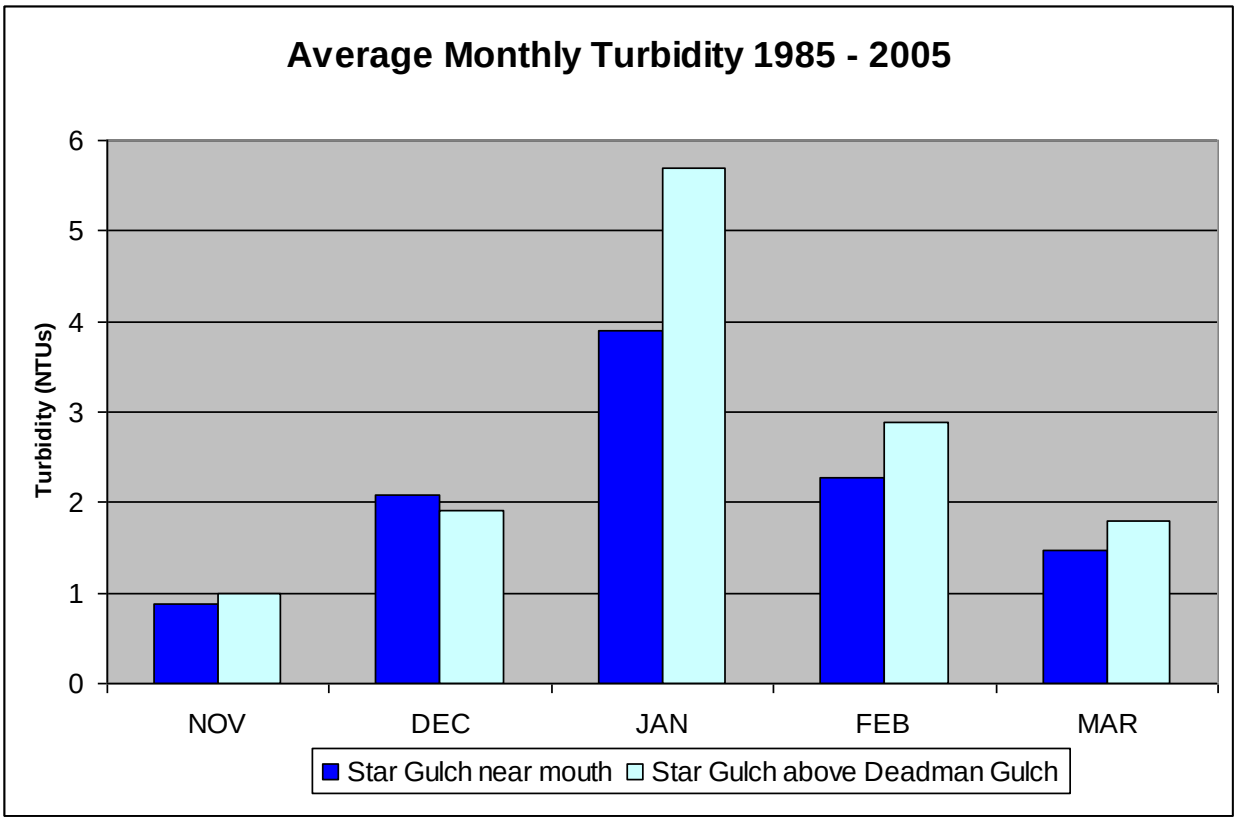
	Star Gulch at Gage	Benson Gulch	Lightning Gulch	1917 Gulch	1916 Gulch	Ladybug Gulch	Alexander Gulch	Deadman Gulch	Star Gulch above Dead-man Gulch
1982-2005 Average Turbidity (NTU[2])	2.82	3.39	2.14	0.87	0.54	1.25	2.64	0.97	1.70
1982-2005 Maximum Turbidity (NTU[2])	64.5	108.0	77.4	33.1	5.34	52.7	35.0	16.6	21.7

1/ Grab samples were generally collected year-round on a monthly basis from 1982-2005. Additional samples were collected during most high flow events.
2/ NTU – Nephelometer Turbidity Unit

In addition to the grab samples, water samples collected by automatic samplers have been analyzed for turbidity at two Star Gulch locations: approximately one mile upstream from the mouth and above Deadman Gulch. Average monthly turbidities for the upstream site above Deadman Gulch are higher than the site near the mouth for all months except December (Figure 3-2). The highest average monthly turbidities have occurred during January. The maximum turbidities at these two sites were recorded during the January 1, 1997 flood: 318 NTUs

at the lower Star Gulch site and 795 NTUs at the upper Star Gulch site. Excluding the maximum turbidities from the 1997 flood, the maximum turbidity over the 20 year period was 98 NTUs at the lower Star Gulch site and 116 NTUs at the upper site.

Figure 3-2. Average Monthly Turbidity[1] for Star Gulch (USDI 2005b)



1/ Turbidity data collected February 1985 – March 2005. Monthly averages were compiled using days when complete data was available for both stations. Reasons for missing data include: battery failure, periods of freezing weather, electrical/mechanical problems with samplers, and equipment theft.

Past Actions

Past human-caused actions that have affected stream temperature in the analysis area include stream shade removal for: conversion to agricultural fields and home sites, mining activities, timber harvest, and road building; and water withdrawals for irrigation, mining, and domestic use (ODEQ 2003b). Large scale hydraulic mining conducted in the later half of the nineteenth century dramatically increased sediment in the Applegate River and some of its tributaries (USDI 1998). Hydraulic mining is no longer allowed and large placer mining operations require the use of settling ponds. Agricultural and residential development along the Applegate River contributed sediment through channel modification, grazing, and land clearing. Logging activities started in the late nineteenth and early twentieth centuries, but were limited in scale until the late 1940s (USDI 1998). During the second half of the twentieth century, large scale intensive timber harvest and road building resulted in increased sediment production (USDI 1998). Until the Oregon Forest Practices Act was passed in 1972, yarding was typically accomplished using tractors, even on steep slopes, with little regard for protecting stream crossings. Riparian areas received little protection and ground disturbing activities such as yarding resulted in sediment reaching the streams. Trees were harvested from streambanks leaving little vegetation to prevent the banks from eroding into the streams during high flows. Early forest roads were often poorly designed and located in unstable areas, and road failures provided a major source of sediment.

The BLM implemented a land management plan in 1979 (USDI 1979) that provided 100 foot no-cut riparian buffers for anadromous fish-bearing streams, retained shade from hardwoods and non-commercial conifers on resident fish-bearing streams, and minimal to no protection of nonfish-bearing streams. Road design and construction practices improved during the 1980s however, extensive road building occurred.

The advent of the Northwest Forest Plan in 1994 (USDA and USDI 1994) followed by the Medford District Record of Decision and Resource Management Plan in 1995 (USDI 1995) resulted in major improvements for stream and watershed protection and restoration on federal lands. Riparian Reserves establish protection for all fish-bearing streams as well as nonfish-bearing perennial and intermittent streams, wetlands, lakes, ponds, and unstable areas. Riparian Reserves are adequate to maintain riparian conditions necessary to protect stream shade and restore water temperature over time (USDA and USDI 2005). Over the past 10 years, road construction has declined and road decommissioning and upgrading has increased. Implementation of best management practices during road and logging operations have reduced impacts on water quality. Water quality on federal lands is on an upward trend with reductions in summer stream temperatures and sediment input.

Past timber harvest on BLM-administered lands in the analysis area has been fairly extensive, especially on the north facing slopes of the Star Gulch Analysis Area. Most of the harvest occurred during the 1960s and 1970s primarily using select-cut and salvage harvest methods with some clearcutting. The majority of the clearcut harvests took place in the 1980s. Portions of the Benson Gulch and Alexander Gulch drainages in the Star Gulch Analysis Area were harvested in the mid-1980s. The 1987 Star Fire in the northeastern portion of the Star Gulch Analysis Area resulted in a fire salvage harvest in the late 1980s. The most recent BLM timber sale activity in the analysis area was a roadside and helicopter mortality tree salvage in the early 1990s. The harvested areas are stable and have recovered from harvest-related disturbances.

Environmental Consequences

Because no new management is proposed under Alternative A, the effects described reflect current conditions and trends that are shaped by ongoing management and events unrelated to the Deadman's Palm project. Discussion for Alternatives B and C reflects the direct and indirect impacts of the proposed actions. Effects discussion also includes cumulative impacts of those direct/indirect actions when added incrementally to actions past, present, and reasonably foreseeable. Short-term effects are defined as those lasting ten years or less and long-term effects last more than ten years (USDI 1994:4-4).

Alternative A

There are no actions proposed under Alternative A (the No Action Alternative); therefore direct and indirect effects are the current conditions in the project area which are the result of past actions not related to the Deadman's Palm project. Alternative A describes anticipated effects of not implementing an action at this time.

Under Alternative A, there would be no change in existing water quality on BLM-administered lands. Streams in the analysis area would continue to meet the Oregon water temperature standard except for the lower half of Star Gulch, Palmer Creek, and the Applegate River. Surface erosion from roads would be expected to remain a concern, and the risk of sediment inputs to streams would be expected to remain relatively constant. A minimum level of BLM road maintenance would occur to prevent major sediment input or repair drainage failures. There would be no action to decrease overall road densities or decrease road interactions with streams.

In the long term, with no vegetation treatments and the subsequent increase in stand densities and fuel loading, there is a high probability that a severe, stand-replacement fire could burn across the project area (see Fire

section). A high severity fire could reduce or eliminate riparian vegetation, resulting in increased stream temperatures, and expose large areas of bare soil to the erosive forces of rainfall, potentially increasing soil erosion and sedimentation.

Effects from past and ongoing actions are summarized as follows. Surface erosion from existing roads (see Soils section) contributes to low levels of sediment input primarily at road-stream crossings and where fill slopes closely parallel streams. Stream temperatures are on an upward trend on federal land as previously harvested riparian vegetation recovers. However, roads built in riparian areas continue to contribute to temperature increases. On non-federal lands, near-stream vegetation disturbance/removal and water withdrawals continue to adversely affect stream temperatures (ODEQ 2003b).

Reasonably foreseeable future actions planned for BLM-administered lands in the analysis area include the Bald Lick Landscape Project, a culvert replacement on Star Gulch, a fish habitat improvement project in Star Gulch, and continued small scale placer mining. Reasonably foreseeable future actions for non-BLM-administered lands in the analysis area include a hazardous fuel reduction project on Forest Service-managed lands and timber harvest on private lands.

Alternative 2 from the BLM's proposed Bald Lick Landscape Project is used for analysis of the reasonably foreseeable future actions since it would have the most road construction and the most extensive vegetation treatments. The proposed Bald Lick Landscape Project would include the following activities within the Deadman's Palm analysis area: 274 acres of commercial timber harvest, 0.5 mile of mechanical road decommissioning, 1.1 miles of natural decommissioning, and 4.6 miles of road renovation within the Applegate River between Beaver Creek and Star Gulch Analysis Area; and 269 acres of commercial timber harvest, 1.0 mile of new road construction, 1.9 miles of mechanical road decommissioning, and 2.8 miles of road renovation within the Applegate River between Star Gulch and Little Applegate River Analysis Area.

The proposed Bald Lick Landscape Project would not cause adverse effects to water quality within the Deadman's Palm analysis area due to implementation of best management practices (BMPs), other project design features, and protection of Riparian Reserves (USDI 2005a). There would be no removal of streamside vegetation, roads would not be constructed with drainage systems that route flow directly to streams, and existing road drainage or erosion problems would be fixed (USDI 2005a). The proposed road renovation and decommissioning would have positive benefits from a hydrologic/sediment delivery standpoint, helping to control and prevent road-related runoff and sediment production.

The proposed culvert replacement would occur on the upper reach of the Star Gulch mainstem when funding is available. This undersized culvert is not capable of passing the 100-year flood with associated bedload and debris. During a high flow event the culvert is at risk for failure, which would cause a large amount of sediment to be released into Star Gulch. Localized, limited duration turbidity/sediment increases in Star Gulch would occur as a result of the culvert replacement, although implementation of BMPs would minimize the amount. BMPs would include: diverting the stream around the work area, conducting instream work during the summer when streamflows are low, and placing materials, such as straw bales, immediately downstream of the work area to trap sediment. A local sediment pulse would most likely occur during storm events that occur the first fall/winter following the culvert replacement. The timing of this sediment pulse would coincide with normal high turbidity levels and the sediment from the proposed project would not be discernible above background levels. This sediment would likely be transported out of the Star Gulch stream system during the first bankfull flow (flow having a 1-2 year return interval) following the culvert replacement.

The proposed fish habitat improvement project would place approximately 20 pieces of large wood of varying diameters (greater than 10 inches) and lengths (greater than two times the bankfull width) at five to ten locations in the lower half of the Star Gulch mainstem when funding is available. The project would take place during the low flow instream work period. Wood used for the project would come from outside any Riparian Reserve and

would be placed in the stream using an excavator, tractor skidder, and/or cable yarder. Riparian vegetation would be damaged and/or destroyed as the logs are moved from the access road to the channel. The project design would ensure that no vegetation that is considered primary shade would be adversely effected by the proposed project. No heavy equipment would enter the stream channel and it would be clean and leak free before entering the riparian area. Ground disturbance would occur due to mechanized equipment. Disturbed soil would be stabilized with straw mulch and seeded with native, weed-free seed to minimize erosion. Water bars on skid trails would be installed for drainage if necessary. The wood placement operation could cause a small increase in turbidty and sediment due to damage to streambanks and stirring up fine sediments on the channel bed. This increased turbidity/sediment would be localized and of limited duration as the suspended material settles out or is transported downstream.

Placer mining in Star Gulch and several of its tributaries would continue to result in increased turbidity in the vicinity of the mining sites during the July 1 to September 15 instream work period.

The proposed hazardous fuel reduction project on Forest Service-administered lands would treat small standing and down trees, limbs, and shrubs near the mouth of Star Gulch. All treatments would be manual and no ground disturbance would occur. No-treatment buffers would prevent any shade reduction on perennial streams. This project would not have any effects on water quality in the Deadman's Palm analysis area.

Reasonably foreseeable future forestry operations on private forest lands in the analysis area are assumed to be the same as under the Water Quantity section: no new road construction; 5 acres in the Applegate River between Beaver Creek and Star Gulch Analysis Area; 70 acres in the Star Gulch Analysis Area; and 440 acres in the Applegate River between Star Gulch and Little Applegate River Analysis Area. Private forest lands in the project area would be managed according to the Oregon Forest Practices Act and agricultural/rural residential lands would be managed according to county ordinances. Management of these lands is addressed in the *Applegate River WQMP* (ODEQ 2003b). Conforming to the WQMP should ensure achievement of the Applegate Subbasin TMDL.

In the long term, with no stand management on BLM-administered lands, a severe, stand-replacement fire would likely occur (see Fire section) and it could result in water quality degradation. The loss of riparian vegetation after a severe wildfire would result in reduced stream shade and increased water temperatures. A severe wildfire could reduce vegetative cover across large areas and this could lead to higher levels of soil erosion and sediment concentrations.

In conclusion, past actions from the 1850s to the 1980s on both private and federal lands throughout the analysis area contributed to water quality degradation, specifically summer stream temperature and sediment increases. With the cessation of some activities, such as hydraulic mining, and the moderation of impacts from other activities, such as logging and road building, water quality conditions are improving. Present and reasonably foreseeable future actions would be required to adhere to the *Applegate Subbasin TMDLs and WQMP* (ODEQ 2003b) and water quality in the tributary streams would be expected to continue to improve. Water temperatures in the Applegate River are not likely to noticeably improve since even at system potential it is not predicted to meet the temperature criteria during the hottest time of the year (ODEQ 2003b). Reasonably foreseeable future culvert replacement, fish habitat improvement, and placer mining activities could cause small, localized sediment/turbidity increases in Star Gulch that would be of limited duration. The lack of vegetation management on BLM-administered lands could lead to a high intensity fire that would likely set-back the shade recovery and expose large areas of bare soil, thus increasing stream temperatures and sedimentation.

Alternative B

Alternative B would have no direct or indirect effects on summer stream temperature for any stream in the project area as shade on perennial streams would be maintained.

Under Alternative B, proposed road related actions would have the greatest potential for increasing the amount of sediment delivered to streams in the project area. Alternative B would include mechanical decommissioning of 1.7 road miles, natural decommissioning of 2.6 road miles, construction of approximately 1.6 road miles, and improvement of approximately 43 miles of access road. In addition, 0.7 miles of a road that had been naturally decommissioned previously would be opened up for temporary use and then mechanically decommissioned. The road decommissioning, construction, and most of the renovation would occur in the Star Gulch Analysis Area.

The proposed mechanical decommissioning of the Ladybug Gulch road (1.7 miles) in the Star Gulch Analysis Area would have the greatest likelihood of affecting sediment levels in the project area due to the removal of three culverts and associated fill from two perennial streams (Ladybug Gulch and a tributary) and removal of one culvert and associated fill from short duration intermittent stream (tributary to Ladybug Gulch). Other proposed road work would have less connectivity between the road and stream networks and thus less potential for sediment delivery to streams.

Localized, limited duration turbidity/sediment increases in Ladybug Gulch would occur when the culverts and fill material are removed, although implementation of BMPs would minimize the amount. BMPs during the removal operation would include: conducting the instream work late in the summer when streamflows are low, diverting the stream around each work site, and placing sediment trapping materials such as straw bales immediately downstream of each work area. The primary sediment delivery mechanism resulting from the proposed removal of the two Ladybug Gulch and two tributary road crossings would be streambank erosion during the first few major streamflow events following completion of the instream work. Project BMPs that would minimize the potential for streambank erosion include: pulling back side slopes to the natural contour; removing excavated material from stream crossing areas and placing it at stable locations; placing straw bales at the toe of the side slopes; and mulching, seeding (with native or approved seed), and planting native tree species on the streambanks. A secondary sediment source would be from surface erosion off the road surface after it is decommissioned, especially where the road is located within the flood prone area of Ladybug Gulch. Mechanical decommissioning of the Ladybug Gulch road would include ripping the road surface where the soil depth allows and “roughing” up the surface where ripping is not appropriate in order to provide a seed bed and reduce compaction. BMPs designed to minimize sediment delivery to the adjacent Ladybug Gulch include: water barring each side of the stream crossings in order to adequately filter road surface runoff and minimize sediment transport to streams; and seeding (with native or approved seed) and mulching areas of disturbed ground. Large sediment pulses would most likely occur during the first few major flow events following the culvert removals. The timing of these initial sediment pulses would coincide with normal high turbidity levels, however sediment from the proposed project would be visible downstream in Star Gulch. The sediment would not be discernible above background levels once it reaches the confluence with the Applegate River. After the initial sediment flush, the amount of sediment transported downstream would steadily decline as the Ladybug Gulch channel stabilizes and streambanks re-vegetate. Sediment produced during the channel stabilization recovery process would be less than that produced by the existing road during high flow events. This road decommissioning would have long-term positive benefits to water quality as it would reduce a major source of road-caused sediment production in the Star Gulch Analysis Area. Road decommissioning is an important treatment under the watershed restoration component of the Aquatic Conservation Strategy (USDA and USDI 1994:B-31) and decommissioning the Ladybug Gulch road is a management recommendation in the *Applegate-Star/Boaz Watershed Analysis* (USDI 1998:140).

The 2.6 miles of road proposed for natural decommissioning are located at two locations within the Star Gulch Analysis Area. These roads would be barricaded and left to decommission naturally. One road is a jeep road along the ridge on the north side of the Star Gulch Analysis Area. There are no stream or dry draw crossings and no culverts to be removed over the 2.2 mile length. Water bars would be installed as needed to provide drainage and minimize surface erosion resulting from water concentrating on the road surface. No sediment from this proposed work would be expected to reach a stream channel because there is no connectivity from the road to the stream network. The other road is 0.4 miles long and adjacent to 1917 Gulch. This road has been blocked for several years and has become well vegetated. There are no culverts to be removed and the only work proposed is to improve the existing barricade. There are no signs of erosion from this road and it is not contributing sediment to 1917 Gulch.

Under Alternative B, the proposed 1.6 miles of new road construction in the Star Gulch Analysis Area would occur at five different locations. Three of the proposed new road segments (38-3-32.0, 39-3-8.0, and 39-4-26.1), totaling 1.2 miles, would be located on or near ridges with very low risk of sediment reaching streams as there are no drainage crossings and soils are stable. These three new road segments would be outsloped, thus avoiding road ditch connectivity to the stream network. Soil that moves off the new road would likely be trapped by woody material below the fill slopes and not move into any dry draws or stream channels. Proposed new road segment 39-3-30.0 (0.2 miles) would be located in the upper third of the slope just above a Riparian Reserve for a short duration intermittent stream that flows into Star Gulch approximately 1.4 miles upstream from the mouth. This new road would cross three dry draws on moderate slopes (45%). Drainage on this road would be achieved through outsloping and water dips, thus minimizing any concentrated flows and associated sediment delivery to the short duration intermittent stream below. Armored splash pads would be placed at the water dip outfalls to minimize erosion below the outfalls. The fifth proposed new road segment (39-4-24.1) would extend an existing road by approximately 0.2 miles. The start of this road would cross a dry draw and cut across the outer edge of a Riparian Reserve for approximately 280 feet. A culvert would be installed in the dry draw and a rolling water dip placed a short distance from the culvert to minimize sediment delivery to the dry draw. The culvert and all water dips would have armored splash pads at the outfalls. Fill material at the location of the draw crossing structure would be stabilized as soon as possible following construction and exposed soils would be seeded and mulched. The road would be outsloped to disperse any water that collects on the road surface. All 1.6 miles of new road construction would have eight inches of rock placed on the road surface to minimize surface erosion. The 0.7 mile long decommissioned road that would be reconstructed for the proposed project is located on or near a ridge and crosses two dry draws. The road would be outsloped to reduce connectivity to the stream network. Upon completion of the contract, this road would be mechanically decommissioned by ripping, water barring, and seeding the road. All road work would be done during weather conditions that will minimize sediment delivery to streams. Fill slopes on new road construction would be seeded and mulched with slash windrowed along the toe of the fill to filter sediment.

There would be four stream crossings removed and one culvert added in a dry draw for a net decrease of three crossings in the Star Gulch Analysis Area. Stream crossing density would decrease by 0.1 crossings/mi.^{2} in the Star Gulch Analysis Area from 20.8 to 20.7 crossings/mi.^{2}.

The timing of road work operations would reduce the amount of sediment entering streams simultaneously; new road construction and renovation would occur during the first year of the contract while road decommissioning would occur during the final dry season of the contract.

Road renovation of approximately 43 miles would consist of putting rock surfacing on 12.3 miles of natural surfaced roads, adding rock to the existing base on 30.4 miles, and installing some ditch relief culverts. Of the 43 road renovation miles, approximately 5.7 miles would be renovated outside the project area, with 5.3 miles in the Rock Gulch drainage (northwest of the Applegate River between Star Gulch and Little Applegate River Analysis Area) and 0.4 miles in the Thompson Creek Subwatershed (west of the Star Gulch Analysis Area). Rock surfacing would reduce the amount of soil moving off the road surface, resulting in less sediment entering

streams. The road drainage improvements would further disperse road runoff and decrease the rapid, concentrated routing of water to streams during storm events. This would help to minimize the amount of sediment delivered to streams that are connected to the road network. The rock surfacing and drainage improvements would help to minimize the sediment input from roads and was identified as a restoration priority in the Applegate-Star/Boaz Watershed Analysis (USDI 1998:141).

Overall, proposed road work in and near streams would increase sedimentation rates slightly for up to three years, except the Ladybug Gulch road decommissioning which would result in large sediment pulses being transported to Star Gulch during the first few major flow events following completion of instream work. The location and design features of the proposed new road construction, rock surfacing, road drainage improvements to existing roads, and decommissioning of problem roads and road stream crossings would result in a net reduction in sediment delivered to streams over the long term.

Sedimentation as a result of log truck travel on roads in the project area would be minimal due to the proposed road surfacing, dust abatement, and a BMP for seasonal hauling restrictions. The increase in vehicular traffic associated with this project would increase the risk of an accident that results in a fuel or other chemical spill. Spilled material that would reach a perennial stream would have a direct effect on water quality. Appropriate measures would be taken to prevent and, if necessary, respond promptly to a spill situation.

In addition to road related actions, management activities proposed under Alternative B that could have an indirect effect on sedimentation to streams in the Deadman's Palm project area include commercial harvest, non-commercial thinning in oak woodland, fuel treatments, and landing construction. Under Alternative B, no impacts on water quality from pre-commercial thinning (PCT) would be likely since there would be no PCT within Riparian Reserves and manual treatments would not cause any ground disturbance.

Proposed actions due to commercial harvest would include tree felling and log yarding. Of these actions, yarding would be most likely to lead to sedimentation due to ground disturbance. Alternative B proposes approximately 211 acres of tractor yarding, 1,263 acres of cable yarding, and 2,517 acres of helicopter yarding (Table 3-25). Research has found that the amount of ground disturbance from yarding varies by logging system with 21 percent for tractor, 7 percent for skyline cable, and 2 percent for helicopter (see Soils section). Estimated area disturbed by yarding would be greatest in the Star Gulch Analysis Area (Table 3-25). The estimated 150 acres of ground disturbance equates to about 1.4% of the Star Gulch Analysis Area. The potential for sediment in commercial harvest units to reach stream channels is very low due to BMPs such as no harvest or yarding in Riparian Reserves and minimizing and waterbarring skid trails (see Soils section). Soil that moves on cable yarding corridors during storm events would be trapped by logging slash or by ground cover on undisturbed ground at the bottom of or adjacent to yarding corridors. On steeper slopes with higher erosion potential, waterbars would be constructed manually to direct water off the cable yarding trails. Waterbars on tractor skid trails would prevent water from concentrating on bare, compacted ground and move it to adjacent vegetated or slash covered slopes.

Table 3-25. Proposed logging systems under Alternative B and estimated acres disturbed.

Analysis Area	Tractor Yarding (Acres)	Cable Yarding (Acres)	Helicopter Yarding (Acres)	Total Yarding (Acres)	Total Estimated Acres Disturbed
Palmer Creek above Nine Dollar Gulch	13	4	0	17	3
Applegate River between Beaver Creek and Star Gulch	0	25	161	186	5
Star Gulch	176	1,014	2,095	3,285	150
Applegate River between Star Gulch and Little Applegate River	22	220	260	502	25
Totals	**211**	**1,263**	**2,517**	**3,991**	**183**

Under Alternative B, prescribed burning in the commercial harvest units would be either broadcast (underburning) or handpile burning. Spring underburning would result in a low intensity burn with minimal duff consumption. Sediment increases from spring underburning would be very slight given the low intensity burn and BMPs that stipulate no ignition or fire lines in Riparian Reserves. Fall underburning would only be undertaken if "spring-like" conditions exist for soil and duff moisture levels. An area burned in the fall would not revegetated until the following spring; intense fall and winter rains immediately following the burn could move soil and ash to stream channels. Any turbidity and sediment increases resulting from underburning would be within the scope of the increases analyzed in the Medford District PRMP/EIS (USDI 1994:4-19). No pile burning is proposed in the Riparian Reserves adjacent to commercial treatments.

Proposed non-commercial treatments on approximately 441 acres of oak woodlands would include manual thinning of brush, hardwoods, and small conifers; hand piling; pile burning; and possibly some limited underburning. Thinning and pile burning may occur within some Riparian Reserves adjacent to short and long-duration intermittent streams. Pile burning would be excluded from within 30 feet of long-duration intermittent streams and no piles would be allowed in the channel of short-duration intermittent streams. Underburning would exclude any ignition or fire lines within the Riparian Reserves. These BMPs would minimize the entry of sediment or ash into stream channels. Any increases in sediment or ash to water bodies in the project area resulting from pile burning would be very slight.

There are 23 existing landings that would be used for the proposed Deadman's Palm project. Four existing landings within Riparian Reserves would be used and no vegetation would be disturbed. Proposed landing construction would occur at 15 sites outside of Riparian Reserves and mostly on stable ridges. New landing construction would occur during the dry season and the running surface and fill slopes of all landings would be seeded upon completion of the contract. The locations and BMPs applied to the proposed landing sites would greatly limit the amount sediment moving off-site to stream channels.

Alternative B would have no direct or indirect effects on stream temperature and minimal effects on sedimentation because: 1) shade on perennial streams would be maintained with all vegetation treatments and proposed road work; 2) BMPs governing instream culvert removals would minimize the amount of sediment reaching downstream water sources; 3) 1.2 of the 1.6 miles of proposed road construction would occur in stable locations, on or near ridges, thus minimizing the risk of sediment reaching streams; 4) design features on the remaining 0.4 miles of proposed road construction (consisting of two 0.2 mile segments that would cross a total of four dry draws) would include outsloping and water dips with armored splash pads at the outfalls to minimize concentrated flows and associated sediment delivery to downstream water bodies; 5) the 0.7 mile long reconstruction of a decommissioned road is located on or near a ridge with two dry draw crossings and would be outsloped to reduce connectivity to the stream network then mechanically decommissioned by ripping, water

barring, and seeding the road after the contract is completed; 6) all new road construction would have eight inches of rock placed on the road surface to minimize erosion; 7) the net miles of existing roads would be decreased by 0.1 miles until the roads proposed for natural decommissioning becomes fully vegetated at which time there will be a net decrease of 2.7 miles; 8) the total road miles in Riparian Reserves would be reduced by approximately 1.4 miles, decreasing sediment sources over the long term; 9) rock surfacing on 43 miles of existing road and additional ditch relief culverts would decrease sediment delivery; 10) the potential for sediment from commercial harvest units to reach stream channels is very low due to BMPs, including Riparian Reserves; 11) manual pre-commercial thinning would not occur in Riparian Reserves and would not involve any ground disturbance and therefore would not have any effect on erosion rates or sedimentation in the project area; 12) sediment increases from underburning would be very slight given the low intensity burn and BMPs that stipulate no ignition or fire lines in Riparian Reserves; 13) BMPs would minimize the entry of sediment or ash into stream channels from pile burning within Riparian Reserves proposed for non-commercial thinning; and 14) landings would be constructed outside Riparian Reserves and BMPs would minimize any sediment moving off-site.

"Minimal effects" means actions would not result in the listing of streams as water quality limited. Ladybug and Star gulches would likely experience increases in turbidity and fine sediment concentrations during the first few major flow events following the Ladybug Gulch road decommissioning when bare soil from the project is flushed downstream. No direct or indirect effect on water quality of the Applegate River would be anticipated under Alternative B.

The cumulative effects of Alternative B on summer stream temperature when added to the past, present and reasonably foreseeable actions would be the same as described under Alternative A since there would be no direct or indirect effects of Alternative B on shade for perennial streams. However, the implementation of Alternative B would greatly reduce the risk of a high intensity wildfire as described under Alternative A, thus stream shade would likely continue to be maintained in the long term.

Existing sediment sources in the analysis area are primarily related to the road network created by past actions. Measurable changes in sedimentation resulting from Alternative B implementation and reasonably foreseeable actions (see Alternative A) would be minimal except for during the initial sediment pulses following the Ladybug Gulch road decommissioning. Any soil that reaches the stream system due to proposed road construction, decommissioning, and renovation under Alternative B would likely result in a local sediment pulse during the first few major flow events following road work. The timing of any sediment pulse would coincide with normal high turbidity levels and the sediment from the proposed project would not be discernible above background levels, except for initial sediment produced by the Ladybug Gulch road decommissioning which would be visible downstream during the first few major flows. Therefore, the cumulative effects on sedimentation resulting from Alternative B would be slightly greater than Alternative A for all analysis areas.

Alternative C

Effects on water quality from Alternative C would be less than from Alternative B, as there would be approximately 141 fewer acres treated, no new road construction, and five less landings constructed. Alternative C would include mechanical decommissioning of 1.7 road miles, natural decommissioning of 2.6 road miles, and improvement of approximately 43 miles of access road. In addition, 0.7 miles of a road that had been naturally decommissioned previously would be opened up for temporary use and then mechanically decommissioned. Effects of these proposed road activities on water quality are described under Alternative B. The mechanical decommissioning of Ladybug Gulch would be the primary source of increased sediment delivery for both Alternatives B and C.

There would be four stream crossings removed in the Star Gulch Analysis Area as a result of the proposed Ladybug Gulch road decommissioning. Stream crossing density would decrease by 0.2 crossings/mi.^{2} in the Star Gulch Analysis Area from 20.8 to 20.6 crossings/mi.^{2}.

Alternative C proposes 211 acres of tractor yarding, 1,132 acres of cable yarding, and 2,292 acres of helicopter yarding (Table 3-26). Research has found that the amount of ground disturbance from yarding varies by logging system with 21 percent for tractor, 7 percent for skyline cable, and 2 percent for helicopter (see Soils section). Estimated area disturbed by yarding would be greatest in the Star Gulch Analysis Area (Table 3-26), but would only amount to 1.3% of this analysis area. The potential for sediment in commercial harvest units to reach stream channels is very low due to BMPs such as no harvest or yarding in Riparian Reserves and minimizing and waterbarring skid trails (see Soils section). Soil that moves on cable yarding corridors during storm events would be trapped by logging slash or by ground cover on undisturbed ground at the bottom of or adjacent to yarding corridors. On steeper slopes with higher erosion potential, waterbars would be constructed manually to direct water off the cable yarding trails. Waterbars on tractor skid trails would prevent water from concentrating on bare, compacted ground and move it to adjacent vegetated or slash covered slopes.

Table 3-26. Proposed logging systems under Alternative C and estimated acres disturbed.

Analysis Area	Tractor Yarding (Acres)	Cable Yarding (Acres)	Helicopter Yarding (Acres)	Total Yarding (Acres)	Total Estimated Acres Disturbed
Palmer Creek above Nine Dollar Gulch	13	4	0	17	3
Applegate River between Beaver Creek and Star Gulch	0	0	186	186	4
Star Gulch	176	914	1,926	3,016	139
Applegate River between Star Gulch and Little Applegate River	22	213	180	415	23
Totals	**211**	**1,132**	**2,292**	**3,635**	**169**

Effects of prescribed burning and non-commercial thinning under Alternative C would be the same as under Alternative B.

Five fewer landings would be constructed under Alternative C resulting in less ground disturbance and thus less potential for sediment to move off site.

Overall, Alternative C would have less effect on water quality than Alternative B in the four analysis areas due to less ground disturbance from yarding, landings, and road construction. Alternative C would have no direct or indirect effects on stream temperature and minimal effects on sedimentation with adherence to BMPs and protection of Riparian Reserves. Actions proposed under Alternative C would not result in the listing of streams as water quality limited. Ladybug and Star gulches would likely experience increases in turbidity and fine sediment concentrations during the first few major flow events following the Ladybug Gulch road decommissioning when bare soil from the project is flushed downstream. No direct or indirect effect on water quality of the Applegate River would be anticipated under Alternative C.

The cumulative effects of Alternative C on summer stream temperature when added to the past, present and reasonably foreseeable actions would be the same as described under Alternative A since there would be no direct or indirect effects of Alternative C on shade for perennial streams. However, the implementation of Alternative C would greatly reduce the risk of a high intensity wildfire as described under Alternative A, thus stream shade would likely continue to be maintained in the long term.

The cumulative effects on sediment resulting from Alternative C would be slightly less than from Alternative B. Any soil that reaches the stream system due to proposed road decommissioning and renovation under Alternative C would likely result in a local sediment pulse during the first few major flow events following road work. The timing of any sediment pulse would coincide with normal high turbidity levels and the sediment from the proposed project would not be discernible above background levels, except for initial sediment produced by the Ladybug Gulch road decommissioning. As with Alternative B, the incremental impact of Alternative C when added to other past, present, and reasonably foreseeable future actions would not result in a discernable change in water quality at or beyond the mouths of the individual analysis areas analyzed. Water quality in the Applegate River would not be affected by cumulative effects.

G. FISH HABITAT

Fisheries Background

The proposed Deadman's Palm project is located in the western half of the Applegate River-McKee Bridge fifth field Watershed, in the Applegate Subbasin. The Deadman's Palm project area is composed of nearly all the Star Gulch drainage, a very small portion (18 acres) of the Palmer Creek drainage, roughly the upper third of the Lime Gulch drainage (an Applegate River frontal), and significant portions of several other small, unnamed Applegate River frontals. The Star Gulch and Palmer Creek drainages are the only streams included in the project area that have been observed to support fish populations. The Applegate River-McKee Bridge Watershed includes the mainstem of the Applegate River, an important migratory and spawning corridor for recreational and commercially important salmonids. Boaz Gulch, Beaver Creek (a fish-bearing perennial stream), and several other small frontals are also included in the watershed on the east side of the Applegate River. These east side drainages will not be included in this analysis because there are no activities (and no haul) within their drainage boundaries, so they would not be affected by the Deadman's Palm project.

Palmer Creek will not be analyzed in detail. The 18 acres proposed for harvest would be located on the ridge between Star Gulch and Palmer Creek. There are no streams through these acres and no Riparian Reserves. This land is not hydrologically connected to Palmer Creek; therefore, there is no route for any sediment generated to affect Palmer Creek or Star Gulch. In addition, the small amount of acres proposed for harvest and the canopy closure remaining (at least 40%) would prevent any peak flow problems from this harvest (see Water Resources for details on peak flow analysis). Therefore, harvesting these acres would have no effect on fisheries resources or aquatic habitat in Palmer Creek.

This analysis will focus primarily on Star Gulch because it is in this particular drainage that effects to fisheries resources from this project would be discernable. Lime Gulch and the small, fishless frontal streams will be discussed in terms of their impacts to the Applegate River. The Applegate River-McKee Bridge Watershed will also be included in this analysis, the Northwest Forest Plan states that Aquatic Conservation Strategy objectives will be analyzed at the fifth field watershed scale.

Key Fisheries Resources Issues in the Watershed

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action. These effects may or may not occur as a result of the proposed action but were of concern to members of the public or ID team specialists.

- Riparian areas and instream aquatic habitats in the Applegate River-McKee Watershed are currently degraded from a host of past and ongoing activities within the watershed.

- Habitat connectivity in the watershed has been impacted by past activities, limiting fish passage and distribution.

- Sedimentation from road construction/decommission, and other ground disturbing activities could increase sediment levels in stream channels, which could degrade coho critical and essential fish habitat, as a result of implementing alternative B or C.

Endangered Species Act
In 1997 the Southern Oregon/Northern California (SONC) Evolutionary Significant Unit (ESU) of coho salmon (*Onchorynchus kisutch)* was listed as "threatened" with the possibility of extinction under the Endangered Species Act (ESA) by the former National Marine Fisheries Service (NMFS), now the National Oceanic and Atmospheric Association Fisheries (NOAAF). Within the Deadman's Palm Project Area, Star Gulch, Palmer Creek, and the Applegate River support populations of SONC coho salmon.

Pacific Lamprey (*Lampetra tridentata*) were recently petitioned to be reviewed under the auspices of the Endangered Species Act (ESA) to determine if the species warranted listing. The United States Fish and Wildlife Service (USFWS) reviewed the status of lamprey in January of 2005, and determined that the species did not warrant listing. Lamprey are known to occur in the Applegate River and in Star Gulch.

Coho Critical and Essential Fish Habitat
On May 5, 1999, NOAAF (formerly NMFS) designated Coho Critical Habitat (CCH) for SONC coho salmon. Critical habitat includes "all waterways, substrate, and adjacent riparian zones below longstanding, naturally impassable barriers." It further includes "those physical or biological features essential to the conservation of the species and which may require special management considerations or protection...", including all historically accessible waters (F.R. vol. 64, no. 86, 24049). CCH in the Deadman's Palm Project Area includes the Applegate River and the lower reaches of Star Gulch and Palmer Creek mainstems.

Essential Fish Habitat (EFH) has been defined by NOAA fisheries as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This definition includes all waters historically used by anadromous salmonids of commercial value (including coho salmon). In the Deadman's Palm project area, EFH is identical to CCH. More information regarding EFH may be found at: http://www.nmfs.noaa.gov/ess_fish_habitat.htm.

Riparian Reserves
Under the Northwest Forest Plan (NWFP), Riparian Reserves (RRs) have been established on all stream channels displaying annual scour located on federal lands. Areas of unstable/potentially unstable ground are also managed as RRs. Widths are measured as slope distance from the edge of the stream, and are applied to both sides of the channel. Within the project area, RR widths of 640' (320' slope distance either side of the channel) to 720' (360' slope distance either side of channel) surround all fish streams. These Riparian Reserve widths are in accordance with the Medford District Resource Management Plan (RMP). See Appendix A, pg. C-31 of the Medford District RMP, 1994. The primary function of Riparian Reserves is to provide shade and a source of large wood inputs to stream channels. Additionally, they are a source of nutrient inputs to the aquatic ecosystem, they provide bank stability, maintain undercut banks that offer prime salmonid habitat, and provide habitat for a diverse range of other aquatic and terrestrial organisms (Meehan 1991).

Aquatic Conservation Strategy
The Aquatic Conservation Strategy (ACS) was developed to restore and maintain ecological health of watersheds and aquatic ecosystems on public lands. It includes 9 objectives, which guide BLM's management of Riparian Reserves. These objectives are meant to be examined at the HUC 5 (watershed) scale. The 9 objectives and effects from implementation of the preferred alternative are presented in the Appendix of this document.

Foreseeable Future Actions

This section will present projects proposed in the foreseeable future within the Deadman's Palm project area that may add cumulative impacts to fisheries resources impacts resulting from the Deadman's Palm project. Anticipated direct and indirect affects to fisheries resources will be described from each action. Cumulative impacts will be analyzed later in this document (see Aquatic Habitat section).

Habitat Improvement Project

In March of 2005, the Ashland Resource Area Fisheries Program of the Medford District BLM applied for Title II grant funds to improve fish habitat in the mainstem of Star Gulch. The restoration project aims to place several (~ 20) pieces of large wood into fish-bearing reaches of Star Gulch. Some of these pieces would include root wads. Star Gulch lacks key pieces of large wood, and this is currently limiting the quality and quantity of fish habitat in the stream (see "Aquatic Habitat" section in this document). The restoration project is not contingent on approval or sale of the proposed Deadman's Palm timber sale, but on securing the grant funding. However, the effects of the project will be analyzed in this document.

This improvement project would have some short-term, negative effects, but both immediate and long-term positive effects on fish and fish habitat. Short-term negative effects to fish include reduced feeding opportunities from localized increases in turbidity and temporary displacement of fish from habitats where wood placement occurs. Experience observing similar projects and the steep gradient and turbidity patterns in Star Gulch (see Water Resources section) both indicate that the effects of both increased turbidity and fish displacement would be expected to only last several hours, and so would be biologically insignificant. Positive indirect effects to SONC coho salmon (and other fishes and aquatic organisms) would result from an increase in habitat quality. Increased spawning and rearing habitat would benefit the population of coho in Star Gulch for many years, and may increase individual fish survival rate and productivity in the Star Gulch drainage basin.

This improvement project would also have both negative and positive effects to aquatic habitat. Negative effects would include a short term (up to several hours) increase in turbidity as sediment may be stirred up as the wood is placed in the channel, and short-term (weeks or months) changes in downstream habitats as the stirred-up sediment settles out over substrate. The sediment would not initially move very far downstream, as all instream work would take place during periods of low flow. It is anticipated that the first pool downstream of each wood structure would accumulate and store some amount of sediment, potentially decreasing habitat availability for macroinvertebrates and reducing feeding opportunities for fish. Levels of sediment deposition would decline substantially below this first pool, and likely would not be noticeable three or more pools downstream. However, following the pattern of sediment movement in Star Gulch (see Water Resources section of this document), deposited sediment would be flushed out during the first substantial flow event following wood placement, and transported to natural deposition areas in Star Gulch, or carried by high flows to the Applegate River as a very brief pulse of slightly increased turbidity. This turbidity would not be detectable above background turbidity levels.

Positive effects include long term benefits derived from the addition of large wood to the stream channel such as increased habitat complexity by the formation of pools and increased amount of cover provided by the wood. This would benefit juvenile rearing habitat in the mainstem of Star Gulch. Aggradations of spawning gravels upstream of the wood would increase spawning habitat available to adult salmonids. Wood additions would also increase the potential for lateral stream movement, possibly encouraging formation of slow water habitats (a crucial winter rearing habitat that is currently almost non-existent in Star Gulch), adding to habitat complexity in Star Gulch.

Some disturbance of riparian vegetation would occur as logs are pulled into the channel. However, the disturbance is expected to be localized and temporary. Some shrubs and plants would be crushed, but the area disturbed would be so small relative to the several miles of riparian area along mainstem Star Gulch that riparian

habitat value would not be degraded. (Required habitat surveys for plant, animal, and mollusk species have been completed) In addition, the amount of disturbance would be minimized by 1) having a professional fisheries biologist supervise and coordinate the activity; 2) using the appropriate machinery (e.g. with extendable arms) so that the machine itself does not disturb the stream bank; 3) minimizing the number of riparian access points; 4) keeping heavy equipment out of the stream channel; and 5) not obtaining logs from the immediate site. Other project design features for the improvement project are as follows: 6) the ODFW guidelines for instream work period would be followed; 7) disturbed soil would be stabilized with straw mulch and seeded with native, weed-free seed; and 8) machinery would be cleaned and free of leaks before entering the riparian area.

Culvert Replacement

An undersized and failing culvert located on the upper reaches of the mainstem of Star Gulch has been identified as being in need of replacement. As funding becomes available, the BLM plans to remove the old culvert and replace it with a larger pipe, capable of passing 100 year flood event flows, bed load, and aquatic organisms. The culvert is located at ~ river mile 7.7, and less than 500' upstream from historically observed populations of cutthroat trout (*O. clarkii*). Strict adherence to Project Design Features (PDFs) such as employment of sediment capture devices, diversion of stream flow during the period of in-channel work, and following instream work period guidelines would minimize, but not eliminate the potential for sediment mobilization and transport to downstream habitats from the culvert replacement activity. Sediment would be mobilized during replacement of the undersized culvert, and some would almost certainly find its way to pool habitats within the range of cutthroat trout. This would result in a short term increase in turbidity (lasting several hours during the initial stage of the culvert replacement project) potentially temporarily disrupting feeding behavior of cutthroat trout populations located downstream of the culvert. Some individuals may move to downstream habitats to avoid the turbidity.

It is also anticipated that some pool habitats may be adversely modified by a fine layer of sediments deposited over substrates. This may reduce macroinvertebrate production until the first fall rains raise stream flows, and wash the deposited sediments downstream, where they would be deposited in natural deposition areas (such as above a log jam). This affect would be greatest in the first pool located below the culvert, and will progressively diminish in downstream habitats. There are numerous pieces of downed woody debris in the stream channel of Star Gulch immediately below the culvert that would aid in capturing and storing displaced sediment, reducing the spatial extent of this impact.

It is highly unlikely, given the distance of this activity from CCH, EFH, and populations of anadromous fish (located approximately 2.3 miles downstream), the short term nature of the disturbance, and the abundance of woody debris (natural sediment traps) between the culvert location and anadromous fish populations, that populations of coho or steelhead will be affected by this activity.

As mentioned, the effects to aquatic habitat from the culvert replacement will be short duration, persisting only until stream flows raise in response to fall rains. In the long term, replacing the culvert would improve the downstream movement of substrate and debris. The culvert is in the process of failing, as evident by stream flow passing below the road prism. During periods of high flow, material in the road bed (including sediment) is being eroded away and into Star Gulch (chronic source of sediment input to Star Gulch). Eventually, the pipe will fail completely, resulting in a large input of sediment into the channel. Replacing the culvert would halt these periodic sediment inputs, and greatly reduce the risk of culvert failure during a flood event.

Other Projects

The United States Forest Service (USFS) is planning on treating 132 acres of land adjacent to lower Star Gulch for hazardous fuels reduction. 48 of these acres are located in RRs, and treatments would parallel ~ 750 feet of CCH/EFH in Star Gulch. Minimum 25' no-treatment buffers would be maintained around all channels. Treatments would target brushy species and small diameter trees, while maintaining large shade producing

vegetation. No adverse affects to SONC coho salmon, CCH, or EFH are anticipated as a result of this project (USDA 2005).

In addition, it is anticipated that private landowners in the vicinity of the Deadman's Palm project area would treat some % (unknown quantity) of their land for hazardous fuels reduction. These treatments are unlikely to be of any consequence to fisheries resources as private lands near the project area, with the exception of those that are already largely cleared surrounding the mainstem Applegate River, are not located near any fish bearing streams.

Private Timber Harvest
There are 515 acres of private lands adjacent to the Deadman's Palm Project area that are of sufficient stand age to be harvested within the foreseeable future. Approximately 440 of these acres are located in the Lime Gulch drainage basin, and the remaining 75 acres are located between the Star and Palmer drainage basins. There are no fish-bearing streams contained within these acres.

Bald Lick Landscape Project
The Bald Lick project area includes areas of the eastern half of the Applegate River-McKee Bridge Watershed. Effects analysis of this project have been completed (see Bald Lick Environmental Assessment), and no effects to fisheries resources in the Applegate River-McKee Bridge Watershed as a result of this project are anticipated.

Current Watershed Conditions/Environmental Effects

This section will present baseline conditions in the Applegate River-McKee Bridge Watershed and within the project area specifically, as well as anticipated effects resulting from this project. The effects of past actions manifest themselves in the current conditions. Effects added on top of these past actions as a result of the Deadman's Palm project, coupled with foreseeable effects from future projects, are the cumulative effects of this project to fisheries resources in the watershed and specific drainage basins.

Fish and Designated Habitat

Applegate River-McKee Bridge Watershed
SONC coho salmon, fall chinook salmon (*O. tshawytscha)*, summer and winter steelhead (*O. mykiss*), cutthroat trout, Pacific lamprey, sculpin (*Cottus spp.*), Klamath small-scale sucker (*Catostomus rimiculus*), and rainbow trout (*O. mykiss*) are native fish species present in the Applegate River-McKee Bridge Watershed. Distribution of these species in the watershed includes the mainstem of the Applegate River to Applegate Dam (which is a complete passage barrier to upstream fish migration). These species (except for fall chinook, Pacific lamprey, and Klamath small-scale suckers) are also present in reaches of the Star Gulch, and Beaver and Palmer Creek drainages. A host of introduced fish species is present in the Applegate River mainstem and in Applegate Lake (located immediately upstream of the watershed), including redside shiners (*Richardsonius balteus*), large and smallmouth bass (*Micropterus dolomieui* and *M. salmoides*), bluegill (*Lepomis macrochirus*) as well as other introduced warm water fish (USDI 1998).

Fall chinook, coho, and summer and winter steelhead are the species of greatest economic importance in the watershed, providing for commercial (in the Pacific Ocean) and recreational (in the Applegate and Rogue Rivers) fishing opportunities. The mainstem of the Applegate River is open to recreational angling for steelhead in the winter, trout in the summer, and attracts anglers from around the country.

The Applegate River is used as a migratory corridor for adult and juvenile coho and steelhead to access their primary spawning and rearing habitats located in the larger tributaries. Fall chinook are mainstem spawners and utilize suitable spawning locations in the Applegate River. A percentage of winter steelhead and coho salmon

spawn in the mainstem, especially during periods of low flow when access into spawning tributaries is difficult (personal observation). The mainstem provides some juvenile salmonid rearing habitat, although young fish rearing in the Applegate River are likely more susceptible to avian and piscivorous predation than they would be in the tributaries.

The mainstem of the Applegate River is considered occupied CCH and EFH from its confluence with the Rogue River upstream to Applegate Dam.

Star Gulch

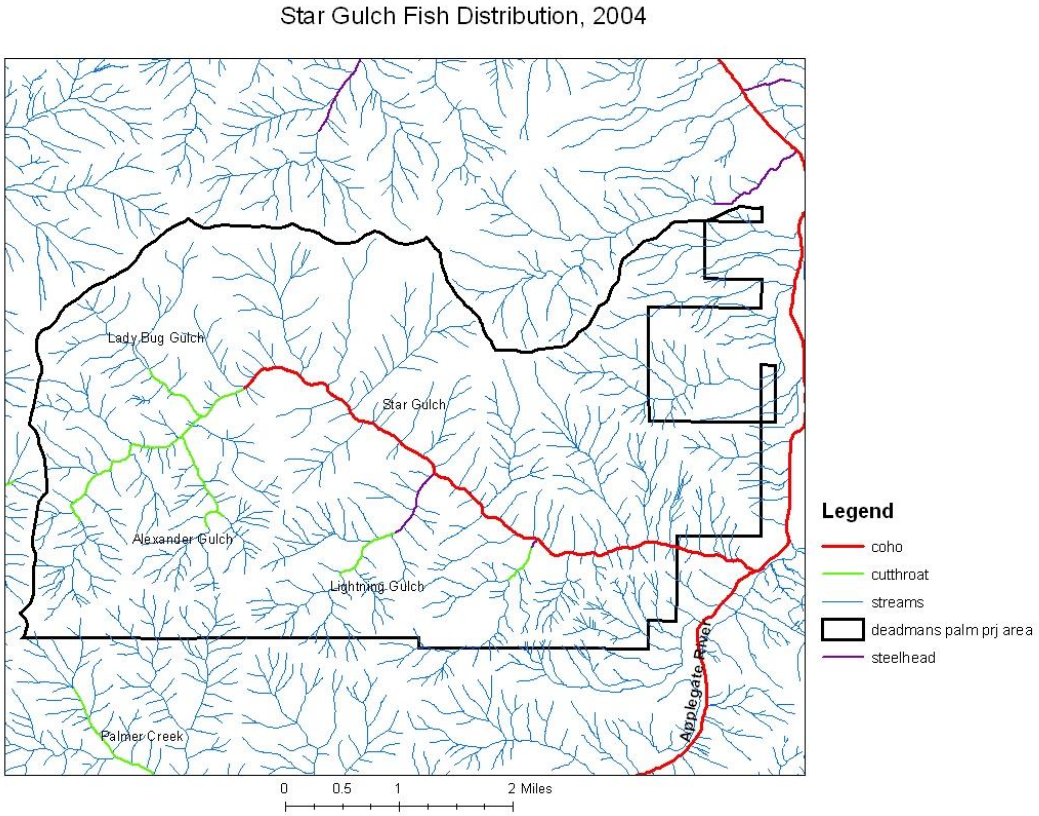
Distribution of fish species in Star Gulch was investigated by BLM surveyors in the springs of 2004 and 2005 (USDI 2004, USDI 2005). In 2005, juvenile coho were present to the 1918 Gulch confluence (~ river mile 4.3), where an old debris jam with subsurface flow through aggraded substrates appeared to halt upstream migration to juveniles. The debris jam would likely not be an adult coho barrier during normal winter flow levels. This is the upper most observation of coho on record in Star Gulch. No substantial migration barriers exist from this point upstream to just below the 1916 Gulch confluence (river mile 5.4), so CCH and EFH would be considered to extend upstream to this point.

Juvenile coho snorkel surveys performed in Star Gulch in June of 2005 (following a productive winter when many adult coho successfully spawned in the stream) documented that juvenile coho salmon densities averaged 0.91 fish/square meter of pool habitat (USDI 2005). This is above the Oregon Department of Fish and Wildlife's (ODFW) established benchmark of 0.7 fish/square meter (Rodgers 2000), indicating a healthy population of coho in lower Star Gulch. Densities were much less in 2002 and 2003, averaging less than 0.5 fish per meter^2. This may be a result of limited or no spawning by adults in Star Gulch during this period. Snorkel surveys in previous years have documented a decline in juvenile densities as the summer progressed. As described later in this document, lower reaches of Star Gulch commonly dry up during warm and dry periods, and this limits juvenile coho survival in Star Gulch. Annual spawning surveys conducted on Star Gulch for adult coho have rarely documented observations of adult coho or redds, with the exception of 2001 and 2004 (USDI 2001, USDI 2004). This may indicate that juvenile coho are migrating into the suitable summer rearing habitats available in Star Gulch from the mainstem of the Applegate River in years when adult coho can not access the stream.

Steelhead were observed in Star Gulch as far upstream as 100 feet below the 1916-Star Gulch confluence, where a four foot tall waterfall over bedrock appeared to halt upstream migration efforts. Steelhead were also present in Lightning Gulch (roughly to stream mile 0.6) and in Benson Gulch, where a small, non-used concrete diversion dam located 200' upstream from the Benson-Star confluence blocks further access to migratory fish. Spawning surveys conducted annually on the lower two to three miles of Star Gulch over the past five spawning seasons have shown a respectable average of 41.8 steelhead redds per mile in Star Gulch mainstem (USDI 2005).

Cutthroat trout distribution was found to extend upstream to a point located 0.8 miles upstream from the Deadman Gulch-Star Gulch confluence in the mainstem, where a debris jam appeared to block further upstream passage. This is approximately ¼ mile further downstream than previously identified in the Applegate-Star/Boaz Watershed Analysis (USDI 1998). Cutthroat were found 1.4 miles up Lightning Gulch, 1 mile up Alexander Gulch, and 0.75 miles up Ladybug Gulch. In addition, the Applegate-Star/Boaz Watershed Analysis identified cutthroat trout distribution to extend to roughly river mile 0.5 in Benson Gulch. No cutthroat trout were found upstream of the diversion dam barrier located just above the mouth of Benson Gulch during the 2004 surveys. This suggests that cutthroat were at some time extirpated from the upper stream reach, and have not been able to recolonize it due to the old diversion dam. Map 3-2 shows observed fish distribution, by species, in the Star Gulch drainage basin.

Map3-2. Star Gulch Fish Distribution



Riparian Reserve widths established around the fish-bearing reaches include the reaches found to be fishless in 2004 surveys (upper Star, upper Benson Gulches) identified in the Applegate-Star/Boaz Watershed Analysis as being fish-bearing.

Lamprey distribution in the Star Gulch drainage basin is unknown, and fish presence in other tributaries to Star Gulch has not been documented in previous surveys. Table 3-27 displays fish-bearing stream miles (2004 distribution) in the Star Gulch drainage basin by species.

Table 3-27: Observed salmonid distribution in the Star Gulch drainage basin, spring 2004/2005.

Stream	Coho to river mile	Steelhead to river mile	Cutthroat to River mile
Star Gulch	5.4[1]	5.4	7.0[2]
Benson Gulch	0.0	0.04	0.04[3]
Lightning Gulch	0.0	0.66	1.4
Ladybug Gulch	0.0	0.0	0.75
Alexander Gulch (both forks)	0.0	0.0	1.0
Total fish-miles	**5.4**	**6.1**	**10.19**

1 Coho have only been observed up to river mile 4.3, but as no migration barriers exist from this point up to river mile 5.4, distribution is considered to extend up to this point.

2 Cutthroat were identified to River mile 7.25 from Applegate-Star/Boaz Watershed Analysis.

3 Cutthroat were identified to River mile 0.5 from Applegate-Star/Boaz Watershed Analysis.

Applegate River Frontals
Included in the Deadman's Palm project area are significant portions of eight small drainage basins that flow directly into the Applegate River. The combined acreage of these small drainage basins included in the project area total 3,093.1 acres. The largest of these frontals is Lime Gulch. The majority of these channels are comprised of either short or long duration intermittent reaches through the project area. None of these small streams support fish populations. Historic use of these streams by fish is unknown, but it is possible that lower reaches were occasionally occupied by fish. Given the small and seasonal nature of these streams, it is doubtful that fish resided in these streams for long periods. It is possible that fish from the mainstem of the Applegate River opportunistically sought out refuge in them during periods of high flow, and some of the larger frontals may have even supported limited spawning by summer steelhead in their lower several hundred feet as the channels drained through the historic terrace surrounding the Applegate River. These lower stream reaches now flow through private lands that have largely been cleared for residences and agriculture, and many of them disappear upon reaching the terrace before entering the Applegate River (personal observation). None of the frontals are considered CCH or EFH.

Although these frontals do not contribute to fish habitat in the Applegate River-McKee Bridge Watershed, they do have the potential to influence fish habitat in the mainstem Applegate River, the biggest concern being their ability to increase turbidity and add sediment into the river during periods of elevated flow. This potential is slight, as the majority of the frontals are no longer hydrologically connected to the mainstem river.

Effects to Fish and Designated Habitat

No Action Alternative
The No Action Alternative would have "*No Effect*" to fish populations or distribution, SONC coho salmon, CCH, or EFH, as no ground disturbing activities would occur under this alternative. Affects already occurring to fish habitat as a result of past and ongoing activities are presented in the Aquatic Habitat, Riparian Reserve, and habitat connectivity sections following.

Alternative B
There are no actions planned under Alternative B that would directly influence fish populations or distribution in Star Gulch or the Applegate River. Indirect and cumulative effects to fish could occur from effects to fish habitat as a result of implementation of this alternative (see aquatic habitat section, below), and the habitat improvement projects. These include short duration reduced feeding opportunities from increased turbidity and small localized reductions in macroinvertebrate production, and temporary avoidance of some rearing habitats should pools be covered by a layer of fine sediment (see aquatic habitat section below). These effects (especially sediment deposition) would be most pronounced in the immediate vicinities of Ladybug Gulch and in Star Gulch downstream of and near the mouth of Ladybug Gulch. These areas are within the range of cutthroat trout and sculpin only. Anadromous fish-bearing reaches may potentially experience brief increases in turbidity levels, and some short-term fine sediment deposition in pools, primarily as a result of the habitat improvement project.

Alternative B has been determined to be "*May Affect/Not Likely to Adversely Affect (NLAA)*" SONC coho salmon, CCH, and EFH in the Star Gulch drainage. This determination was based upon anticipated affects to aquatic habitat that can indirectly affect fish, and are described in the "Biological Analysis for the Deadman's Palm Project" (Rossa 2005). BLM has initiated section 7 consultation with NOAA Fisheries as required by the ESA. The proposed habitat improvement project may potentially directly affect fish as described above in the foreseeable future actions section. This project would be "*May Affect/Likely to Adversely Affect (LAA)*" SONC coho salmon. Incidental take of SONC coho salmon is approved for this restoration project in the Programmatic Biological Opinion of Oct. 18, 2002 (NOAAF 2002).

Alternative C
Same as Alternative B, but with slightly less risk of sediment and turbidity inputs to fish habitat as no new road construction would occur under this alternative. Since Alternative C is not the proposed action, it has not been consulted upon. Were the BLM to choose to implement this alternative, it would reinitiate consultation following the guidelines in Federal Register Section 402.16 (50 CFR Part 402).

Aquatic Habitat Current Conditions

Applegate River-McKee Bridge Watershed
The Applegate River-McKee Bridge Watershed is 17,651 acres (28 square miles) in size and includes the mainstem Applegate River and all tributaries from the mouth of (but not including) the Little Applegate River upstream to Applegate Dam. The major, fish bearing tributaries include Star Gulch and Palmer Creek which drain the west side of the watershed, and Beaver Creek on the east side. Ownership in the watershed is comprised of 87% public (managed by the USFS and the BLM), and 13% private lands. Private land ownership is concentrated in the riparian corridors surrounding the mainstem Applegate and lower reaches of the tributaries.

Aquatic Habitat in the Applegate River-McKee Bridge Watershed as a whole can be described as degraded compared to historic (pre-European settlement) conditions. Instream channel habitats have been modified as a result of historic mining operations, resulting in downcut and simplified channels, in places constrained by old tailing piles. Gravels and cobbles have been removed from some stream reaches, exposing bedrock. Urban and agricultural development in the floodplain has also had a large impact to the mainstem Applegate River and lower reaches of tributaries, resulting in straightened, simplified channels lacking habitat complexity (USDI 1998). Roads (to access home sites and past timber harvest units) located in riparian corridors parallel all of the fish bearing drainages in the watershed, exacerbating channel confinement.

Several man made passage barriers that impede fish migration exist in the Applegate River-McKee Bridge Watershed, most notably Applegate Dam. A large diversion dam located on the mainstem river between the mouths of Star Gulch and Palmer Creek appears to offer sufficient passage to fish, as adults are observed upstream of it each year.

Construction of Applegate Dam in 1980 has led to reduced winter peak flows, and increased summer base flows in the Applegate River. Decreased winter peak flows have reduced the ability of the river to move laterally, as it would have historically during flood events. The dam is a complete barrier to upstream fish migration, and many miles of high quality spawning and rearing habitat are now inaccessible to migrating fish. Applegate dam has effectively cut off the primary supply of substrates (including spawning gravels) to the mainstem Applegate River in the Applegate River-McKee Bridge Watershed (USDI 1998). In addition to reducing the amount of available spawning habitat in the Applegate River, this has significantly reduced the rate at which the river is able to aggrade substrates, especially upstream of the mouth of Beaver Creek (the highest upstream tributary to the Applegate River-McKee Bridge Watershed of sufficient size to effectively add large material to the mainstem river). As a result, instream habitats in the Applegate River located upstream of the mouth of Beaver Creek that currently have high amounts of exposed bedrock would likely remain in their current state. Areas of exposed bedrock do not provide quality cover for fish or macro-invertebrates, resulting in reduced aquatic organism productivity.

Road construction on private and federal lands to access home sites, historic mine sites, and timber harvest have had a detrimental impact to instream habitat and water quality. Roads located within riparian corridors of streams influence the ability of the riparian area to provide protection to the stream system. As roads are constructed, vegetation is cleared; vegetation cleared from riparian corridors equates to decreases in stream-side shade, bank and ground stability, and nutrient and wood inputs; and increases in erosion and run-off rates, stream temperatures, and water turbidity (USDI 1998). Roads located within the flood plains of stream channels

restrict the ability of the channels to meander, encouraging channel downcutting, and simplifying aquatic habitat (lack of summer rearing pools and winter refugias).

Roads are a source of fine sediment (see Soils and Water Resources sections, this document) which when mobilized and deposited in stream channels can have a detrimental affect to fish and other aquatic species. Increased turbidity from mobilized sediments can directly impair a fish's ability to feed (Meehan 1991). Should turbidity be high enough and persist long enough, mortality may result. Even slight increases (10 to 20 Nepolothelmic Turbidity Units) in turbidity that persist for several weeks can have a significant detrimental affect to fish populations (Newcombe 2003). Excess sediments deposited in stream channels have consequences to populations of aquatic organisms as well. Deposited sediment can smother fish redds (killing the eggs or developing juveniles), fill pool habitats, cover substrates that macroinvertebrates (the primary food source for fish) depend upon for habitat, in turn reducing survival and growth rates of fish and other aquatic organisms (Meehan 1991). In the Applegate River-McKee Watershed, roads have been identified as the primary source of sediment delivery to stream channels (USDI 1998, USDA 1994).

Roads influence the timing and magnitude of peak flow events as well (see Water Resources). Increased peak flows lead to accelerated rates of bank erosion, sediment transport, turbidity, and sediment storage in stream channels, which reduces the quality and quantity of aquatic habitat.

Star Gulch

Star Gulch (mainstem) flows generally east for roughly eight miles from its headwaters to its confluence with the Applegate River. The drainage basin is 10,840 acres in size, and lies almost entirely within federal ownership (USDI 1998). The Star Gulch drainage basin is somewhat unique to the Ashland Resource Area of the BLM in that almost the entire basin is managed by the Resource Area. The Deadman's Palm project area includes 10,390 acres (96%) of the Star Gulch basin, and as such is the basin that has the greatest potential to be affected by the Deadman's Palm project.

As a perennial stream, Star Gulch provides important summer rearing habitat to a variety of aquatic organisms, including federally listed "threatened" SONC coho salmon. Summer and winter steelhead, cutthroat trout, pacific lamprey, and sculpin also spawn and rear in Star Gulch.

Star Gulch mainstem often has interrupted surface flow in reaches below river mile 1.0 during the summer months. Upstream reaches normally retain surface flow annually. The result of this disconnected flow has consequences for aquatic organisms including direct mortality for stranded individuals, increased stress for individuals that must migrate out of the effected habitats to upstream refugias (density dependent interactions), and loss of access into or out of Star Gulch from/to the Applegate River.

Two man-made barriers impede fish migration on tributaries to Star Gulch; a recently installed culvert on Lightning Gulch Rd. and an old diversion dam near the mouth of Benson Gulch. The culvert on Lightning Gulch Rd., located at roughly river mile 0.6 of Lightning Gulch, was filled with large rip-rap substrate (see photo 1 below) in an attempt to provide somewhat natural stream bottom habitat through the pipe. The spaces between the pieces of rip-rap have not yet filled in with smaller substrates, a situation that allows stream flow to sub under the substrate leading to interrupted surface flow through the pipe. It has been observed to be a complete barrier to up and downstream migration at all times except during periods of high flow that typically occur only in the winter months (personal observation). Juvenile steelhead were found above the culvert, indicating that steelhead are able to pass during these high flow events, but these fish may not be able to migrate downstream as they smolt and begin their oceanward migration. It is expected that as the culvert recruits smaller substrates (including fines) that the spaces between the large substrate would fill in, allowing stream flow to remain above the surface. The rate of recruitment depends on location of available substrates and high flow events, as it is at bank-full or greater flow events that substrates would be moving into the pipe and settling

among the rip-rap. The diversion dam on Benson Gulch appears to be a complete barrier to fish migration, as no fish were found above the dam (USDI 2004).

In addition to these man-made barriers, a natural fall over bedrock exists at the mouth of Star Gulch. A fish ladder was constructed to facilitate passage over this fall in 1974 (USDI 1998). This ladder has been observed occasionally to plug up with debris, and at such times passage over it is probably reduced.

Star Gulch (mainstem) can generally be characterized as having a moderate to high (3.4 to 8.3 %) gradient channel located in a narrow, steep valley (ODFW 1999). Riffles are the dominant habitat type with boulders, cobbles, gravels and bedrock comprising the majority of substrates present (USDI 1998). The stream channel is constrained by terraces or hillslopes along its entire length. Stream banks are rocky and stable; only 1.2% of stream banks have been identified as actively eroding throughout the entire surveyed reach (10,620 meters) of the mainstem (ODFW 1993). Width/Depth ratios range from 9.4 to 15.0 throughout this length (ODFW considers <10 "desirable" and >30 "undesirable" (ODFW 1999)).

Fine particulate substrates (including silt, organic matter, and sand less than 0.62 mm in size) account for 10% or less of all substrates present in the anadromous fish reaches (below 1916 Gulch confluence) of Star Gulch mainstem (USDI 2005, ODFW 1999). While gravels account for only about 30% of the substrate in this area, limiting the availability of spawning habitat, the low percentage of fines ensures that suitable spawning locations are not impacted by excess deposition of sediment. The percent of fines increases slightly in upstream (above 1916 Gulch confluence) reaches of Star Gulch to an average of around 15% (ODFW 1999).

Pools account for less than 20% of all habitat units (less than the established ODFW "desirable" benchmark percentage of > 35%), and Large Woody Debris (LWD) has been found to be lacking throughout the mainstem of Star Gulch, limiting the quality of rearing habitat available for juvenile salmonids (USDI 1998, ODFW 1999). Large (24" or greater in diameter) LWD densities are less than five pieces per mile in the mainstem of Star Gulch. The Applegate River Watershed Assessment recommended that streams in the Applegate subbasin should have at least 40 pieces of LWD per stream mile (USDA and USDI 1995). The low volume of LWD is major factor limiting the quantity and quality of pool habitat in Star Gulch.

Instream habitat was found to be good, at least in the fish bearing reaches, of both Lightning and Alexander Gulches during distribution surveys conducted in the spring of 2004 (USDI 2004). Although channels in these two drainages are constrained by hillsopes or terraces, are steep (9-18% channel gradient throughout the fish bearing reaches), and pools account for less than 11% of all habitat units, fish were abundant and ubiquitous throughout the surveyed reaches (ODFW 1999, USDI 2004). Large wood greater than 24" in diameter is lacking in these tributaries (average of 6 pieces per mile in Lighting Gulch, 2 pieces/mile in Alexander Gulch) although is was noted during the distribution surveys that smaller pieces were abundant (not enumerated) and contributing to formation of quality pool habitats (USDI 1998, USDI 2004). Spawning gravels are slightly more abundant in these two tributaries (average 35% of all substrates) than in Star Gulch. Fine particulates account for 17% or less of all substrates throughout the ~ 5,500 meters of surveyed reaches of these two drainages (ODFW 1999). Riparian Reserves adjacent to these tributaries consist of a mosaic of young to mature conifer and hardwood stands, and generally provide sufficient shade to stream channels.

Instream habitat was considered poor in Benson Gulch, due to old slash and brush that is currently choking the stream channel. The Riparian Reserve has been significantly reduced by past timber harvest (ODFW 1999). Habitat in Ladybug Gulch is also poor; Ladybug Gulch Rd. is encroaching and impacting the stream channel, causing it to be incised and down-cut in many areas (USDI 1998, USDI 2004) and exacerbating erosion. Fines account for 31% of all substrates in the 3,000 surveyed meters of Ladybug Gulch (ODFW 1999). Distribution surveys in Ladybug Gulch found very low densities of cutthroat trout in the stream (less than 3 fish per mile). Quality pool habitat was found to be lacking in both of these tributaries accounting for 11% or less of all habitat units (ODFW 1999).

Historic mining has had the single greatest impact to fish and instream habitat in the Star Gulch basin. Beginning in the 1850's with the discovery of gold in southwest Oregon, and continuing (to a much lesser extent) to present day, stream channels have been "turned over", channels straightened, and many tons of substrates removed and piled near the stream banks, reducing the streams abilities to meander and interact with their narrow floodplains (USDI 1998). As substrates were removed, bedrock was exposed in places. In addition, removal of substrates (in particular cobbles and large boulders) has reduced the friction of stream channels, leading to elevated stream velocities, further exacerbating channel erosion, enabling the stream to scour down to bedrock in places. This impact has been greatest on the mainstem of Star Gulch. In the lower reaches of Star Gulch, worked and displaced cobbles and boulders (old tailings) have aggraded in the stream channel. These areas are more prone to interrupted surface flow (during periods of low flow) as the stream sumps under the large substrates, decreasing habitat continuity and helping create temporal barriers to fish passage (Montfort 2005, and Chris Volpe, personal observation).

Stream side trees were cleared as roads were created along Star Gulch and its major tributaries to allow access to mine sites (USDI 1998). This has reduced the amount of large wood available to fall into the stream system. Any wood that was present in stream channels was likely removed to facilitate mining operations, also contributing to negative channel and habitat modification (USDI 1998).

These impacts from historic mining are still visible today as large piles of worked mine tailings line miles of channels on the mainstem and tributaries of Star Gulch, and substrates in lower reaches are dominated by the presence of old mine tailings.

There are currently eight active placer claims located on Star Gulch and its tributaries. These claims are primarily worked by "hobby" miners, utilizing a variety of methods including panning and suction dredges. Miners are allowed to work only during the instream work period (in the Applegate Subbasin, July 1st to September 15th), set by the ODFW. These small operations continue to have localized impacts to aquatic organisms. Substrates are turned over in channels, dislodging stored fine sediments that can create short term sediment pulses. These sediment pulses increase stream turbidity and can disrupt behavior of juvenile salmonids, causing stress, decreased growth, and possibly lead to decreased survival rates if disturbances persist over time (Meehan 1991). This sediment has also been observed to settle out and cover substrates in pools located as far as 250 feet downstream of the mining operation (personal observation). If these detrimental conditions persist throughout the summer months, juvenile salmonids may avoid these areas all together, which in turn can lead to negative density dependent interactions as un-affected pools become seeded at higher densities with displaced fish. This too can reduce individual growth and survival rates. These impacts are short term in nature, as operations must discontinue in early fall. The first moderate flow event of the season transports accumulated sediments downstream and deposits them in natural deposition areas, effectively cleaning substrates.

Timber harvest and road construction related to harvest operations have also had an impact to fish habitat in the Star Gulch drainage basin. Roughly 40% of the Star Gulch drainage basin is comprised of slopes with a northerly aspect. These slopes are dominated by conifer stands, and as such are the slopes that have historically been subjected to more intense timber harvest and associated road construction. The larger perennial streams (Benson, Lightning, and Alexander) drain these cooler and damper north aspect slopes.

Large scale timber harvest operations began in earnest in the 1960's in the Star Gulch basin, and peaked in the 1980's (USDI 1998). Prior to initiation of the North West Forest Plan and establishment of Riparian Reserves, clear cutting and harvesting of trees in riparian areas was common. This, coupled with wood removal related to historic mining practices, has resulted in a large decrease in the amount of large wood available to fall into the stream channels, adding to the present day lack of woody material in Star Gulch. The current lack of large wood

in Star Gulch and its tributaries is limiting the amount of spawning and rearing habitat available to salmonids and other aquatic organisms in the streams.

Road construction in the basin (primarily related to past timber harvest) continues to impact water quality and quantity as well (see Water Resources). Star Gulch and Ladybug Gulch Rds. are both located in the floodplains of the respective streams, and are restricting lateral migration of the channels in areas. A road parallels a lower reach of Lightning Gulch as well. Road related erosion has been noted in headwater sections of upper Star Gulch and Ladybug Gulch Rd. has been identified as contributing sediment to Ladybug Gulch (USDI 1998), degrading cutthroat habitat. Drainage subbasins within the Star Gulch basin with moderate to high road densities include Benson (5.1 miles/miles^2), Lightning (3.4 miles/miles^2), and Alexander (8.8 miles/miles^2) Gulches.

Below the Upper Applegate Rd, Star Gulch flows through private agriculture/residential lands for approximately 500 feet before its confluence with the Applegate River. This section of land has largely been cleared of vegetation.

Frontals

The Applegate River Frontals included in the Deadman's Palm Project area do not provide any habitat to populations of fish. They do provide habitat for other aquatic organisms, such as macroinvertebrates and amphibians.

Effects to aquatic habitat

No Action Alternative

The No Action Alternative would have no direct, indirect, or cumulative effects to aquatic habitats, as no ground disturbing activities would occur under this alternative. Aquatic habitats within the watershed would continue to exist in their current degraded (but functioning) state. As no new road construction or decommissioning of old roads would occur, road densities would remain at the current level within the project area. Fish habitat in Star and Ladybug Gulches would continue to be impacted by the poorly located roads that parallel the stream channels. Ladybug Gulch road in particular would continue to input sediment to fish bearing reaches of Ladybug and Star Gulches during high flow events.

Small scale mining operations would continue to have localized negative impacts to fish habitat in the Star drainage within and downstream of the project area as areas are periodically worked by miners. Urban and agricultural lands will likely remain in their current state, impacting fish habitat in the Applegate River and lower reaches of the major tributaries in the watershed.

Without thinning and fuels treatments, upland and riparian stands of trees currently stocked at high densities would remain over stocked, and may not ever reach a desired natural late seral stage, with out some disturbance such as a wildfire (Dwire 2003). These densely stocked stands would remain at a higher risk of experiencing a high intensity (such as a stand replacing) fire. The potential effects of a high intensity wildfire to aquatic habitat in the project area could be positive or negative. Negative effects include elevated rates of sediment deposition (Benda et al. 2003, Wondzell and King 2003), loss of riparian cover and future wood inputs and increased summer water temperatures (should the fire consume riparian vegetation), elevated channel scour (due to elevated peak flows), and reduced habitat complexity (such as less pools and less aggraded spawning substrates). Positive effects include potential short term increased summer base flows as less vegetation is left to utilize ground water. However, over time as brush species recolonize burned areas, vegetative water demands would quickly increase. Large wood inputs to streams may increase after a fire, as fire killed trees fall into stream channels (Benda 2003). This situation was observed locally along Quartz Gulch after the Quartz Fire killed large riparian trees in a reserve. Increased wood inputs can increase habitat complexity by forming pools and aggrading spawning substrates, benefiting aquatic organisms.

Alternative B
Activities proposed under this alternative include: 1.6 miles of new road construction, 4.3 miles of road decommissioning (and associated culvert removals), 42.7 miles of road renovations, 79.1 road miles used as haul routes, 3,991 acres of various prescription commercial timber harvest units, 3,469 acres of non commercial (2,339 of these acres are within units proposed for commercial treatments) and fuels treatment prescriptions, and construction of 15 new helispots/landings.

Ground disturbing activities in or near stream channels and roads have the greatest potential to impact fish habitat; it is these activities that could cause erosion and sediment transport to, and storage in, stream channels. The soils and hydrology sections of this document describe where erosion would likely occur, and the mechanisms for displaced sediments to enter the stream network. The new road construction and road decommissioning proposed under this alternative have been identified as having the greatest potential to contribute sediment to streams (see Water Resources).

Roads
The 1.6 miles of new road construction is a concern to fisheries resources in the Star Gulch basin. The 1.6 miles consists of: 0.6 miles (hereafter referred to as segment "A") of new road proposed on the ridge (drainage divide) between Lightning and an unnamed frontal to Star Gulch; 0.5 miles located on a ridge between Star and an unnamed frontal to the Applegate (segment "B"); 0.1 miles on a ridge (drainage divide between Star and Rock Gulch basins) that connects to Burton Butte (segment "C"), and two 0.2 mile short segments near/in Riparian Reserves of Star tributaries (segments "D" in lower Star Gulch basin and "E" in the middle of the basin);

Of these proposed new roads, segments "A", "B" and "C" have little potential to impact fish or aquatic habitat. All three segments are located either on or very near ridge tops, and would not cross stream channels nor be located within RRs. Because they do not cross any channels, there is no connectivity between these segments and the stream network (see Water Resources). Displaced sediment resulting from construction and use of these roads would have no mechanism for entering stream channels and hence these roads would not directly affect aquatic habitat. Because of the location of these three roads near/on ridge tops, the potential for these roads to intercept ground water would be minimal.

Road segment "D" would be located mid slope. Segment "D" would cross three dry swales that drain into a short duration intermittent stream. The swales are small and gentle enough that they would not require culverts. Regardless, the road would be "rolled away" from these crossings, limiting the amount of road surface draining into the swales to approximately 14' x 20' at each crossing. The rest of the roadbed would be outsloped, preventing water accumulation. The dry swale crossings would be located approximately 0.3 of a mile upstream of occupied CCH and EFH in the mainstem of Star Gulch. Drainage connectivity from this proposed road to stream channels exists, creating the potential for displaced sediment to enter the stream network. However, outsloping the road, rolling the road away from the dry swale crossings, and the fact that over 100' of vegetation in the bottom of the draw would trap any fine sediment that did move off the road bed before it ever reached the short-duration intermittent would ensure that any sediment moving off of the small areas of road bed into the dry swales would not reach downstream fish-bearing streams (Lindell, personal communication).

Proposed road segment "E" would be located in a small perennial tributary basin opposite and upstream of the 1918 Gulch basin. It would cross one dry draw channel its 0.2 mile length. It would include 280' located in the outer 20'-40' of the 160' Riparian Reserve of the basin, but would quickly exit the reserve and head upslope to the top of a small ridge. Because segment "E" includes lengths located midslope, it would likely intercept ground water. PDFs would allow this intercepted ground water to be diverted off of the road, downslope and into vegetation where it may be utilized by the vegetation or allowed to percolate back into the ground water table (see Water Resources). Outsloping the road and rolling back the road at the dry draw crossing would reduce the amount of water routed into the dry draw during rain events. Only approximately a 14' x 20' area over the culvert would potentially drain water into the dry draw. During a major storm event, there is the

potential that fine sediment could move into the draw, and that the draw could flow water, potentially entraining some fine sediment and contributing turbidity to fish habitat in downstream Star Gulch. However, the amount of sediment would be so small, along with the capturing ability of vegetation in the draw that it is doubtful that any increase would be measurable. In addition, turbidity levels in Star Gulch peak and drop very quickly (usually within a day) (see Water Resources section), so there is no chance that the turbidity from this road could reach the chronic levels of exposure reported in the literature as harmful to fish.

Decommissioning 4.3 miles of road in the Star basin would have a negative, short term (< 5 years) effect to aquatic habitat, coupled with a long term beneficial effect, as chronic sources of fine sediment input would be eliminated. Of the total miles of road proposed for decommissioning, 1.7 miles of road parallel Ladybug Gulch (1.1 miles located in RR) and 0.4 miles parallel 1917 Gulch (all in RR). The Ladybug Gulch Rd. includes multiple stream crossings (see hydro) with culverts that would be removed. The Ladybug road is hydrologically connected and contributes sediment to the stream channel, impacting aquatic habitat. Ladybug road would be mechanically treated. Mechanized decommission involves the use of heavy equipment to break up the compacted prism. Water bars would be installed to divert captured water off of the road prisms and away from the stream.

The 1917 Gulch road crosses 1 dry draw and two intermittent stream channels, none of which have culverts. This road segment has been closed to vehicles previously, and has since recovered to some degree as the road prism is covered with vegetation. It would be blocked and "officially" decommissioned through this project, but not mechanically decommissioned. The 1917 road would be allowed to decommission naturally, a process that has already begun, as the road has been closed for several years, and vegetation has already colonized the old road prism. The remaining 2.2 miles of road proposed to be decommissioned are located near a ridge and do not include any channel crossings. This road segment has no hydrologic connection to stream channels; there is no potential for it to input sediment to these channels.

Decommissioning the Ladybug Gulch road would create pulses of sediment into the channels of both Ladybug and Star Gulches (RRs and soils) (see Water Resources). These pulses would have short-term negative impacts to aquatic habitat. After high flow events, some fine sediment would wash off the road and be deposited into habitats occupied by cutthroat trout in Ladybug Gulch. Utilizing PDFs would reduce the quantity of sediment that is available to be mobilized and deposited into channels, but it is anticipated that this activity would generate enough sediment to modify habitat and affect cutthroat trout populations in Ladybug Gulch (substrates covered by fines, reduced feeding opportunities from increased turbidity and decreased macroinvertebrate production, and potentially some loss of spawning and rearing habitat).

These pulses of sediment would persist until vegetative recovery along the road prism is progressed enough to stabilize soils (less than two years), and would correspond with precipitation and high flow events. However, once recovery has occurred, sediment transport and deposition rates would decrease below their current levels, resulting in a net decrease in sediment delivery to the aquatic habitats. Over time, this would have a significant positive affect to cutthroat trout habitat in Ladybug Gulch, which is currently very degraded primarily due to the location and poor design of the road, and is a chronic source of sediment input into the stream system.

Decommissioning Ladybug Gulch road would improve habitat connectivity at the site scale. Four culverts would be pulled as part of the decommissioning: two on mainstem Ladybug Gulch, one on a perennial tributary, and one on a short-duration tributary. Although these culverts are not all barriers, they all constrict the stream channel and may present flow barriers during certain times of the year. Removing them would improve passage up and down Ladybug Gulch for all aquatic organisms.

It is possible that during high flow events, sediment from Ladybug Gulch could wash downstream into mainstem Star Gulch. However, the steep gradient and shape of the channel would ensure that most of the fines would be entrained as turbidity and moved downstream and out of the system very quickly (see Water

Resources). In addition, sediment that is deposited would have very little biological effect because fine sediments are lacking in Star Gulch (Waters 1995).

Proposed renovation of 42.7 miles of existing road is not expected to have negative effects to aquatic habitat (see Water Resources). Road renovation would consist primarily of adding rock to road surfaces, and may include some ditch line maintenance. The majority of roads to be renovated are within the Star Gulch drainage basin, although there are approximately 3 miles of roads proposed for renovation in the Rock Gulch drainage (Middle Applegate River Watershed), an adjacent basin to the north of the project area.

Roads used as haul routes have the potential to transport airborne particulates to stream channels as repeated use of the roads creates dust that may settle into the channels. Any non-paved roads located adjacent to or crossing stream channels may contribute small amounts of dust to the stream. The magnitude of this effect would be greatly diminished by following standard PDFs that call for dust abatement of haul routes, but it is anticipated that a small amount of dust generated from the haul roads would enter aquatic habitats.

Haul roads for this project include through Star Gulch, Lime Gulch, Rock Gulch, and several of the frontal basins. In addition, the Upper Applegate Rd. would also be utilized. The vast majority of haul would be routed down Star Gulch road, most of which is paved along its length and located on an abandoned flood terrace elevated above the stream channel and separated by thick riparian vegetation. All roads that parallel SONC coho-bearing reaches of streams are paved, and would not contribute dust to CCH or EFH. There are two gravel roads that cross Star Gulch within the range of CCH and EFH (Benson and Lightning Gulch Rds.) and these crossings may contribute a very small amount of dust to habitats near these crossings. The amount of dust that settles in the stream from these crossings would not be of sufficient quantity to adversely modify any aquatic habitat because the square footage of road is very small, because layered riparian vegetation would trap much of the dust, and because dust abatement PDFs would be strictly adhered to in order to prevent dust from becoming airborne.

Within the Star Gulch drainage, there are six non-paved roads proposed for log haul that parallel fish bearing streams for some distance; of these, three (roads that parallel Rock, Benson, and Alexander Gulch) are located near the top of there respective RR, and are far enough away from the stream channel that there is no risk of airborne dust to settle into aquatic habitats because it would be completely trapped by at least 75’ of thick riparian vegetation. The Star Gulch Rd. above Ladybug Gulch, the Ladybug Gulch Rd, and the lower ~ ¾ miles of Lightning Gulch Rd. are close to the stream channels. Hauling on these roads may potentially contribute dust to the aquatic system. The magnitude of this affect is anticipated to be very small, due to dust abatement measures (see PDFs) that would be employed, and because vegetation exists between most of the roads and the channels which would intercept mobilized dust particles, keeping them from reaching the stream channels.

Through the frontals, there are three haul routes. The route from the Star Gulch ridge to Cantrall-Buckley park is either on the ridge and not hydrologically connected to streams or paved and not contributing dust; therefore would not contribute sediment to the CCH in the Applegate River. The route through the mid of Lime Gulch was rocked and renovated under a previous timber sale. With additional dust abatement measures (see PDFs) and riparian vegetation trapping dust at stream crossings, and the distance to CCH in the Applegate River, the amount of dust that settles into these streams would not be of sufficient quantity to aversely modify any aquatic habitat, especially CCH. The third route runs from Burton Butte down along a tributary to Rock Gulch and connects to the Cantrall-Buckley Road. This road is in good shape. With dust abatement measures and thick riparian vegetation completely shading the stream along almost the entire length of any stream, the amount of dust that could enter a stream would be so small as to be unmeasurable. In addition, most of this route is over a mile from CCH. Effects to CCH in the Applegate River would be nil.

Harvest
Commercial and non commercial timber harvest activities would not directly affect aquatic habitat. No harvesting, tractor or cable yarding, or other timber treatments would occur in Riparian Reserves; hence no mechanism for disturbed soils to enter stream channels exists. PDFs (see PDFs) for felling, tractor, and cable yarding operations would minimize the potential for sediment transport into dry draws (the only channels in the project area not protected by RRs). It is not anticipated that peak flows in the Star Gulch basin would be affected by timber harvest (see Water Resources), so no adverse channel modifications are expected as a result of harvest activities.

Four existing helicopter landings that might be used for timber harvest are located within Riparian Reserves; however all are located in the outer portion of their respective RR, are vegetated and completely flat, separated from streams by thick riparian vegetation, duff and downed wood, and three are additionally separated from the stream by roads. No trees would be felled near these existing helicopter landings, except those required by OSHA, and if so, would be left on site. Finally, dust abatement and sediment control PDFs would be implemented. Therefore, there are no effects to habitat expected from the use of these existing landings.

Fuels
441 acres of fuels reductions are proposed under this alternative. 254 acres of the fuels units are located in the Star basin, concentrated on the north side of the basin, and located below the Benson Gulch confluence. These units would all be treated manually, involving thinning, piling, burning the piles, and some limited underburning. Standard PDFs for fuels treatments call for leaving a 50' no-treatment buffer on either side of long duration intermittent channels. In the event that sediment was mobilized as a result of the fuels treatments, the vegetative buffers paralleling the channel would capture this sediment, and keep it from reaching the stream channel.

Construction/use of helispots and landings would not affect fisheries resources. All proposed sites are located on ridges or are existing landings. No new sites would built in RRs.

Cumulative Effects
This analysis assumes that the habitat project and the culvert replacement project will occur, and that the private land available for harvest adjacent to the project area will be clear cut in the foreseeable future. The proposed Bald Lick sale would have no adverse effects on fisheries resources in the Applegate River-McKee Bridge watershed (see Bald Lick Environmental Assessment).

Cumulatively, short term and localized increases in base turbidity and sediment deposition levels are expected to impact some aquatic habitat as a result of implementation of this alternative, from the culvert replacement, private timber harvest, and from the habitat restoration project. These sediment and turbidity pulses would be most noticeable during the first two years following any ground-breaking activities. Habitat in Ladybug Gulch would experience short-term negative impacts from decommissioning Ladybug Gulch road, due to the proximity of the road to the stream; however it would also experience significant long-term improvement, important for the local cutthroat population.

Some temporary (less than 2 days) turbidity increases and additions of small amounts of fine sediment would be expected in Star Gulch following the first high flow events off of the decommissioned Ladybug Gulch road (see Water Resources), and off of the new road segment "E". The habitat restoration project would also contribute some sediment during the summer months that would be disappear with the first high flow events. The majority of these sources of sediment delivery would greatly diminish over time (within two years following activities). Localized mining operations would also continue to occasionally contribute small amounts of turbidity/sediment to aquatic habitats during the summer months. In the event the private lands adjacent to the project area were clear cut, it is anticipated that sediment levels would increase in Lime Gulch (a fishless stream) and in fishless headwater reaches of Lightning Gulch. All of these localized disturbances are anticipated to negatively affect a

small percentage of fish habitat in the Star drainage. In addition, any effects would be short-term: anywhere from 2 days for increased turbidity levels to two years for continued addition of fine sediment. Stream gradient and shape serve to entrain and move fine sediments quickly out of the drainage. Effects would be limited as described above, and would not persist to the mainstem of the Applegate River in a manner that would be detrimental to aquatic organisms. Because no discernable effects are anticipated beyond the sixth field watershed scale (such as beyond the mouth of Star Gulch), this project would not add a cumulative affect to aquatic habitat in the Applegate River-McKee Bridge fifth field Watershed.

Although a net decrease in road densities in the Star Gulch drainage basin of 2.7 miles would represent a beneficial effect to this basin (see Water Resources), this positive effect would not be discernable at the fifth field watershed scale.

Alternative C

Activities proposed under this alternative include: 4.3 miles of road decommissioning (and associated culvert removals), 42.7 miles of road renovations, 79.1 road miles used as haul routes, 3,635 acres of various prescription commercial timber harvest units, 3,486 acres of non commercial and fuels treatment prescriptions, and construction of 10 new landings/helispots.

354 less acres are proposed for commercial timber harvest under this alternative, and no new roads would be constructed. Affects to aquatic habitat from alternative C are the same as described above for alternative B, except that no new roads would be constructed. This reduces the potential for new chronic sources of sediment and turbidity inputs to impact aquatic habitat in the Star basin. Non chronic sources would still have localized and short term impacts such as those resulting from the culvert replacement, road decommissioning, and mining disturbances.

Riparian Reserves

Applegate River-McKee Bridge Watershed

Riparian corridors along fish-bearing stream reaches in the Applegate River-McKee Watershed (including the mainstem Applegate) have been reduced from historic levels as agriculture and urban development of valley lands, road construction, and historic timber harvest practices have cleared vegetation adjacent to stream channels. This has increased penetration of solar radiation to stream channels, resulting in elevated summer stream temperatures to many areas. Riparian corridors are very narrow around the mainstem Applegate, and homes and pastures now exist in the historic flood plain. Invasions of introduced species (especially Himalayan blackberry) have also reduced the quality of riparian vegetation in the watershed.

Of additional concern is a decrease of large wood inputs to stream channels in the watershed as less large trees are available to fall into the channels. Large wood is an important component of the aquatic system (particularly in small tributary streams such as Star Gulch) that affects the physical processes and biological health of the streams. Large wood that falls into the stream channel creates debris jams that accumulate spawning gravels and encourage formation of pools, stores sediments, slows and diverts high stream energies that would otherwise scour out substrates, helps create channel meander which increases habitat diversity and complexity, all of which act to provide for high quality habitat for aquatic organisms.

Within the project boundary, there are an estimated 2,177.8 acres of Riparian Reserves (calculated from GIS). This represents nearly 18% of the total acreage of the project. Overlaying the vegetation condition (GIS) layer with Riparian Reserve boundary layer is a useful way to display current vegetative states of the reserves over the large area encompassed within the project boundary. Note, however, that the vegetative condition layer was generated primarily to reflect upland conditions, and may not provide an accurate picture of conditions in Riparian Areas, especially those areas adjacent to stream channels. A summary of existing vegetative states within the Deadman's Palm project area is presented by major drainage basins in table two below.

Table3-28. Vegetative condition class of Riparian Reserves in the Deadman's Palm Project Area

Drainage Basins in Project area	Riparian Reserve Acres by Vegetation Type						
	Grass	Hardwoods	Early Seral (seedlings/saplings)	Poles (5-11" DBH)	Mid Seral (11-21" DBH)	Mature (>21" DBH)	Total Acres of R.R.'s in Project Area
Star	2.2	143.3	271.3	300	674.3	515.1	1906.2
Frontals	0.8	11.4	6.5	16.1	168	46.5	249.3
Project total	**3**	**177**	**277.8**	**316.1**	**842.3**	**561.6**	**2177.8**

The seral stage of vegetation surrounding the reserves can provide insight to how well the reserves are capable of functioning, in terms of providing shade and as a source of large wood inputs. For the purpose of this analysis, it was assumed that trees in a mid seral stage (minimum 11" in diameter at breast height (DBH)) or older would function to provide sufficient shade to stream channels, and that pole size trees (< 11" DBH) and younger may not provide sufficient shade to stream channels to prevent solar penetration to the stream channel. It was also assumed that only stands in a mature stage (>21" DBH) are capable of providing a source of Large Woody Debris of sufficient size to encourage channel modification and habitat improvements. Hardwoods were not included in this comparison as they do not conform well to DBH measurements, and do not provide LWD of the same quality that conifers do (Beechie et al 1999). Excluding hardwoods and pole size trees may tend to underestimate the percent of reserves that are currently providing sufficient levels of shade to stream channels. The water resources analysis (see Water Resources) includes a more focused look at actual shade provided to stream channels, while this analysis attempts to describe the reserves in a broader perspective with regards to overall riparian function. Table 3-29, below, displays the percent of reserves that are in mid seral or greater stage and in a mature stage (capable of providing LWD to channels).

Table 3-29. Percent of reserves in mid seral or greater, and mature seral stages in the project area

Drainage Basins in Project area	% of Reserves in Mid Seral Stage or Greater (Trees >11" DBH)[1]	% of Reserves in Mature Stage (Trees >21" DBH)[1]
Star	62%	27%
Frontals	86%	19%
Project total	**65%**	**26%**

[1] Does not include acres of hardwoods.

Data obtained through this analysis suggests that reserves capable of providing LWD are lacking throughout the entire project area. A more detailed analysis of current shade conditions is provided in the Water Resources section of this EA.

There is currently one planned timber sale in the Applegate River-McKee Bridge Watershed, the Bald Lick sale. This sale does not propose harvest of trees in Riparian Reserves in the Applegate River-McKee Bridge Watershed, and fuels treatments associated with this sale would not treat overstory shade and LWD producing vegetation (see Bald Lick EA).

<u>Star Gulch</u>

The Riparian Reserve, although seemingly intact along much of Star Gulch mainstem, has been impacted by Star Gulch Road, past mining practices, and timber harvest. Along the tributaries, some Riparian Reserves were clearcut in the 1980's. Although recovering, the remaining narrow riparian strips are dominated by hardwood species, and lack large conifers that would increase shade as well as serve as a source of large wood input to the stream (USDI 1998). See the Water Resources section for more detail on tributary shade conditions.

The Water Resources section presents and explains water temperatures in Star Gulch and its tributaries. Within the proposed Deadman's Palm project area, Star Gulch is the only stream included on DEQ's 2002 303(d) list for temperature, listed from the mouth to 1918 Gulch. These elevated water temperatures in lower Star Gulch are not directly limiting survival of salmonids. The temperatures are well below the lethal upper limit for coho salmon (78.8^{o}) and steelhead (75.0^{o}) (Meehan 1991). The maximum recorded temperature for lower Star Gulch is significantly above the reported upper optimum (the temperature at which fish growth rate is the most metabolically efficient) of 57.2^{o} and 55.4^{o} for coho and steelhead (respectively). Possible indirect effects of elevated water temperatures include decreased growth and productivity (Meehan 1991). However, these fishes are adapted to life in small streams where diurnal temperature fluctuations of up to 20 degrees are possible, and a spike in temperature to 67.4^{o} that persists for several hours is well within the tolerance range of both of these species (Meehan 1991). It is the average summer time water temperatures that best represents conditions relative to fish growth. It is unknown if and how much summer water temperatures in Star Gulch may affect growth and survival rates, but summer snorkel surveys in 2003 did document a decline in the numbers of juvenile coho observed between the August and September surveys from the mouth to 1918 Gulch (USDI BLM 2003).

Data obtained through GIS analysis identified that the percentage of RRs in a mature stage (capable of contributing large wood to the stream channels) is very low in the fish- bearing sub-drainage basins of Star Gulch, ranging from 3% in the Benson Gulch basin to 49% in the Ladybug Gulch basin (note, however, that the RR adjacent to Ladybug Gulch itself has been significantly reduced due to the location of Ladybug Gulch road). This is limiting the rate at which the stream system may accumulate LWD. It will take many years for the streams to recruit sufficient supplies of wood that would optimize habitat complexity and diversity for aquatic organisms (see aquatic habitat section). The proposed habitat improvement project in Star Gulch would seek to speed up this process some, but LWD quantities will remain well below historic levels until the reserves have reached a mature stage and large trees are available to fall into the channels.

Frontals

There are 249.3 acres of Riparian Reserves surrounding Applegate River Frontals included in the project area. Of these acres, 86% are in a mid seral or greater stage, and as such are capable of providing ample shade to the frontal channels. Only 19% are in a mature stage, and as such are not capable of providing much LWD to the streams. Because these streams are not fish bearing, this lack of LWD is not reducing fish habitat, but it is reducing the capability of the frontal basins to capture and store sediments that may impact fish habitat in the mainstem of the Applegate River.

Effects to Riparian Reserves

No Action Alternative

The no action alternative would have no direct, indirect, or cumulative effects to riparian reserves in the project area, or in the Applegate River-McKee Watershed. Reserves located on federal lands would continue to receive protection afforded under the NWFP, and would slowly recover in areas that were previously harvested. Over time, increases in numbers of mature trees in the Riparian Reserves would increase the potential for large wood inputs to the stream system. As debris jams form, in-channel habitat complexity would increase, providing more spawning and rearing habitat for salmonids. As the Riparian Reserves recover and produce increased shade to stream channels, summer time water temperatures may begin to lower. Recovery would be limited in reserves impacted by roads (such as along Star Gulch mainstem) as these roads would continue to exist near the stream channels. Riparian areas along private lands may never recover, as it is unlikely that lands cleared for urban or agricultural development would be returned to their historic state.

The Ladybug and 1917 Gulch Rds. would not be decommissioned under this alternative, and these reserves would continue to be impacted by the roads.

No fuels reduction would occur and no upland forest health thinning would take place. No riparian reserve prescribed burning study could take place as no thinning or prescribed burning would be authorized.

Alternative B

There are several ground-disturbing activities proposed in Riparian Reserves under this alternative: the decommissioning of Ladybug Gulch and 1917 Gulch Roads., and construction of 280' of new road in the Riparian Reserve of a small, non fish bearing tributary stream to Star Gulch. In addition, fuels treatments would treat some riparian vegetation (by allowing fire to back into the Reserves or by manual thinning). But following standard Project Design Features (PDFs) and Best Management Practices (BMPs) as outlined in this document, would ensure that overstory shade producing trees are not impacted by the treatments. Treatment of brushy species in the Reserves may actually increase the health of the Reserve, as larger tree species may be "released" (Beechie et al, 1999). Decreased competition for resources may allow for quicker growth of the desired conifer species. Quicker growth would allow trees to assume characteristics of a mature stand sooner, capable of providing increased shade and potential large wood inputs to the stream channel. However, given the small amount of riparian acres proposed for treatment, this beneficial effect would help only a very small percentage of Riparian Reserves located in small, non-fish bearing tributary streams. There is no harvest of trees in RRs proposed under this alternative.

Decommissioning 2.1 miles of road that parallel Ladybug (1.7 miles total, 1.1 miles located in RR) and 1917 (0.4 miles, all located in RR) Gulches would have a beneficial effect to the health of the Riparian Reserves. After decommission of these poorly located roads, vegetation would colonize the old road prisms, and reestablish itself. Over time, the reserves would recover to their full capacity as overstory trees grow and provide shade and increased potential of wood inputs to the stream channels. Construction of ~280' of new road in Riparian Reserves of a Star Gulch tributary stream would have a small negative effect to this Reserve. Riparian vegetation (including overstory trees) would be removed in the road right of way. This would potentially increase solar radiation inputs into this reserve. The proposed road construction within the basin of this small stream is located at the edge of the Riparian Reserve and would then quickly exit the reserve. Very little riparian vegetation would be impacted, and what was would not be near the stream channel, minimizing the potential to increase water temperature to the stream. The nearest fish habitat (in Star Gulch mainstem) is located approximately ¼ of a mile downstream from this proposed road, and would not be affected by the slight reduction in riparian vegetation.

Approximately 45 acres of RRs would be treated for fuels reduction as part of a study, and an additional 48 acres of RRs on USFS land would be treated in the Star Basin for hazardous fuels reductions. Reducing brushy species in these RRs would not have any negative affects to the reserves.

Cumulative Effects

The replacement of the undersized culvert located on the mainstem of Star Gulch may require the removal of a few trees to allow equipment to access the culvert site. This would increase the opening around this already exposed site, and allow for additional solar penetration. However, given the small size of the area involved with this activity, it is highly unlikely that there would be a measurable increase in stream temperature in this vicinity.

The USFS has proposed some fuels treatments in the parcel of land managed by them adjacent to Star Gulch, located just upstream of the mouth of the creek. The treatments included some vegetation in the reserve, near the stream channel. Large overstory trees would not be treated, and no reduction in shade levels or potential LWD inputs would occur as a result of the treatments.

The planned Bald Lick sale is not anticipated to have any affects to Riparian Reserves in the Applegate River-McKee Watershed, and planned fuels treatments in Star Gulch RRs would not compromise the function of the RRs.

Cumulatively, the effect of this alternative to Riparian Reserves would be a very slight reduction in the percentage of healthy Riparian Reserves in the Star drainage due to the culvert removal on Ladyug Gulch and new road construction, coupled with a much larger increase (over time) in the percentage of healthy Riparian Reserves in the same basin as a result of the road decommissioning. Overall, the increase would be significant and noticeable at the site level, as 1.5 linear miles of reserves paralleling Ladybug and 1917 Gulches would be allowed to fully recover. Ladybug Gulch is a perennial stream. Should water temperatures in Ladybug Gulch lower as a result of increased riparian vegetation (due to road decommissioning) it could result in a beneficial decrease in summer water temperatures to downstream habitats in the mainstem of Star Gulch as well. This benefit would not be noticeable at the 5th field watershed (Applegate River-McKee Bridge) level.

Riparian areas surrounding non-fish bearing streams on private timber land would likely be reduced over time as stands become harvestable, while other previously harvested areas would continue to slowly recover. No change in riparian areas along fish bearing streams on other private lands (agricultural/urban lands) is expected.

Alternative C
Same as above, but no new road construction, and hence no loss of riparian vegetation in the ~ 280 of the Star tributary reserve.

H. WILDLIFE

This section discusses terrestrial wildlife habitats and the impacts to threatened, endangered and special status wildlife species.

Issues/Concerns

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action. These effects may or may not occur as a result of the proposed action but were of concern to members of the public or ID team specialists.

- Some oppose logging and road construction actions because of perceived negative effects to wildlife. Native wildlife populations and/or species may decline in number as a result of habitat loss, fragmentation, and disturbance due to forest openings resulting from roads, logging and/or fire management activities.

- Some are opposed to cutting any large trees because doing so will impact recruitment of snags and large woody material.

- Vegetation manipulations, regardless of the vegetation type (trees, brush, grasslands) affect wildlife primarily by modifying habitat. The proposed action focuses on the removal of trees in forested stands, and nearly all effects would be to forested habitat.

- Degrading habitats for special status species may result in further population declines and/or trends away from long term viability of the species.

- Logging may degrade suitable habitat for northern spotted owls resulting in perceived adverse effects.

The *No Action Alternative* describes anticipated effects of not implementing an action at this time.

Affected Environment

Wildlife species may have specific preferences with forests of particular age class and structure, which are best described by seral stages (RMP EIS, 3-19). The current distribution of seral stages in upland plant communities (those in which conifers are present) is presented in table 3-30.

Roads result in direct and indirect habitat loss. The road prism itself alters existing habitat to essentially compacted bare ground, a habitat type typically not utilized by most wildlife species in the project area. Other ways roads affect wildlife in addition to habitat removal include: vehicular noise disturbance which affects behavior patterns; increased potential for poaching; microclimatic changes to the habitat adjacent to roads; and physical barriers to movement. Hamann et al 1999 observed that for birds there is a continuum of responses to roads ranging from habituation to abandonment of adjacent habitat. This scenario likely holds true for all species in the project area.

The vegetation condition classes presented in the table below provide habitat for the terrestrial wildlife species found in the proposed Deadman's Palm project area. Acreage of each vegetation condition class and several wildlife species that are representative of the various habitats are also displayed. Approximately 200 vertebrate terrestrial wildlife species are known or suspected (based on known range and habitat associations) to occur in the proposed project area. This includes species that migrate through the area.

Table 3-30 Current Vegetation Condition

Vegetation Condition Class	Approximate Acres in Project Area – BLM Administered Land	Representative Species (from Brown 1985)
Grassland	153	gopher snake, California ground squirrel, western meadowlark
Brushland/Shrubland	404	western fence lizard, wrentit, dusky-footed woodrat
Hardwood/Woodland	2,284	acorn woodpecker, western gray squirrel, common garter snake
Seedling/Sapling	1,761	Cassin's vireo, deer mouse, black-tailed deer
Small Conifer	1,897	Golden-crowned kinglet, porcupine,
Mature Conifer	5,825	northern spotted owl, northern flying squirrel, pileated woodpecker, Siskiyou Mountains salamander

.

Special Status Species are those species that are federally listed as threatened or endangered, proposed or candidates for federal listing as threatened or endangered, or are BLM designated sensitive or assessment species. In addition, prior to April, 2004, the Survey and Manage species program was in place and provided protection measures similar to the current BLM sensitive species program.

Threatened/Endangered Species

Northern spotted owl

The northern spotted owl (Strix occidentalis caurina) is a federally listed threatened species. There are three known spotted owl sites on BLM administered land within the proposed project area. These sites have been monitored at various intensities during the last 13 years (1990-2003). Two of these sites are known to have been occupied within the last l0 years. Portions of the proposed project area are also within the provincial home

range radius (1.3 mile) of eight other known northern spotted owl sites. Three of the eight sites adjacent to the project area are on land managed by the U.S. Forest Service. Surveys have not been conducted on the three Forest Service sites within the last 10 years (Clayton, 2005). As with the sites within the project area, the eight sites on BLM adjacent to the proposed project have been monitored at various intensities during the last 13 years (1990-2003). Four of these sites are known to have been occupied within the last 10 years.

There are approximately 4,542 acres of suitable spotted owl habitat and 1,825 acres of dispersal-only habitat on BLM administered land within the proposed project area. The suitable spotted owl habitat makes up 37 percent of the proposed project area. Suitable habitat includes nesting/roosting and foraging habitat and generally has the following attributes: high degree of canopy closure (approximately 60%+), multilayered canopy, large snags, and coarse woody debris. Dispersal-only habitat provides spotted owls some degree of protection and some foraging opportunity during dispersal and other activities, and generally has the following attributes: conifer stands with an average diameter of approximately 11 inches and 40-60 percent canopy closure.

Northern Spotted Owl Critical Habitat

Approximately 10,315 acres (84 percent) of the proposed project area is in an area designated as critical habitat for the northern spotted owl, within Critical Habitat Unit (CHU) OR-74. CHU OR-74, along with adjacent CHU OR-75, were designated to provide the east-west connection for owl habitat and dispersal along the southern portion of the Klamath Mountains Province (USDI 2003). Thirteen historic spotted owl pair sites are located within CHU OR-74.

The CHU contains 25,231 acres; of which 12,772 acres are suitable habitat. The constituent elements of northern spotted owl critical habitat are nesting, roosting, foraging, and dispersal habitat, as described above. The proposed project area contains 5,657 acres (44 percent) of the 12,772 acres of suitable habitat within the CHU. A small portion of the CHU is on land managed by the U.S. Forest Service. Within the proposed BLM project area, there are approximately 4,196 acres of suitable habitat and 1,461 acres of dispersal habitat within the CHU.

Bald Eagle

The Bald eagle Haliaeetus leucocephalus is a federally listed threatened species. There are several reported sightings of Bald eagles flying over the proposed project area. No nest sites are known within the project area.

Special Status Species

Special Status Species are those species that are federally listed as threatened or endangered, proposed or candidates for federal listing as threatened or endangered, or are BLM designated sensitive or assessment species. The table below lists the special status species that are known or are likely to be present in the proposed project area. Only those species that could reasonably be present in the project area are included – not species that would be considered an “accidental” in the project area.

Table 3-31. Known or Suspected Special Status Species

Common Name	Scientific Name	Status
Northern Spotted Owl	Strix occidentalis caurina	FT - Known
Northern Goshawk	Accipiter gentilis	BS - Suspected
Bald Eagle	Haliaeetus leucocephalus	FT - Known
Lewis' Woodpecker	Melanerpes lewis	BS - Suspected
Flammulated Owl	Otus flammeolus	BS - Suspected
Foothill Yellow-legged Frog	Rana boylii	BA - Suspected
Black Salamander	Aneides flavipunctatus	BA - Suspected
Siskiyou Mountains Salamander	Plethodon stormi	BS - Known
Chase Sideband Snail	Monadenia chaceana	BS – Known
Northwestern Pond Turtle	Clemmys marmorata marmorata	BS – Suspected
Pacific Pallid Bat	Antrozous pallidus	BA - Suspected
Fringed Myotis Bat	Myotis thysanodes	BA - Suspected
Pacific Fisher	Martes pennanti pacifica	FC - Suspected

FT = Federal threatened; FC = Federal Candidate; BS = Bureau Sensitive; BA = Bureau Assessment

Generally, Bureau Sensitive Species have restricted ranges and have natural or human-caused threats to survival (USDI 1992). Where BLM actions could have a significant effect on their range-wide status, management direction is to protect and manage the species and their habitat so that the Bureau actions will not contribute to the need to list the species as federally threatened or endangered. Surveys may be conducted for Bureau Sensitive and Assessment Species, but are not required. Bureau Assessment species are species that are of concern and may need protection or mitigation in BLM activities. However, the level of concern for these species is generally less than for the Bureau Sensitive species due to less threats to the species or they have larger ranges.

Survey and Manage Species

The Northwest Forest Plan provided extra protection for some species through Survey and Manage (S&M) standards and guidelines (S&Gs). The S&Gs generally required that surveys be conducted for certain species prior to ground-disturbing activities and that located sites be protected. In March, 2004 the Northwest Forest Plan was amended, and the S&M Mitigation Standards and Guidelines were eliminated. Prior to this, the proposed project area was surveyed for Great gray owls. Results of those surveys follow.

Great gray owl

Surveys in 1997 resulted in finding one occupied Great gray owl nest site in the proposed project area. Subsequent opportunistic surveys of the historic nest site were conducted in 1998 through 2004 and the Great gray owl was not found to be present. In 2002, a Great horned owl used the historic nest. Surveys in 2003 and 2004 resulted in finding Great gray owl feathers or hearing a Great gray owl vocal response in the nest stand, but the historic nest was not occupied by either species.

Siskiyou Mountains Salamander

The Siskiyou Mountains Salamander Plethodon stormi is a Bureau Sensitive species known to occur on numerous sites within the proposed project area. Known site locations include historically known sites and recent incidental sightings which resulted from mollusc surveys completed in the project area.

Recently, a Conservation Strategy (CS) for the Siskiyou Mountains salamander has been developed (Olson, 1994). The Draft Conservation Strategy includes protection for some but not all of the known sites and

associated habitat in the proposed project area. The draft CS recommends protection of strategic areas of suitable habitat containing known sites.

Terrestrial Molluscs
NWFP protocol surveys were conducted in suitable habitat within the proposed project area for five Special Status terrestrial mollusc species which have been documented on the Ashland RA. These species are, Monadenia chaceana, Chase sideband snail; Monadenia fidelis celeuthia, Travelling sideband snail; Deroceras hesperium, Evening fieldslug; Helminthoglypta hertleini, Oregon shoulderband snail; and Vespericola sierranus, Siskiyou hesperian snail.

Surveys of the proposed project area resulted in finding a snail species; Chase Sideband, Monadenia chaceana, in two locations. This species is listed as a Bureau Sensitive species. Mollusc surveys completed throughout different areas of the Ashland Resource Area have found that this species is rare on the Ashland Resource Area and is patchily distributed. Where it does occur, it is likely contained within small populations with small spatial extent. (LGL Northwest, 2004).

Environmental Consequences

Alternative A - No Action

Because no projects are planned under this alternative, the effects to wildlife that are discussed in the action alternatives would not immediately occur. However, habitat conditions in the proposed project area are dynamic and various natural processes will continue to change the character of the habitat over time. For example, drought and overstocking have stressed many of the large remnant trees in the project area, particularly pine, and these trees will continue to be lost. As snags, these trees would continue to benefit wildlife, but data indicate that snags are present in adequate numbers across the landscape to meet wildlife needs – there are up to 100 snags per acre in some areas (See Appendix – Silviculture Prescription). The larger live trees add an element of diversity to the landscape and provide adequate tree size for nesting, roosting, foraging, and denning by some of the large wildlife species in the project area, e.g.; red-tailed hawk, porcupine, and black bear.

Encroachment of shrubs and conifers into the oak-woodland savannah habitat is prevalent in the proposed project area and the encroachment will continue without some type of intervention/disturbance, whether human-caused or natural, e.g., fire. The larger oaks, which are important to some wildlife species for some of their life functions (e.g., nesting and foraging), are experiencing die-off as a result of the encroachment of shrubs and conifers. As the encroachment continues, more large oaks will die and there will be less food (acorns) for deer, squirrels, woodpeckers, etc. Unfortunately, if fire is the disturbance agent, fuel loads are so high due to tree and shrub encroachment that many of the acorn-producing oaks would be killed.

Most of the shrubland habitat is fire-dependent, and due to the lack of fire (except for that portion of the proposed project area in the 1987 Star Gulch Fire) much of it is in a decadent state. Without some type of intervention/disturbance to set back succession, early seral vegetation will continue to be deficient in the shrublands.

Alternative B

Direct/Indirect Effects

General

An overview of the effects of timber management on wildlife/wildlife habitat is provided in Chapter 4, pages 51-83, of the BLM Medford District Resource Management Plan (RMP). Additional site-specific impacts are addressed in the following discussion.

In order to accomplish the timber management objectives in the proposed project area, existing wildlife habitat conditions would be modified on approximately 3,991 acres of commercial conifer forest stands. Due to the variety of stand conditions in the proposed project area, numerous prescriptions/marking guidelines have been developed. Prescriptions have been developed to maintain the component elements of existing spotted owl nesting, roosting, foraging, and dispersal habitat within the proposed project area. With the exception of the 16 acres of Douglas fir regeneration prescription, all prescriptions have the stated objective of improving existing tree/stand vigor and growth. Conifer stands that have been selected for treatment are primarily in the small conifer and mature/large conifer vegetation condition classes.

All prescribed treatments would reduce canopy closure, remove some snags, and reduce understory vegetation where it currently exists. It is inherent with forest disturbance, whether natural or anthropogenic, that some species of wildlife are winners and others are losers. The habitat components described above (canopy closure, vertical structure, and snags) are important to a variety of wildlife species associated with the conifer stands proposed for treatment. No adverse effects to northern spotted owl habitat are expected as the late seral emphasis prescriptions retain necessary canopy closure and other habitat elements needed for spotted owls.

The winner/loser scenario is played out by innumerable species throughout all forested habitats when there is disturbance. As practical examples, Janes (1988) and Hayes et al (2003) found that thinning in mixed conifer and Douglas-fir forests (respectively) benefited some bird species and was detrimental to others. Janes noted population increases in terrestrial insectivores and declines in bark and foliage gleaners. The declines were attributed to decreases in canopy foliage, stem density, and snags, and the increases were attributed to the presence of more woody debris on the forest floor. Similarly, Hayes et al (2003) found that detections of 9 breeding bird species decreased and detections of 8 species increased relative to controls following thinning in young Douglas fir stands.

Although some species in the project area would be adversely affected by changes in the habitat conditions described above, these impacts would be mitigated on both landscape and project scales by land use allocations and management actions adopted in the Medford District RMP, and by measures incorporated in the design of the project.

Land Use Allocation Mitigation:

(1) Late Successional Reserves - The large LSR network incorporated in the Medford District RMP mitigates the impacts of local projects by providing for late-successional forest habitat on a landscape scale. LSR forest structure is characterized by multispecies and multilayered stands; moderate to high canopy closure; moderate to high accumulations of down logs and snags; and moderate to high numbers of trees with physical imperfections, e.g., cavities and broken tops (NWFP ROD pg. B-5). Also scattered about the project area are three smaller LSRs (100 acre spotted owl activity centers) that will continue to provide the habitat characteristics described above.

(2) Riparian Reserves – Approximately 2,091 acres of the planning area are in riparian reserves, and approximately 103 acres of these reserves are planned for noncommercial thinning. The remaining 1,988 acres of riparian reserves that would remain untreated would continue to provide important habitat elements to the project area.

<u>Project Design Mitigation</u>

Siskiyou Mountains Salamander

Recently, a Conservation Strategy (CS) for the Siskiyou Mountains Salamander was developed (Olson, 2004). The Draft Conservation Strategy includes protection for some but not all of the known sites and associated habitat in the proposed project area. The draft CS mapping recommends protection of well distributed, strategic areas of optimal habitat containing known sites. The Deadman's Palm project design includes no-treatment for all of the areas recommended for salamander habitat protection in the CS.

Approximately 289 acres of high quality, occupied Siskiyou Mountains salamander habitat have been delineated and would be designated as strategic no-treatment areas. This protection would ensure that the rock substrate would remain intact, and that microclimatic conditions would not be altered. Approximately 70 percent of the potential salamander habitat within the project is protected by various no-treatment designations. Of the remaining 30 percent of potential habitat outside strategic no treatment areas, 22 percent is planned for helicopter yarding, which would be expected to have minimal ground disturbance.

Snag Retention

Snags are not marked for removal; therefore, the only snags that would be affected are those that would be cut for safety concerns. Snags in adequate numbers to support 100 percent of the current snag-dependent species in the project area would likely remain on the landscape.

Late Seral Emphasis Prescriptions

Under Alternatives B and C, prescriptions have been developed that will retain the component elements of existing owl habitat within the proposed project area. The late seral emphasis 60% forest prescription is designed to retain an average of 60 percent canopy closure and other structural elements (snags, down wood, understory species) needed for spotted owl habitat The prescription designed for late seral emphasis 40% will retain an average of 40 percent canopy closure and will remain suitable for spotted owl dispersal habitat. In addition, prescriptions are designed to provide a high level of structural and tree species diversity within forest stands. Coarse woody debris and snags will be maintained. Long-term benefits to forest health can be expected that will improve owl habitat.

Within the proposed project area, the distribution and abundance of species would change. However, with the mitigation described above, adequate habitat would remain in the project area to support the full complement of species now present.

Priority Species

Because individual northern spotted owls could potentially be adversely affected by the proposed timber harvest activities, and critical habitat would be affected, but not adversely, formal and informal consultation with the U.S. Fish and Wildlife Service is required. The consultation was completed through a programmatic consultation with the Service for timber sales and other projects in the Rogue River/South Coast basin that are to be sold (timber sales) or implemented (other projects) in fiscal years 2004 through 2008. The biological opinion concluded that the programs consulted on would not jeopardize the continued existence of the northern spotted owl, or destroy or adversely modify critical habitat for the northern spotted owl. The Biological Assessment **(**BA**)** for Rogue River/South Coast FY 04/08 Timber Sale and Other Projects, and the Biological Opinion (BO) (Log # 1-15-03-F-511) issued by the Service are available for review at the Medford District Office. The mandatory terms and conditions of the BO require the implementation of specific project design criteria, such as seasonal and distance restrictions for certain operations. These criteria would be incorporated in the design of the Deadman's Palm project (see PDFs). Reference is made to the BA and BO in the discussion that follows.

Threatened/Endangered Species

The northern spotted owl is listed as a threatened species under the auspices of the Endangered Species Act of 1973, as amended (Act). There are approximately 4,542 acres of suitable spotted owl habitat, and 1,825 acres of dispersal-only habitat in the proposed project area. Under Alternatives B and C, late seral emphasis prescriptions have been developed that will retain the component elements of existing owl habitat within the proposed project area. The late seral emphasis 60% forest prescription is designed to retain an average of 60 percent canopy closure and other structural elements (snags, down wood, understory species) needed for spotted owl habitat The prescription designed for late seral emphasis 40% will retain an average of 40 percent canopy closure and will remain suitable for spotted owl dispersal habitat. In addition, prescriptions are designed to provide a high level of structural and tree species diversity within forest stands. Coarse woody debris and snags will be maintained. Long-term benefits to forest health can be expected that will improve owl habitat.

It is estimated that Alternative B would maintain existing owl habitat within the proposed project area.

Table 3-32

Alternative B – Estimated Effects on Spotted Owl Habitat Within the Proposed Project Area			
Suitable Habitat (Acres)		**Dispersal-only Habitat**	
Pre-project	Post-project	Pre-project	Post-project
4,542	4,541	1,825	1,824

The Deadman's Palm project would take place within portions of the median home range radius (1.3 miles) of 11 historic northern spotted owls sites – 3 sites are within the project area, and 8 sites are adjacent to the project area. The three known spotted owl sites on BLM administered land within the proposed project area have been monitored at various intensities during the last 13 years (1990-2003). Two of these sites are known to have been occupied within the last l0 years. Portions of the proposed project area are also within the provincial home range radius (1.3 mile) of eight other known northern spotted owl sites. Three of the eight sites adjacent to the project area are on land managed by the U.S. Forest Service. Surveys have not been conducted on the three Forest Service sites within the last 10 years (Clayton, 2005). As with the sites within the project area, the eight sites on BLM adjacent to the proposed project have been monitored at various intensities during the last 13 years (1990-2003). Four of these sites are known to have been occupied within the last 10 years. The ultimate fate of the owls, as a result of the proposed habitat modification, is unknown due to the variability in individual owl response to habitat modification. Some mitigation is provided for the spotted owl sites discussed above by the Standards and Guidelines of the NWFP. These sites were found prior to January 1994, and approximately 100 acres of the best habitat are protected at these sites. These reserves are intended to preserve an intensively used portion of the breeding season home range (USFS/USDI 1994).

The Service evaluated the impact of habitat removal, including the proposed action, in their biological opinion. They concluded that the programs consulted on would not jeopardize the continued existence of the northern spotted owl, and that the AMA and Matrix land allocations in the action area (Medford BLM, Rogue/Siskiyou NF) would continue to provide sufficient suitable habitat for spotted owls for at least the next several decades. They also noted that the overall impact would be tempered by the acres that would be downgraded (rather than removed) and that could return to suitable habitat in approximately 20 years.

In the biological opinion, the Service also evaluated the Applegate watershed, which includes the project area, with respect to its function in providing connectivity between LSRs in light of the harvest anticipated in the watershed. They concluded that the remaining habitat within the watershed would continue to provide for east-

west spotted owl movement through the watershed to connect the Coast and Cascade Range spotted owl populations. This connection is important for genetic interchange.

Several reports have been published recently concerning the status of the northern spotted owl – Courtney et al. (2004); Anthony et al. (2004); USFWS, November 2004; and Lint, Technical Coordinator, (2005). Anthony et al. (2004) found greater than expected adult owl population declines in Washington and northern Oregon, but also found the populations in southern Oregon and northern California to be more stable. The reasons for both the population decline in one portion of the range of the owl and the good demographic performance in another portion are unknown. Courtney et al. (2004) noted that current habitat loss didn't appear to be a factor since areas with good demographic performance had the highest level of timber harvest, and the areas with greatest declines had the lowest rates of harvest. This indicates that there are likely a number of interacting factors at play in the declines. Courtney et al (2004) also pointed out that there could be lag effects of previous timber harvest, and that habitat loss from wildfires, and competition from barred owls are current threats. USFWS (November 2004) found that even though the spotted owl population was declining in some areas and there were some additional threats the scientific data did not support changing the spotted owl status from threatened to endangered. USFWS (November 2004) also did not identify the need to change the existing conservation strategy, i.e., NWFP

Northern Spotted Owl Critical Habitat

Approximately 10,315 acres (84 percent) of the proposed project area is in an area designated as critical habitat for the northern spotted owl, within Critical Habitat Unit (CHU) OR-74. CHU OR-74, along with adjacent CHU OR-75, were designated to provide the east-west connection for owl habitat and dispersal along the southern portion of the Klamath Mountains Province (USDI 2003). Thirteen historic spotted owl pair sites are located within CHU OR-74.

The Service in its Biological Opinion recognized that spotted owl connectivity would be provided through CHUs, supplemented by other provisions, such as leave tree guidelines, 100-acre spotted owl cores, riparian reserves, and the 15 percent late-successional/old-growth retention guideline. The Service came to the conclusion in the Biological Opinion that despite forest management planned in the matrix, remaining forests would adequately provide for east-west dispersal throughout the Applegate Watershed. The rule designating spotted owl critical habitat designated the physiographic province as the scale for analysis to determine if range-wide conservation goals were being met (USDI FWS 2003). In the Biological Opinion, the Service analyzed the projected impacts to CHU OR-74 in this context and concluded the proposed action would not preclude the intended function of the CHU (USDI FWS 2003).

The CHU contains 25,231 acres; of which 12,772 acres are suitable habitat. The constituent elements of northern spotted owl critical habitat are nesting, roosting, foraging, and dispersal habitat. The proposed project area contains 5,657 acres (44 percent) of the 12,772 acres which are suitable habitat within the CHU. A small portion of the CHU is on land managed by the U.S. Forest Service. Within the proposed BLM project area, there are approximately 4,196 acres of suitable habitat and 1,461 acres of dispersal habitat within the CHU.
As with the impacts to the species, the Service findings indicate that the impacts of the proposed project to designated critical habitat would not be deemed significant in the context of spotted owl recovery which is a goal of the NWFP.

Table 3-33

Alternative B – Estimated Effects on Spotted Owl Habitat Within Critical Habitat Unit OR-74			
Suitable Habitat (Acres)		**Dispersal-only Habitat**	
Pre-project	Post-project	Pre-project	Post-project
4,196	4,195	1,461	1,461

American bald eagle

Bald eagles are listed as a Federally threatened species. Bald eagles have been observed flying over the Star Gulch area, but no nest sites are known in the proposed project area. Eagles prey on fish, waterfowl, small mammals (rabbits, etc.), and carrion. Eagles nest in trees that are the larger, dominant or co-dominant trees in the forest stand. These trees are usually components of old growth or older second growth forests. Nests are located near streams or lakes, such as the nearby Applegate River, which provide a prey base of fish and waterfowl. The forest treatments planned for the proposed project, will retain larger, dominant trees that are suitable for eagle nesting.

Special Status Species

Four Special Status Species (SSS) (Federally Threatened and Bureau Sensitive Species) are known to be present in the proposed project area. These species are Northern spotted owl, Bald eagle (both addressed above), Siskiyou Mountains Salamander, and Chase Sideband Snail.

Siskiyou Mountains Salamander

The project area was not surveyed for salamanders due to the reclassification of the salamander within the Survey and Manage program as a result of the 2001 Annual Species Review (USDI/USDA 2001). The reclassification eliminated the survey requirement for Siskiyou Mountains Salamanders. The rationale for discontinuing the survey requirement was that enough known sites were already protected to ensure persistence of the species in the northern portion of its range. Numerous Siskiyou Mountains Salamander sites were found during surveys in the project area for mollusc species. There are also several historically known sites within the project area.

Recently, a Conservation Strategy (CS) for the Siskiyou Mountains Salamander was developed (Olson, 2004). The Draft Conservation Strategy includes protection for some but not all of the known sites and associated habitat in the proposed project area. The draft CS mapping recommends protection of strategic areas of suitable habitat containing known sites. The Deadman's Palm project design includes no-treatment for the areas recommended for salamander habitat protection in the CS.

Approximately 289 acres of occupied habitat have been delineated and would be designated as strategic no-treatment areas. This protection would ensure that the substrate would remain intact, and that microclimatic conditions would not be altered. Approximately 70 percent of the potential salamander habitat within the project is protected by other no-treatment designations. Of the remaining 30 percent of potential habitat outside strategic polygons, 8 percent is planned for tractor or cable yarding, which would be ground disturbing, as opposed to helicopter yarding, which would be expected to have much less ground disturbance.

Chase Sideband Snail

Surveys of the proposed project area resulted in finding Chase Sideband snails in two locations. This species is listed as a Bureau Sensitive species. Mollusc surveys completed throughout different areas of the Ashland Resource Area have found that this species is rare on the Ashland Resource Area and is patchily distributed. Where it does occur, it is likely contained within small populations with small spatial extent. (LGL Northwest,

2004). The two known sites will receive no-treatment buffers designed to protect microsite conditions including shade and undisturbed forest floor.

Suspected Special Status Species

Nine SSS currently are not known to be present in the proposed project area, but they are likely to be present based on known range and habitat associations. These species are Northern goshawk, Lewis' woodpecker, Flammulated owl, Foothill yellow-legged frog, Black salamander, Northwestern pond turtle, Pacific pallid bat, Fringed myotis, and Pacific fisher. No surveys for these species have been conducted in the proposed project area, none are required. Project design retains habitat elements that provide for these species needs.

Northern Goshawk

The proposed action would modify approximately 2,080 acres of habitat considered to be suitable for the Northern goshawk. Adverse effects to goshawk habitat would be mitigated in Alternatives B and C due to prescription design in late-successional forest stands to retain canopy closure and component elements of suitable spotted owl habitat. Some short-term adverse effects to goshawk nesting habitat may result from the treatments, but long-term benefits to forest health can be expected that will improve goshawk habitat.

The Standards and Guidelines of the NWFP accommodate the habitat requirements of the Northern goshawk within the NWFP area and provides for persistence of the species at that scale (BLM 1997). The proposed project conforms to the Standards and Guidelines of the NWFP; therefore, the project would not lead to listing the species as threatened or endangered which complies with the BLM Special Status Species policy.

Lewis' Woodpecker

Flocks of Lewis' woodpeckers are often seen moving through the Applegate Valley in migration during the fall. Some nesting may occur but is not common in the Applegate area. In Southwest Oregon, Lewis' woodpeckers are primarily a winter population (Rogue Valley Audubon Society 2001); however, some limited nesting may occur. Lewis' woodpeckers are associated with open oak-pine woodland habitat. The treatments prescribed for the commercial portions of the project are not likely to adversely affect this species since the treatments normally target the dense conifer stands. Some of the pine restoration treatments could potentially benefit this species in the long-term by promoting development of the historic open pine forests.

Flammulated Owl

The flammulated owl is a Bureau Assessment species that is occasionally observed throughout SW Oregon. Primary habitat is conifer forest intermixed with oak-woodland and grassland in the Mixed Conifer Zone. This species nests in cavities created by other bird species (pileated woodpecker, flicker) in large pine trees and snags. Prescriptions call for snag and pine retention which will mitigate impacts to this species (USDI/USFS, 2004).

Foothill Yellow-legged Frog

Habitat for these frogs is low-gradient streams with bedrock and gravel substrates, along with the adjacent grass/sedge banks (Corkran and Thoms 1996). Their elevation range includes elevations up to 1,800 ft., which would fall within the lower elevations of Star Gulch and small tributaries in the project area. At the lower reach of the stream, gradients are lower and may be suitable habitat. Stream surveys in Star Gulch for hydrology and fisheries have not sighted this species. The required stream buffers would protect the aquatic and streamside habitat of this species.

Black Salamander

Black salamanders have been found along the Little Applegate and Lower Applegate Rivers. Star Gulch is a tributary to the Applegate River and is in the general vicinity of both rivers. Black salamanders can be found in a variety of habitat types, but they are most commonly found in moist conditions (Nussbaum et.al. 1983; Nauman and Olson 2004). In the project area, moist conditions are generally found year round only in riparian zones. The riparian buffers in the project area would mitigate potential impacts to this species.

Northwestern Pond Turtle

The Little Applegate Watershed Analysis (1995) indicates that pond turtles are present in the Little Applegate River. Star Gulch is a tributary to the Applegate River and is in the general vicinity of the both rivers. The riparian buffers in the project area would mitigate potential impacts to this species.

Pacific Pallid Bat

Preferred habitat is canyons and other rocky areas near water sources in arid areas. This species is known to roost extensively in large snags on ridgetops in the Applegate Valley. There has been documented foraging and roosting in large snags in nearby areas. This species probably uses snags and rock outcrops throughout the proposed project area. Prescriptions call for snag retention, which will mitigate impacts to this species.

Fringed Myotis

Fringed myotis are associated with a variety of habitats including conifer forests and oak-woodlands. They roost in mines, caves, abandoned buildings, and crevices and cavities in large trees. Within the proposed project area there is one known mine site, which will be protected from changes to microsite conditions with a 250 no-treatment buffer as required in the RMP. Some trees that will be harvested could be used by bats as roost sites. Riparian and other reserves and the snag retention guidelines would mitigate this potential impact (USDI 1994).

Pacific Fisher

There have been several observations of fisher in the Middle Applegate River watershed.
USFWS published a finding in April 2004 that a petition to list fishers as a "Federally Threatened" species was warranted but precluded by higher priority listing actions. The species remains a USFWS candidate species (USFWS April 8, 2004, 18770). There is no management strategy available at this time. They remain Bureau Sensitive on the BLM special status species list.

Preferred habitat is dense conifer forests in the mixed conifer and white fir zones. Fishers have been found to be associated with late successional forest stands. Important features include canopy closure and denning sites in snags and downed wood**.** Connectivity of late-successional forests is important. Fisher have been found to avoid non-forested areas, so that they are affected by forest fragmentation (Zielinski, 1994). Adverse impacts are expected to be mitigated through retention of no-treatment riparian reserves and owl nest cores, and retention of suitable spotted owl habitat in the project, which will retain 60 percent canopy closure, snags, and down woody debris in 4,542 acres of late-successional forests.

Survey and Manage Species

Although no longer required, protocol surveys for great gray owls were conducted in the project prior to the Survey and Manage Standards and Guidelines being eliminated. Results follow.

Great gray owl

Surveys in 1997 resulted in finding one occupied Great gray owl nest site in the proposed project area. Subsequent opportunistic surveys of the historic nest site were conducted in 1998 through 2004 and the Great gray owl was not found to be present. In 2002, a Great horned owl used the historic nest. Surveys in 2003 and 2004 resulted in finding Great gray owl feathers or hearing a Great gray owl vocal response in the nest stand, but the historic nest was not occupied by either species. The historic nest tree is within a forest stand along a riparian reserve. The riparian reserve area will not be treated. Outside of the riparian area, it is the biologist's professional judgment that the owl's habitat would be improved through a density thinning, which is planned in surrounding areas.

Oak-Woodland and Shrubland Treatment

Direct/Indirect Effects

General

Fuel/hazard reduction treatments are planned on approximately 441 acres of shrubland and oak-woodland. The treatments are designed to reduce fire hazard and restore oak-woodland habitat by reducing the density of both shrubs and hardwoods. As with the timber management portion of the proposed project, the fuel reduction treatments would adversely affect some species and benefit others.

Effects on Birds

There are approximately 2,677 acres of oak-woodland/shrubland habitat within the project area. Many species of birds use the oak woodlands and chaparral as habitat for nesting, feeding and hiding cover. Approximately 441 acres are planned for treatment. This total represents approximately 16 percent of the existing habitat for these species within the project area. As a project design feature, 10 percent of the units are reserved in refugia of 1-3 acres. Given the amount of habitat that would remain unaltered (approximately 84 percent), the impact to birds would be minimal. If operations take place during the nesting season, birds could be displaced and production for one season could be curtailed.

Threatened/Endangered Species

The fuel treatments would not remove/or downgrade suitable spotted owl habitat, or any of the constituent elements of critical habitat. Also, the oak woodland and shrub treatments would not take place proximate to known northern spotted owl sites; therefore, disturbance during the nesting season would not be an issue. Therefore, northern spotted owls would not be adversely affected by the proposed project.

Special Status Species

Two special status species are associated with habitat to be treated in the non-commercial units; Lewis' woodpecker, and the Flammulated owl. Opportunistic observations have not detected these species in the project area. Lewis' woodpeckers are associated with open oak-pine woodland habitat. The treatments prescribed for the oak-woodlands would potentially improve habitat conditions for this species in the long-term by improving acorn production. The Flammulated owl nests in cavities created by other bird species. Prescriptions call for snag retention, which will mitigate impacts to this species.

Road Construction

Under Alternative B, 1.6 miles of new road would be constructed. The proposed new roads traverse a variety of habitat types, and would remove approximately 10 acres of habitat. Road construction would result in a loss of 1.3 acres of suitable spotted owl habitat and 1.3 acres of owl dispersal habitat. This is not expected to result in the loss of the function of these stands as owl habitat types. In relation to the size of the proposed project area, the loss of this amount of habitat would be inconsequential. However, there are other effects of roads to wildlife.

There are a number of ways roads affect wildlife in addition to habitat removal. Some of the more common ones are vehicular noise disturbance which affects behavior patterns, increased potential for poaching, increased potential for over hunting along roads due to easy access, and microclimatic changes to the habitat adjacent to roads.

The new construction would be blocked or barricaded to vehicular traffic (i.e., automobile and truck) after construction as a mitigation measure. However, barricades are seldom 100 percent effective in eliminating autos and trucks, and they don't stop any of the OHV-type of vehicle use. Consequently, even with barricades in place the negative impacts of noise disturbance, increased poaching potential, and the potential for over hunting remain. However, these impacts would be reduced to some extent because many vehicles would be deterred by the barricades.

Barricades, however, don't mitigate the edge effects and microclimatic changes that roads produce. Various studies (e.g., Ortega and Capen 1999; Marsh and Beckman 2004) show that the negative impacts of roads to wildlife habitat are not limited to the road prism - there is a zone of influence that extends into the adjacent habitat. For example, Marsh and Beckman (2004) found that some terrestrial salamanders decreased in abundance up to 80 meters from the edge of a forest road due to soil dessication from the edge effects. Ortega and Capen (1999) found that ovenbird (a forest-interior species) nesting density was reduced within 150 meters of forest roads. This study suggests that even narrow forest roads fragment habitat and exert negative effects on the quality of habitat for forest-interior species.

While roads are generally not good for wildlife, some species take advantage of the edge created by roads. These are the opportunistic habitat generalists that thrive on human disturbance of natural landscapes, e.g., some rodent species, brown-headed cowbirds, and some sparrows. Generally, these species, are not threatened in any way, and do not necessarily need additional habitat.

In summary, although decommissioning and barricading/gating provide mitigation for some of the negative impacts of roads to wildlife, there are long-term negative impacts of roads that aren't mitigated by these measures, e.g., edge effects and microclimatic changes that degrade habitat conditions in adjacent habitat for some species. However, the small amount of road to be constructed would have minimal impact to species and habitat. Because of the amount of road decommissioning vs road construction, there will be a net decrease in open roads. Therefore, the effects of disturbance to wildlife from vehicles traveling on roads will be reduced

Decommissioning

Under Alternatives B and C, 4.3 miles of existing road would be decommissioned. This action would be beneficial to wildlife species through less human disturbance as described above. The Ladybug Gulch road, which is planned for decommissioning, follows a riparian corridor. Closure of this road would greatly benefit wildlife species which use riparian habitat. Species richness and abundance is typically associated with riparian habitat.

Alternative C - No New Road Construction

Direct/Indirect/Cumulative Effects

Under Alternative C, no new road construction would occur. This would reduce direct habitat loss by about 10 acres, and the other effects of roads to wildlife would also be reduced accordingly. Suitable and dispersal spotted owl habitat would not be reduced under this alternative. Timber harvest and other treatments would be somewhat less; therefore the effects from those operations would be similar or slightly reduced from those addressed in Alternative B.

Cumulative Effects

Cumulative effects are defined as the collective environmental impact of all past, present, and reasonably foreseeable future actions in the affected area. For this analysis the affected area is defined as the 5th Field Applegate-Star/Boaz Watershed. The proposed project is located in a portion of this watershed. Watershed analysis was conducted for this watershed, and data collected for watershed analyses facilitates cumulative effects analysis (RMP ROD pg.96). Also, various animals including spotted owls tend to concentrate their activities in watersheds where they breed (Irwin et al 2004). Due to these factors, the 5th field watershed was chosen as an appropriate scale for cumulative effects analysis.

The proposed project implements the objectives of the NWFP. A primary focus of the NWFP is conservation and recovery of the northern spotted owl; therefore, the cumulative effects analysis focuses on spotted owl habitat.

Northern Spotted Owl

Until implementation of the NWFP began in 1994, timber harvest on both federal and private land in the analysis area focused on the harvest of large-diameter trees due to their economic value. Since 1995 the focus on federally-managed land in the analysis area has been thinning/density management in overstocked stands to improve forest health and reduce fire hazard. An exception to these goals is in regeneration harvest units where the goal is to initiate a new stand of trees.

In the Applegate-Star/Boaz watershed, 87 percent of land is federally owned; 84 percent by BLM and 3 percent by Forest Service. It is estimated from watershed analysis that in 1947 there were approximately 8,312 acres of commercial-sized conifer timber stands on both federal and private land in the analysis area. Approximately 7,040 acres are thought to have provided suitable spotted owl habitat. This estimate is based on interpretation of descriptive text by forest surveyors who subjectively described existing stand conditions.
The suitable spotted owl habitat baseline in the analysis area at the time the Applegate-Star/Boaz Watershed Analysis was written in 1998 is estimated to have been approximately 5,426 acres on federal land. The 1998 baseline acreage accounts for habitat lost through timber harvest and natural causes and for suitable habitat ingrowth through succession from 1947 to 1998 (USDI BLM 1998). The baseline data assume that all functional suitable habitat was removed from private land by that time, which is not an unreasonable assumption given the harvesting history in the area.

Since 1998, the amount of suitable owl habitat in the analysis area has not changed due to timber harvest or fire. The Deadman's Palm project is not expected to remove or downgrade any suitable spotted owl nesting, roosting, foraging or dispersal habitat. Short-term adverse effects may occur, but prescriptions are designed to retain required canopy closures and habitat components so as to retain habitat functions.

Upcoming projects in the analysis area, but outside of the area of the Deadman Project, have been planned through fiscal year 2007. The entire Applegate-Star/Boaz watershed analysis area will have been reviewed for forest health projects by the year 2007. On-the-ground actions for these projects could occur up through the year 2010. For purposes of this cumulative effects analysis, 2010 is considered the "reasonably foreseeable future." Through this period, it is estimated that timber harvest in other project areas would remove or

downgrade (to dispersal habitat) an additional 1,079 acres of suitable spotted owl habitat. This estimate is based on the amount of suitable spotted owl habitat in the proposed project areas and the percentage of suitable spotted owl habitat that has been treated in similar projects. Therefore, at the end of this period there would be approximately 4,347 acres of suitable spotted owl habitat in the analysis area. This value does not account for development of suitable habitat during that period because a means to predict ingrowth of suitable habitat is not available. However, the amount of unsuitable habitat developing into suitable habitat in a 5-year period would be expected to be minimal.

Overall, this represents approximately a 38 percent loss of suitable spotted owl habitat in the analysis area due to past, present, and reasonably foreseeable actions. Once again, the Deadman's Palm project is not downgrading or removing spotted owl habitat. Habitat loss is from other projects within the larger analysis area. The Fish and Wildlife Service in their BO (Log # 1-15-03-F-511) for timber sales and other projects in the Rogue River/South Coast basins concluded that the timber sales and other projects from 2004 through 2008 are not likely to jeopardize the northern spotted owl or destroy or adversely modify critical habitat for the northern spotted owl. (Note: Due to project rescheduling the projects scheduled out to 2009 in the analysis area were included in the BO analysis of effects even though the BO was for 2004-2008 projects.) Their analysis was on a larger scale, but their environmental baseline, cumulative effects, and the effects of the proposed actions included the Applegate-Star/Boaz watershed, the Deadman's Palm Project, and the "reasonably foreseeable future" projects discussed above. The Service's findings indicate that habitat removal and downgrading in the analysis area would not preclude the conservation and recovery of the spotted owl which is a primary goal of the NWFP. It should be noted that the analysis that the Service used for analyzing effects to CHU OR-74, included a more aggressive harvest prescription for the Deadman's Palm project than that proposed here.

Connectivity and Fifteen Percent Retention

The Northwest Forest Plan provides direction to retain fifteen percent of the federal forest capable lands in each 5th field watershed in late-successional forest conditions. The Applegate-Star/Boaz watershed analysis team identified areas to be included as 15 percent late-successional retention for the Applegate-Star Subwatershed and the Forest Service did the same for the Palmer and Beaver subwatersheds(USDI, Applegate-Star/Boaz Watershed Analysis, Appendix D, 1998). The analysis indicated that the total federal forest land in the Applegate-Star Subwatershed amounts to 10,266 acres. Fifteen percent of this equals 1,540 acres. Acreage in the designated old growth/mature stands totaled 1,619 acres or 15.8 percent of the federal forest land.

Late-successional habitat amounts to about 9 percent in Palmer Subwatershed and 14.9 percent in Beaver Subwatershed. This habitat includes the spotted owl core areas. Other reserves, such as spotted and great gray owl nest cores, and some riparian reserves dispersed throughout the Matrix contribute late-successional habitat toward the fifteen percent Standard and Guideline. Late-successional stands occurring in existing reserves in the Applegate-Star/Boaz watershed are well distributed throughout the planned harvest areas.

Under Alternatives B and C, prescriptions have been developed that will retain the component elements of existing late-successional stands within the proposed project area. The late seral emphasis 60% prescription is designed to maintain nesting, roosting and foraging habitat for northern spotted owls and retain an average of 60 percent canopy closure. The late seral emphasis 40% prescription is designed to provided dispersal owl habitat and retain an average of 40 percent canopy closure. In addition, prescriptions are designed to provide a high level of structural and tree species diversity within forest stands. Coarse woody debris and snags will be maintained. As a result of these prescriptions, there will be no loss of late-successional stands in the project area.

Non-Commercial Treatments

The non-commercial stands to be treated can generally be characterized as overstocked and decadent. Prior to the initiation of intensive fire suppression fires were common in the shrubland and oak-woodland plant communities. As a result, early seral vegetation was abundant in the shrublands, and the fires kept shrubs and conifers from encroaching into the oak-woodlands. The goals of the treatments for the non-commercial lands, besides reducing fire hazard, are to provide a greater abundance of early seral vegetation, and remove competing vegetation in the oak-woodlands. The prescribed treatments would improve habitat conditions for those species that prefer early seral habitat, and for those species that feed on acorns. On the other hand, habitat would be reduced for those species that prefer dense, mature to over-mature shrubland conditions (e.g., wrentit and blue-gray gnatcatcher).

Based on data in the Star-Boaz Watershed Analysis (USDI BLM 1998), there are approximately 4,575 acres of oak-woodland/shrubland habitat in the analysis area. Treatment of oak/woodland/shrubland habitat was uncommon until implementation of the NWFP. Since 1994 there is one current project named Bobar which is partially in the analysis area. Approximately 400 acres of this habitat is planned for treatment in the analysis area.

In the Deadman's Palm project an 441 acres will be treated. In the "reasonably foreseeable future"; i.e., from the present until 2009, it is estimated that an additional 150 acres of BLM-managed non-commercial land will be treated in the analysis area. This estimate is based on the amount of shrubland/oak-woodland habitat in the proposed project areas, and the percentage of this type of habitat that has been treated in past projects. The Forest Service plans fuel reduction treatments on 132 acres in the analysis area in 2005-06. It is not known how much private land will be treated during this period, but due to the emphasis on fire hazard reduction the treatments on private land will likely increase. For purpose of analysis, it is estimated that approximately 500 acres would be treated on private lands. Therefore, by 2010, approximately 1,623 acres (35 percent) of the 4,575 acres of oak-woodland/shrubland habitat in the analysis area would be treated. The treatments would cause a change in the distribution and abundance of species. However, with 65 percent of the habitat remaining untreated, all species now present in the oak-woodland/shrubland habitat would be accommodated. In addition, those areas treated would improve in overall health and provide high quality habitat for those species benefited by oak woodland habitat.

J. BOTANY

This section discloses the impacts to threatened, endangered, special status and invasive plant (including fungi) species.

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action. These effects may or may not occur as a result of the proposed action but were of concern to members of the public or ID team specialists.

Issues

- Degrading habitat for threatened, endangered, sensitive or other special status species may result in further population declines and/or trends away from recovery of the species.
- Invasive plant species may become established or more widespread as a result of habitat manipulation.
- Habitat alteration including reduced canopy cover and soil compaction associated with harvest activities degrades habitat for native plant (including special status plant and fungi species) populations.
- Ground disturbance associated with harvest activities may impact stems and propagules of native plant species (including special status plant and fungi) species.
- Ground disturbance and road building provide vectors for expansion of invasive plant populations.

The *No Action Alternative* describes anticipated effects of not implementing an action at this time.

Affected Environment

All of the proposed treatment areas were surveyed for vascular and nonvascular (lichens and bryophytes) plants on the Medford District Special Status Plant list and Medford District Noxious Weed list. Surveys were completed starting in 2003 in all major habitats and topographic features by professional botanists using an intuitive controlled survey method. Those areas supporting high potential habitat for target species were surveyed more intensively.

Ten species of fungi were recently listed as Bureau Sensitive. These species were formerly managed under the Survey and Manage program. As Survey and Manage species, surveys were determined to be impractical. Continued direction from the Oregon State Office indicates that field units are not required to conduct pre-project surveys for these fungi species that now fall within the special status species program (OSO IB-OR-2004-145 Attachment 5).

<u>Bureau Special Status Species-Plants</u>
The surveys documented 353 occurrences of 25 Bureau Special Status plant species within the project area including 1 occurrence of the Federally endangered species *Fritillaria gentneri* (Table 3-34.). The occurrence of *Fritillaria gentneri* is outside of treatment areas and proposed actions will have no effect on this species. No other occurrences of Federally listed or proposed plant species are present within the project area. Approximately 30% of the occurrences of Bureau Special Status Species are within potential treatment areas.

Table 3-34. Bureau special status species, species status, general habitat, and number of occurrences in the Deadman's Palm project area.					
Lifeform	Scientific name	Common Name	Status	Habitat	Occurrences in project area
Lichen	*Leptogium teretiusculum*	terete skin lichen	BTO	4,5	5
Moss	*Crumia latifolia*	wideleaf crumia moss	BAO	1,2,4,7	24
Moss	*Eucladium verticillatum*	lime seep eucladium moss	BAO	1,(2),(3),4,7	21
Moss	*Fabronia pusilla*	fabronia moss	BTO	2,4,5	33
Moss	*Fissidens grandifrons*	large-leaf fissiden moss	BTO	1,2,4	20
Moss	*Hedwigia detonsa*	hedwigia moss	BTO	2,4,5	1
Moss	*Hedwigia stellata*	starry hedwigia moss	BTO	4,5	1
Moss	*Tripterocladium leucocladulum*	tripterocladium moss	BAO	2,4,5	13
Vascular	*Carex serratodens*	twotooth sedge	BAO	1,4,5	3
Vascular	*Cryptantha milo-bakeri*	Milo Baker's cryptantha	BAO	3,(4),(5)	10
Vascular	*Cypripedium fasciculatum*	clustered lady's-slipper	BSO	4	80
Vascular	*Cypripedium montanum*	mountain lady's-slipper	BTO	4	17
Vascular	*Enemion stipitatum*	Siskiyou false rue anemone	BTO	5	1
Vascular	*Eucephalus vialis*	wayside aster	STO	3, 4	13
Vascular	*Festuca elmeri*	Elmer's fescue	BAO	3,(4),5,6	12
Vascular	*Fritillaria gentneri*	Gentner's fritillary	BSO	5	1
Vascular	*Lewisia cotyledon* var. *howellii*	Howell's lewisia	BTO	2,5	1
Vascular	*Lithophragma heterophyllum*	hillside woodland-star	BTO	4	4
Vascular	*Mimulus douglasii*	purple mouse ears	BTO	3	1
Vascular	*Rafinesquia californica*	California plumseed	BTO	3,(4),5,6	24
Vascular	*Sedum laxum* ssp *heckneri*	Heckner's stonecrop	BTO	2	3
Vascular	*Sedum oblanceolatum*	oblongleaf stonecrop	BTO	2	16
Vascular	*Solanum parishii*	Parish's nightshade	BAO	3,(5),(6)	15
Vascular	*Triteleia crocea* var *crocea*	yellow triteleia	BTO	5	1
Vascular	*Zigadenus fontanus*	small-flowered death camas	BAO	3,5	33
Habitat definitions: 1 = drainage, **2** = rock outcrops, **3** = meadows and open areas, **4** = coniferous forest, **5** = woodland, **6** = shrubland/chaparral, **7**=tufa deposits. Only a few populations (less than 10%) were found in those habitats enclosed in parenthesis.					

Carex serratodens: Twotooth sedge is a southern Oregon and northern California endemic that occurs in small, scattered populations. It occurs in vernally wet seeps and along margins of headwater and first order streams. In the project area it occurs in moist drainages in Douglas fir and Oregon white oak forests in T39SR3W, Section 21 and T39SR3W, Section 20. The three populations are contained within Riparian Reserves that will not be affected by any of the proposed activities.

Crumia latifolia: Wideleaf crumia moss has a widespread distribution occurring in specialized habitat. This species grows on deposits of calcium carbonate (i.e. tufa deposits) in Star Gulch and ephemeral tributaries flowing into Star Gulch from south facing slopes. The deposits indicate that the uplands are underlain by limestone. A calcium rich solution is created when groundwater dissolves underlying limestone deposits on uplands. Where this mineral rich water surfaces, precipitation of calcium carbonate forms tufa deposits. Twenty-four occurrences of this plant species are scattered throughout the project area. All of the occurrences with one exception are within Riparian Reserves that will not be affected by proposed activities.

Cryptantha milo-bakeri: Milo Baker's cryptantha is a southwestern Oregon and northern California endemic that occurs in dry meadows, conifer-hardwood forests, and white oak woodlands with less than 15% canopy cover. One population in T39SR4W, Section 24 is within commercial harvest units. The remaining 9 populations are outside of treatment units and will not be affected by proposed activities.

Cypripedium fasciculatum: Clustered lady's-slipper is a western North American endemic that occurs at low to mid elevations in mixed evergreen forests. In the project area it is usually found in filtered to shaded plant associations within the Douglas fir series. Eighty occurrences are present in the project area. High concentrations of populations are present in the southwest portion of the project area upstream of Alexander Gulch. Populations typically consist of less than 10 individuals and frequently only one individual may be present. One of the largest clustered lady slipper populations in Oregon (200 individuals) is present in Alexander Gulch. The Alexander Gulch population is outside proposed treatment areas. Of the 80 occurrences approximately 33% are within proposed treatment areas.

Cypripedium montanum: Mountain lady's-slipper has a widespread distribution across all western states and Canadian provinces. Populations are usually small consisting of less than 10 plants. In the project area this species is found in filtered to shaded Douglas fir stands and mixed evergreen stands. Throughout its' range this species frequently occurs with *C. fasciculatum* as the species have similar habitat requirements. This is also the case in the project area where about half of the *C. montanum* populations are in close proximity to *C. fasciculatum.* Approximately 3/4 of the seventeen occurrences in the project area are within proposed treatment areas.

Enemion stipitatum: Siskiyou false rue anenome is endemic to Oregon and California. This species occurs on the edges of and within brushy and wooded slopes. In southwest Oregon it usually occurs in Oregon white oak and black oak woodlands with a filtered light regime. The single occurrence in the project area in T39SR3W, Section 28 is adjacent to a Dry Douglas fir treatment area.

Eucephalus vialis: The range of wayside aster is restricted to western Oregon with one occurrence in adjacent Del Norte County, California. It grows in mixed conifer and conifer/woodland forest habitat with an open to filtered light regime. It is frequently present on ridges as large populations consisting of many individual stems. Ten of the thirteen occurrences are within or in close proximity to proposed treatment areas

Eucladium verticillatum: Lime seep eucladium moss has a widespread distribution across North America occurring in specialized habitat. This species grows on deposits of calcium carbonate (i.e. tufa deposits) in Star Gulch and ephemeral tributaries flowing into Star Gulch from south facing slopes. Adjacent forests are typically dominated by Douglas fir. Twenty-one occurrences of this species are present in the project area.

Most of the occurrences are within Riparian Reserves and will not be affected by proposed actions. Three occurrences are within proposed treatment areas.

Fabronia pusilla: Fabronia moss is found in western North America, Europe, and North Africa. The moss occurs on the exposed and unexposed surfaces of rock outcrops within stands of Oregon white oak and Douglas Fir. *Fabronia pusilla* has some levels of natural protection due to its occurrence on rock outcrops. This is a Bureau Tracking species which generally does not require protection from management activities.

Festuca elmeri: Elmer's fescue is a regional endemic known from southwestern Oregon to west-central California. It occurs in partially shaded grassy openings within Oregon white oak woodland, chaparral, and conifer/hardwood forest habitat. Populations typically contain a high number of individuals and may occupy large areas. In the project area 6 of the 12 occurrences are within or on the edge of proposed treatment areas.

Fissidens grandifrons: Large-leaf fissidens moss is an aquatic species that has a widespread distribution in North American. In the project area the moss occurs on rocky streambeds within stands of Douglas Fir. All of the occurrences of this species are contained within Riparian Reserves that will not be affected by proposed activities.

Fritillaria gentneri: Gentner's fritillary is endemic to southwest Oregon and adjacent northern California and occurs across a wide range in elevations (1100 to 5000 feet) in white oak woodlands, mixed evergreen forest, and mixed white oak/rosaceous chaparral. In the Project area the population occurs in mixed evergreen forest at 3400 feet elevation in T39SR4W, Section 11. No activities are proposed in close proximity to this population. Proposed actions are planned ca. ¼ mile to the west of this population in an area that is separated by two drainages.

Hedwigia detonsa: This moss species is known from southwestern Oregon and California. It occurs on rock outcrops in Oregon white oak woodlands and Douglas fir forests. Light is filtered to open. The single occurrence of *Hedwigia detonsa* is outside of proposed treatment areas.

Hedwigia stellata: Starry hedwigia is a moss species with a widespread distribution. In the project area this moss occurs on rock outcrops in Douglas fir forests. The single occurrence of this species in T39SR3W, Section 25 is adjacent to a Dry Douglas fir treatment area.

Lewisia cotyledon var. *howellii:* Howell's lewisia is a regional endemic with populations known from Douglas County, Oregon south to Trinity and Shasta Counties, California. This species occurs on open rock outcrops in woodland and forested habitat. The single occurrence in the project area in T39S R4W, Section 24 is in a unit scheduled for precommercial thinning.

Leptogium teretiusculum: Terete skin lichen is a widespread boreal species. Known populations are few and far apart. In the project area this lichen species grows on the trunks of black oak and canyon live oak. It occurs as very small populations in closed canopy conifer-hardwood forests on north trending ridgelines. Three of the five occurrences are within proposed treatment areas.

Lewisia cotyledon var. *howellii:* Howell's lewisia is a regional endemic with populations known from Douglas County, Oregon south to Trinity and Shasta Counties, California. This species occurs on open rock outcrops in woodland and forested habitat. The single occurrence in the project area in T39S R4W, Section 24 is in a unit scheduled for precommercial thinning.

Lithophragma heterophyllum: Hillside woodland-star is a regional endemic. This species is present in filtered to shaded Douglas fir forest. All occurrences of this species are in T39SR4W, Section 9 and contained within Riparian Reserves that will not be affected by proposed activities.

Mimulus douglasii: Purple mouse ears is an annual species confined to western North America. The single occurrence of this species in the project area is in an open meadow with less than 5% cover of Oregon white oak. The population is in T39SR3W, Section 21 and is outside of proposed treatment areas.

Rafinesquia californica: California plumseed is an annual species that occurs in western North America. In the project area this species usually occurs on south facing slopes supporting grassland, shrubland, and oak woodland habitat. Stands typically have an open canopy with evidence of a frequent fire regime. Twenty-four occurrences are present in the Project area with most occurrences either outside or on the boundaries of proposed treatment areas.

Sedum laxum ssp. *heckneri:* Heckner's stonecrop is a southwestern Oregon and northern California endemic. This species grows in vertical cracks and on ledges of rock outcrops within Douglas fir dominated stands. Light regimes are open to filtered. Two of the three occurrences in the project area are within or near proposed treatment areas.

Sedum oblanceolatum: Applegate stonecrop is a local southwestern Oregon, northern California endemic that grows in vertical cracks and on the ledges of rock outcrops. Sixteen occurrences are present in the project area with all but 2 occurrences outside of proposed treatment areas.

Solanum parishii: Parish's nightshade is a small shrub with a restricted distribution in western North America. It is found on south facing slopes in grasslands and grassy openings within chaparral and woodland habitat. Evidence of a frequent fire regime is apparent. All of the 15 occurrences of this species within the project area are outside of proposed treatment areas.

Tripterocladium leucocladulum: Tripterocladium moss is known from western North America. This moss species grows on rock outcrops and rock talus within shaded conifer-hardwood forests and Douglas fir forests. Most of the populations in the project area are in close proximity to proposed treatment areas.

Triteleia crocea var. *crocea*: Yellow triteleia is a regional southwestern Oregon and northern California endemic. In the project area this species occurs on gentle terrain in a transitional area between Douglas fir forests and Oregon white oak woodlands. The single occurrence of this species in T39SR3W, Section 15 is within a fuels treatment unit.

Zigadenus fontanus: Small-flowered death camas is known from western California and southwestern Oregon. There are taxonomic questions related to the plants in the Applegate Valley of southern Oregon and they may represent a new species to science. In the project area this species occurs in a wide variety of habitats on south facing slopes. Habitats include meadow, chaparral, Oregon white oak, Douglas fir and mixed hardwood-conifer stands. Soils are often cobbly to gravelly loams. Thirty-three occurrences of this species are within the project area. Eleven of the sites are within or adjacent to proposed treatment areas.

<u>Bureau Special Status Species-Fungi</u>
Ten former Survey and Manage fungi species, now managed as Bureau Sensitive species, have suspected or documented occurrence on lands administered by Medford District BLM (Table 3-35). Known occurrences of these Bureau Sensitive fungi species are present in southwestern Oregon in the Klamath Mountains and Cascade Range.

Pre-disturbance surveys for special status fungi species are not required for proposed treatments within the project area. Spring surveys, as parts of other projects, have been completed in and adjacent to the project area. Most of the 500 acres of spring surveys within the project area have taken place in silviculture units. Approximately 1700 acres of spring surveys have been completed in fuels and timber sale units contiguous

to the project area as part of other projects. No special status fungi species were detected during the spring surveys. Above-ground fruiting structures (sporocarps) are short-lived, seasonal in occurrence, and annually variable making surveys difficult (USDA and USDI 2004). According to BLM Information Bulletin No. OR-2004-145, pre-disturbance surveys in proposed project areas for these fungi are not practical to conduct and are not expected; protection of known sites along with large-scale inventory work will provide the measures and means to meet agency policy.

Four sensitive fungi species occur on the Medford District and four species occur within the Medford District boundary but on other lands (US Forest Service, State of Oregon, and private). Because these species were considered impractical to survey for, much of the surveys and species information came from the Regional Ecosystem Office and the Regional Mycologist's staff. Survey areas and methods were not designed to meet the objectives of site specific, pre-disturbance surveys. Survey methods used in selected areas were line transects, plotless transects, and randomized plots. Of the four species found on the Medford District, three were discovered by BLM or contract botanists performing pre-disturbance surveys for other species.

Table 3-35. Special status fungi species documented or suspected on lands administered by Medford District BLM. Local ecoregions and administrative units where species is documented present are also listed.					
Species name	Status	Local Habitat, Local Ecoregions, and Administrative Units	Known Medford BLM?	Potential for occurrence*	
				Habitat	Proximate
Boletus pulcherrimus	BSO	Late successional white fir communities; Western Cascades Ecoregion, **Ashland R.A.**	**Documented**	-	-
Dermocybe humboltensis	BSO	Stable coastal sand dunes with *Pinus* spp. and *Vaccinium* spp.; Klamath Ecoregion; Roseburg BLM, Arcata Field Office	Suspected	-	-
Gastroboletus vividus	BSO	High elevation Shasta red fir; Klamath/ Western Cascades Ecoregions; Applegate RD.	Suspected	-	-
Phaeocollybia californica	BSO	Associated with oaks in mature to late successional mixed evergreen forests; Western Cascade/Klamath Ecoregions; Arcata Field Office, Coos Bay/Eugene/Roseburg District BLM.	Suspected	+	-
Phaeocollybia olivacea	BSO	Associated with white oak and tan oak in later successional mixed evergreen forests; Western Cascades/Klamath Ecoregion; **Grants Pass R.A.**, Rogue River/Siuslaw/Six Rivers National Forests, Coos Bay/Eugene/Roseburg/Salem Districts BLM	**Documented**	**+**	**-**
Phaeocollybia oregonensis	BSO	Moist late successional Hemlock communities with white fir; Western Cascades Ecoregion; Siuslaw, Mt. Hood National Forests, Coos Bay/Eugene/Salem Districts BLM, - probably only in western Glendale	Suspected	-	-
Ramaria spinulosa var. *dimunitiva*	BSO	Late successional PSME stand, 1200 feet; Klamath Mountains; Roseburg District BLM	Suspected	+	-
Rhizopogon chamaleontninus	BSO	3300 foot PSME forest - Klamath Ecoregion; unknown location	Suspected	U	-
Rhizopopgon ellipsosporus	BSO	In mixed evergreen forest in Kane Creek drainage; Klamath Mountains; **Ashland R.A.**	**Documented**	+	+
Rhizopogon exiguus	BSO	Low elevation PSME forest; Klamath Ecoregion; Siuslaw National Forest	Suspected	+	-
Potential for occurrence: "-" = Low, **"+"**=High, and **"U"**=Unknown potential for occurrence based on similar habitat in project area and proximity to known populations.					

Most of the known occurrences of special status fungi are outside the Applegate watershed and habitat conditions for 4 of the 10 species are not present in the project area (Table 3-35). Two known sites of

sensitive fungi are known from the Applegate watershed. *Gastroboletus vividus* is present on the Applegate Ranger District in high elevation Shasta red fir stands near Jackson Gap. One species, *Rhizopogon ellipsosporus*, is known from mixed conifer forest stands in the Kane Creek drainage. (Rogue River Drainage)

An analysis of forest habitat in the project area, known site proximity to the project area, species distribution patterns and range, species ecological requirements, past surveys, and habitat fragmentation results in the following species *Rhizopogon ellipsosporus, Gastroboletus vividus, Phaeocollybia olivacea, Boletus pulcherrimus, Rhizopogon exiguus, Phaeocollybia californica, Rhizopogon chamaleontinus, Ramaria spinulosa var. diminutiva, Dermocybe humboldtensis* and *Phaeocollybia oregonensis* having low to moderate likelihood of occurrence in the project area.

Noxious Weeds and Invasive Plant Species

Forty three invasive plant species have been identified in the project area (Table 3-36). This includes 6 species that are on Oregon Department of Agriculture's Noxious Weed list. One species, *Centaurea solstitialis* (yellow star thistle), is on the Medford District Target species list. Currently 119 patches of yellow star thistle have been documented in the project area. Population sizes range from 1 individual to large populations with several thousand individuals covering 1 to 10 acres. The large patches of this species are outside of proposed treatment units. However, this species is often present at road junctions and is abundant along roads in the northeast part of the project area.

Invasive plant species are most common outside of coniferous forest habitat. A number of the invasive plant species, including *Hypericum perforatum* (common St. Johns wort), *Cichorium intybus* (chicory), *Agrostis stolonifera* (creeping bentgrass) and *Rubus laciniatus* (cutleaf blackberry), are well established along (and somewhat confined to) roadsides. The annual grasses *Vulpia myorus* (rat-tail fescue) and *Cynosaurus echinatus* (bristly dogstail grass), *Poa bulbosa* (bulbous bluegrass) and other species (see Table 3-36) are often present, and in some cases have become naturalized, on south facing slopes supporting oak woodlands, shrublands, and grasslands.

Table3-36. Noxious weeds and invasive plant species, ODA rating, habitat, and abundance in the Deadman's Palm project area.					
Family	Scientific name	Common name	ODA Rating	Habitat	Percent of sections with known occurrences
Apiaceae	*Anthriscus caucalis*	burr chervil		5	11
Apiaceae	*Torilis arvensis*	spreading hedgeparsley		3,4,5,6	100
Asteraceae	*Centaurea diffusa*	white knapweed	B	3	4
Asteraceae	*Centaurea solstitialis*	yellow star-thistle	B*/T	3,7	34
Asteraceae	*Cichorium intybus*	chicory		3,7	8
Asteraceae	*Cirsium vulgare*	bull thistle	B*	3,4,7	89
Asteraceae	*Crepis capillaris*	smooth hawksbeard		4,5	31
Asteraceae	*Hypochaeris radicata*	hairy catsear		3,7	19
Asteraceae	*Lactuca serriola*	prickly lettuce		3,4,5,6	96
Asteraceae	*Taraxacum officinale*	common dandelion		3,4,7	42
Brassicaceae	*Brassica nigra*	black mustard		3	8
Clusiaceae	*Hypericum perforatum*	common St. Johnswort	B*	3,4,5,7	84
Dipsacaceae	*Dipsacus follunum* ssp. *sylvestris*	Fuller's teasel		1	4
Fabaceae	*Trifolium dubium*	suckling clover		7	4
Fabaceae	*Vicia cracca*	bird vetch		3	19
Fabaceae	*Vicia sativa*	garden vetch		1	4
Geraniaceae	*Erodium cicutarium*	redstem stork's bill		3	42
Plantaginaceae	*Plantago lanceolata*	narrowleaf plantain		1	12
Poaceae	*Agrostis stolonifera*	creeping bentgrass		7	12
Poaceae	*Aira caryophyllea*	silver hairgrass		3,4,5,6,7	92
Poaceae	*Arrhenatherum elatius*	tall oatgrass		7	12
Poaceae	*Avena fatua*	wild oat		3,4,5	54
Poaceae	*Bromus briziformis*	rattlesnake brome		3	12
Poaceae	*Bromus diandrus*	ripgut brome		3,5,6	4
Poaceae	*Bromus hordeaceus*	soft brome		3,5,6	73
Poaceae	*Bromus madritensis*	compact brome		3	8
Poaceae	*Bromus rigidus*	ripgut brome		3,4,5	62
Poaceae	*Bromus sterilis*	poverty brome		3,5	4

Family	Scientific name	Common name	ODA Rating	Habitat	Percent of sections with known occurrences
Poaceae	*Bromus tectorum*	cheatgrass		3,4,5,6,7	92
Poaceae	*Cynosurus echinatus*	bristly dogstail grass		3,4,5,6,7	100
Poaceae	*Dactylis glomerata*	orchardgrass		1,3,4,7	77
Poaceae	*Lolium arundinaceum*	tall fescue		1	8
Poaceae	*Lolium perenne*	perennial ryegrass		1,3	42
Poaceae	*Poa bulbosa*	bulbous bluegrass		3	69
Poaceae	*Poa pratensis*	Kentucky bluegrass		3,4,5,7	65
Poaceae	*Taeniatherum caput-medusae*	medusahead	B	3,4,5,6,7	69
Poaceae	*Vulpia myorus*	rat-tail fescue		3	69
Polygonaceae	*Rumex crispus*	curly dock		1	50
Rosaceae	*Rosa eglanteria*	sweetbriar rose		1	27
Rosaceae	*Rubus armeniacus*	Himalayan blackberry	B	4,7	92
Rosaceae	*Rubus laciniatus*	cutleaf blackberry		1,7	31
Scrophulariaceae	*Verbascum blattaria*	moth mullein		3	4
Scrophulariaceae	*Verbascum thapsus*	common mullein		3,7	46
ODA noxious weed control rating system definitions: "A" designated weed - a weed of known economic importance which occurs in the state in small enough infestations to make eradication/containment possible; or it is not known to occur, but presence in neighboring states make future occurrence in Oregon seem imminent. **"B"** designated weed - a weed of economic importance which is regionally abundant but which may have limited distribution in some counties. Where implementation of a fully integrated statewide management plan is not feasible, biological control shall be the main control approach (**B"*"** are species targeted for biological control). **"T"** designated weed - a priority noxious weed designated by the Oregon State Weed Board as a target on which the ODA will develop and implement a statewide weed management plan.					
Habitat definitions: 1 = drainage, **2** = rock outcrops, **3** = meadows and open areas, **4** = coniferous forest, **5** = woodland, **6** = shrubland/chaparral, **7**=roadsides/disturbed ground					

Environmental Consequences

Past and Future Actions Common to all Alternatives

Fourteen of the twenty-five species in the project area are restricted in distribution to southwestern Oregon and adjacent California and/or are considered Bureau Sensitive or State Threatened species. Actions on BLM lands before special status species policies were in place and past actions on private lands including grazing, farming, development, and logging have eliminated both potential and occupied habitat for plant species including those that are now listed as special status species. Under all the alternatives, including the No Action alternative, actions contributing to fragmentation and elimination of natural plant communities will continue on private lands. Agency policies will provide protection for special status species occurring within future projects on federally managed lands.

Alternative A – No Action

Under the No Action Alternative there would be no direct effects to any special status plant or fungi species within the boundaries of the project area. Habitat associated with Bureau Special Status Species, including canopy cover and humidity, would remain unchanged for the short term. Noxious weed and invasive plant species present in the project area would continue to persist and expand. Under the No Action Alternative treating existing weed populations would be of lower priority in the project area.

Long term and indirect effects on habitat for Bureau Special Status Species would result from the No Action alternative. In the project area changes in plant species composition, including encroachment of woody vegetation and accumulation of understory brush, are a result of long term, uninterrupted successional trends. Over the long-term increased canopy coverage and competition from understory species could modify both occupied and unoccupied forest, woodland, shrubland, and meadow habitat for Bureau Special Status Species and result in the decline or loss of individual plant populations.

In the project area both forest and non-forest stands are at high risk for high severity fires due to dense stand conditions coupled with drought conditions. High severity fires that burn through the upper organic layers of the soil can destroy the stems and propagules of plant species. The resulting habitat may favor early seral species that can tolerate open, dry, non-forest conditions. This includes weeds species that are adapted to open canopies.

Alternative B – Proposed Action – treat with roads

Bureau Special Status Species - Plants
There would be no direct effects on Bureau Special Status plant species under the Action alternatives. Mitigating measures including buffers, seasonal restrictions, dropped units, and weed management are designed to maintain or improve existing habitat conditions (Table 3-36). Buffers including special status plant populations are established to include an area large enough to maintain current habitat and microclimate features. Early in the planning process approximately 20 acres were withdrawn from consideration for timber harvest due to the presence of large populations of Bureau special status plant species.

Five occurrences of Bureau Special Status plant species are known to occur in units proposed for fuels treatments. These species are found in vegetation types that were historically maintained by fire. Buffers of special status plant sites in fuels units include provisions to allow treatments to restore these historic conditions. Design features, including seasonal restrictions to avoid damage to plants during the growing season and pulling of slash outside of buffers, will mitigate any direct adverse effects of fuels treatments.

Table3-36. Mitigation measures for bureau special status species in the Deadman's Palm project area.									
				Mitigation/Protection measures					
Lifeform	Scientific name	Common Name		NT	D	S	RR	NP	O
Lichen	*Leptogium teretiusculum*	terete skin lichen	BTO	■					■
Moss	*Crumia latifolia*	wideleaf crumia moss	BAO	■			■		
Moss	*Eucladium verticillatum*	lime seep eucladium moss	BAO	■			■		
Moss	*Fabronia pusilla*	fabronia moss	BTO	■		■		■	■
Moss	*Fissidens grandifrons*	large-leaf fissiden moss	BTO				■		
Moss	*Hedwigia detonsa*		BTO						■
Moss	*Hedwigia stellata*	starry hedwigia moss	BTO	■					
Moss	*Tripterocladium leucocladulum*	Tripterocladium moss	BAO	■					■
Vascular	*Carex serratodens*	twotooth sedge	BAO				■		
Vascular	*Cryptantha milo-bakeri*	Milo Baker's cryptantha	BAO	■					■
Vascular	*Cypripedium fasciculatum*	clustered lady's-slipper	BSO	■	■		■		■
Vascular	*Cypripedium montanum*	mountain lady's-slipper	BTO	■			■		■
Vascular	*Enemion stipitatum*	Siskiyou false rue anemone	BTO	■					
Vascular	*Eucephalus vialis*	wayside aster	STO	■	■	■			■
Vascular	*Festuca elmeri*	Elmer's fescue	BAO	■		■			■
Vascular	*Fritillaria gentneri*	Gentner's fritillary	BSO						■
Vascular	*Lewisia cotyledon* var. *howellii*	Howell's lewisia	BTO			■			
Vascular	*Lithophragma heterophyllum*	hillside woodland-star	BTO				■		
Vascular	*Mimulus douglasii*	purple mouse ears	BTO						■
Vascular	*Rafinesquia californica*	California plumseed	BTO	■		■			■
Vascular	*Sedum laxum* ssp *heckneri*	Heckner's stonecrop	BTO	■					
Vascular	*Sedum oblanceolatum*	oblongleaf stonecrop	BTO	■					
Vascular	*Solanum parishii*	Parish's nightshade	BAO						■
Vascular	*Triteleia crocea* var *crocea*	yellow triteleia	BTO			■			
Vascular	*Zigadenus fontanus*	small-flowered death camas	BAO	■	■	■			■
Mitigation/Protection Measures: NT = No treatment, **D** = Dropped portion of unit, **S** = Seasonal restriction for fuels/PCT units, **RR** = Riparian Reserve, **NP** = No protection, **O** = Outside proposed treatments									

Native plant populations, including special status plant species, can decline when changes to microhabitat, including lowered humidity and higher temperatures, occur due to removal of overstory protection and/or when soils are disturbed. The Bureau Special Status species in the project area will persist on sites that are currently occupied. Reduction of canopy in adjacent stands may result in the short-term indirect effect of reducing the potential for species that are adapted to closed canopy conditions to spread or establish in unoccupied habitat. Over time, with canopy closure, potential habitat will again be available.

Stand replacing fires that burn the organic layer increase erosion potential, change soil characteristics and can destroy propagules and stems of native (including special status) plant species. In northern California, 79% of all *Cypripedium fasciculatum* populations are at high risk of loss from high intensity fire (Seevers and Lang 1998). Fuels treatment and density management proposed in the Action alternatives would provide an indirect benefit to special status plant species by reducing the potential for stand replacing wildfires.

Proposed new roads are well placed to avoid direct effects on plant sites. Three of the proposed roads were modified or dropped from consideration based on an evaluation of impacts to Bureau Special Status plant species. A road originally proposed in T39SR3W, Section 29 SW¼ was dropped from consideration due to large populations of the Bureau Sensitive species *Eucephalis vialis* and other resource considerations. The take-off for a road in the NE¼ of this same section was modified to avoid this species. A proposed road along the north face and ridge of Burton Butte (T39SR3W, Section 18) was within a few hundred feet of populations of *Zigadenus fontanus* on the south facing slope. The extent of this road was reduced to eliminate potential indirect effects on this population.

Actions proposed in this project may create suitable habitat for the expansion of noxious weeds. At the present time weed species are not in competition with special status plant species. Adverse direct and indirect effects on special status plant species are not expected under the proposed actions. Pre-treatment of known sites should provide an indirect beneficial effect by reducing potential for expansion.

Bureau Special Status Species - Fungi

There is potential for special status fungi species to occur in the project area**.** Predicting the likelihood of occurrence is difficult as habitat requirements for many of the suspected species is broad or poorly understood. For the 10 fungi species known or suspected to occur on Medford District BLM, specific information on connectivity and habitat requirements, range (including occurrences within the project area), and disturbance effects is lacking (USDA and USDI 2004 p. 108). The site-specific environmental consequences for the Deadman's Palm Project are based on information regarding habitat component requirements, proposed treatments, and similar species or species groups' response to such disturbance.

The 2004 SEIS *To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines (*USDA and USDI 2004) analysis determined one of the following outcomes for each of the former Survey and Manage species:

1. Habitat (including known sites) is sufficient to support stable populations in the Northwest Forest Plan area.
2. Habitat (including known sites) is sufficient to support stable populations range-wide in the Northwest Forest Plan area.
3. Habitat (including known sites) is insufficient to support stable populations in the Northwest Forest Plan area.
4. There is insufficient information to determine an outcome.

Outcomes were determined by analyzing factors including habitat, life history, range, distribution, number and location of known sites, and the extent of the reserve system. This information was then used along with

projected conditions to determine the species future population and stability patterns (USDA and USDI 2000, USDA and USDI 2004).

The 2004 FSEIS has determined that for eight of the 10 species (*Boletus pulcherrimus, Gastroboletus vividus, Dermocybe humboldtensis, Phaeocollybia californica, Ramaria spinulosa* var. *diminutiva, Rhizopogon chamaleontinus, Rhizopogon ellipsosporus,* and *Rhizopogon exiguus*) that habitat (including known sites) is not sufficient to support stable populations in the Northwest Forest Plan area (Table 3-37). For seven of the eight species, this outcome is not due to federal actions but other factors such as: (1) limited potential habitat and few populations on federally managed lands; (2) potential for stochastic events; (3) low number of individuals; (4) limited distribution; and, (5) narrow ecological amplitude. Therefore, none of the Deadman's Palm alternatives would change the species viability condition for *Boletus pulcherrimus, Gastroboletus vividus, Dermocybe humboldtensis, Ramaria spinulosa* var. *diminutiva, Rhizopogon chamaleontinus, Rhizopogon ellipsosporus,* or *Rhizopogon exiguus* based on habitat availability.

For one of the ten fungi species (*Phaeocollybia californica*), the 2004 FSEIS determined the outcome of insufficient habitat is due to land management activities. Known sites of *Phaeocollybia californica* are not substantially protected by reserves and are susceptible to adverse impacts from soil disturbance and/or a significant loss of host species. Although Matrix Standards and Guidelines of the Northwest Forest Plan provide for minimizing soil and litter disturbance, there is lack of knowledge about how much disturbance can be tolerated by these species. Loss of even a few known sites could adversely impact this species persistence within the Northwest Forest Plan area (USDA and USDI 2000, p. 154). Management activities proposed under the Deadman's Palm project are consistent with those activities anticipated under the Northwest Forest Plan 1994 FSEIS and 2004 FSEIS to Remove Survey and Manage Mitigation Measure Standards and Guidelines. Currently, there are no known sites within the Deadman's Palm project area. Any sites discovered would be protected and the site maintained. If unknown sites of *Phaeocollybia californica* are present in the project area, this project could adversely impact this species as described above and in the 2004 FSEIS.

Two of the 10 BSS fungi species (*Phaeocollybia olivacea, Phaeocollybia oregonensis*) were determined to have habitat (including known sites) sufficient to support stable populations in the Northwest Forest Plan area. These species would stabilize in a pattern similar to or different from their reference distribution because a substantial number of known sites are located in reserves or managed under the Agencies' Special Status Species Programs (USDA and USDI 2004, p. 152).

Table 3-37. Species outcomes for Survey and Manage Fungi in 2004 SEIS. Number of occurrences and number of occurrences in reserves in the Northwest Forest Planning area.			
Scientific Name	**Number Sites in NFP[1]**	**Number Sites in Reserves[2]**	**% in Reserves**
Habitat Not Sufficient – not due to federal action			
Boletus pulcherrimus	36	5	13.9
Dermocybe humboldtensis	4	1	25.0
Gastroboletus vividus	4	2	50.0
Ramaria spinulosa var. diminutiva	1	0	0
Rhizopogon chamaleontinus	1	0	0
Rhizopogon ellipsosporus	3	0	0
Rhizopogon exiguous	5	3	60.0
Habitat Not Sufficient – due to management			
Phaeocollybia californica	30	5	16.7
Habitat Sufficient			
Phaeocollybia olivacea	93	19	20.4
Phaeocollybia oregonensis	11	5	45.5

[1] Source: ISMS database 11-20-04, Handbook to Strategy 1 Fungal Species in the NWFP, Handbook to Additional Fungal Species of Special Concern in the NWFP, Medford District data.
[2] Reserves = Land Use Allocations Late Successional Reserve and Congressionally Reserved.

The 10 Bureau Sensitive fungi known or suspected to occur on Medford District BLM are species that form mycorrhizae or mutually beneficial relationships with the rootlets of host plants that are typically conifers. The mycorrhizae form an underground mycelial network that can be considered the vegetative body of the fungi. Sporocarps, the fruiting bodies or "mushrooms", may develop above or below the ground surface depending on the species. Spores produced by the fruiting bodies are then transported by animals or wind. Late successional characteristics, including moderate to high canopy cover, high incidence of large trees, snags, and accumulation of coarse woody debris (including logs), in forested stands are important habitat components for fungi (USDA and USDI 2004 p. 148).

An estimated 40% of the timber capable forest land in the Deadman's Palm project area would be treated. Commercial harvest activities could have varying degrees of adverse impacts depending on the level of tree removal and ground disturbance including reduction of canopy cover, ground disturbance, and removal of organic matter or coarse woody debris. Adverse effects to fungi include changes in microsite conditions (including temperature, humidity, light intensity, and wind) from reduction of canopy cover, edge effects, changes in soil moisture regimes, fragmentation of the mycelial network, reduction in availability of host trees, reduction of root and root tip availability, decrease in organic soil layer, soil compaction/bulk density increase, and a decrease in the amount of coarse woody debris that may serve as a source of moisture in the dry months. These effects may reduce or eliminate sporocarp reproduction, change fungal species composition and species diversity, and decrease fungal biomass.

All of the Bureau Sensitive fungi are associated with forested environments and though specific information is unavailable they are thought to be associated with late successional/old growth forests. In the project area 1,549 acres are classified as mature forest and approximately 1/3 of the mature stands are proposed for treatment. The remaining untreated mature habitat in the project area and in the watershed will continue to provide habitat for fungi, including those listed as Bureau Sensitive if they are present. "Small forest

fragments can function as refugia where fungi may persist until suitable habitat conditions become available in adjacent stands." (USDA and USDI 2004 p. 148).

Management methods that retain living trees and shrubs provide host trees and substrates to maintain mycorrhizal networks (Amaranthus and Perry 1994). A study by Luoma et al. (2004) examined the effects of varying levels and patterns of green-tree retention on ectomycorrhizal sporocarp production; levels tested were 15, 40, 75 and 100% existing live tree basal area for aggregated and dispersed patterns of green tree retention. Complete elimination and reduction of sporocarp production was observed in the 15% aggregated and 15% dispersed treatments respectively. Aggregate patterns at 40% retention also showed decrease in sporocarp production. No effect was observed in stands with 40% green tree retention in dispersed patterns. Total fall mushroom biomass decreased significantly in the 40% aggregate and the 15% dispersed and aggregate treatments compared to the 75% aggregate, 40% dispersed, and the control (100 %). All of the proposed prescriptions in the Deadman's Palm project area approximate a minimum of 40% green tree retention. Retention patterns within the project area will include dispersed and small openings (group selection 1/5 to 1 acre in size). It is likely that mycorrhizal fungi, including special status species that may be present in the project area, would survive subsequent habitat conditions due to the design of commercial harvest treatments.

Habitat components important to fungi include dead, downed wood; standing dead trees; and live old-growth trees; as well as a diversity of host species(including trees and underbrush) and microhabitats"(USDA and USDA 2004 p. 148) Proposed project actions and design features including treatments retaining 40% or greater live tree basal area, retention of coarse woody debris and surrounding vegetation, retaining old growth trees and associated trees, riparian reserves, special status plant reserves, and logging systems that minimize or create only localized ground disturbance will support fungi viability.

Increases in soil bulk density from ground disturbing activities limit available soil moisture and inhibit root growth of host species for fungi. Road building, tractor yarding, and cable yarding can have intense effects at a localized level on soils. Under Alternative B 1.6 miles of new road is proposed for the Deadman's Palm project. For new road construction it is estimated that the road prism occupies a width of 40 feet (4 acres per mile). Less than 15% of the 211 and 1263 acres scheduled for tractor yarding and cable yarding, respectively are in mature forest stands. Tractor yarding utilizes tractors to drag trees to landing locations along narrow skid trails (about 9 to 12 feet wide) that are located approximately 150 feet apart. In cable yarding operations parallel skyline corridors 9 to 15 feet wide and placed 200 feet through the treatment unit are used to pull trees upslope to landing areas. Dahlberg and Stenlid (1995) found that mycelial networks may range in size from 1.5 – 27 meters. If special status fungi are present in the project area ground disturbing impacts may fragment the hyphal network reducing or eliminating populations.

Organic soils and coarse woody debris protect mineral soil from compaction, reduce erosion, maintain soil nutrition and maintain long term soil moisture. Mycorrhizal fungi prefer moist sites and rotten wood for colonization. Organic soils and abundance of coarse woody debris may be impacted by tree harvest and prescribed burning. Project design features are in place for the Deadman's Palm project such that coarse woody debris remaining after logging would be maintained at or above current levels in order to protect the surface soil and maintain productivity.

The impacts of prescribed burning for removal of slash and site preparation depends on fire intensity. High intensity burns that get into mineral soils may eliminate mycorrhizal fungi and create habitat that is colonized by non-mycorrhizal plant species including weeds. In the Deadman's Palm project area, all prescribed underburns are to be performed when moisture conditions are high enough and prescription windows are at a level so that no more than 50% of the mound depth/duff layer around pine trees is consumed during burning. A recent study by Smith, et al. (2002) examined short-term effects of seasonal prescribed burning on ectomycorrhizal fungi. Results showed that fall underburning (in dry ponderosa pine stands of eastern

Oregon) significantly reduced duff depth, live root biomass, and ectomycorrhizae species richness compared to spring underburning, for at least two years. Also, the probability of residual tree mortality was greater for fall burning. The data suggests that spring burning should be favored over fall burning if the objective is to maintain ectomycorrhizae species diversity.

High intensity burns, such as pile burning to remove slash, that enter mineral soils would create a localized disturbance including death of fungi down into mineral soil (the more diverse portion of the soil), incineration of the organic soil layer, loss of available nutrients, reduction of soil moisture, a decrease in fungal biomass, a decrease in fungal species diversity, fungal species composition change, degradation of soil physical structure, and increase non-mycorrhizal species' (many that are weedy) ability to become established at the site.

This analysis was completed in compliance with BLM State Office direction on management of fungi under the Special Status Species program to meet the requirements of the Oregon-Washington BLM Special Status Species policy. If sites supporting Bureau Sensitive fungi were discovered in the Deadman's Palm project area they would be managed to maintain the species at an occupied site to prevent contributing to the need to list that species as threatened or endangered under the Endangered Species Act. Reduction of canopy cover and removal of host trees proposed in silviculture prescriptions would not likely adversely affect Bureau Sensitive fungi species since retention of host trees and coarse woody debris would continue to provide habitat components favored by these species. Localized disturbance such as roads, skid trails, or slash piles may adversely impact Bureau Sensitive fungi populations, if they are present in the project area.

For seven of the 10 BSS fungi species it has already been determined in the 2004 FSEIS that habitat is insufficient to support stable populations in the Northwest Forest Plan area; therefore, the species viability condition (based on habitat) for *Boletus pulcherrimus, Gastroboletus vividus, Dermocybe humboldtensis, Ramaria spinulosa* var. *diminutiva, Rhizopogon chamaleontinus, Rhizopogon ellipsosporus,* and *Rhizopogon exiguus* would not change under any of the alternatives including the no action alternative.

In the 2004 FSEIS, *Phaeocollybia californica* was determined to have insufficient habitat due to land management activities. Known sites of *Phaeocollybia californica* are not substantially protected by reserves and are susceptible to adverse impacts from soil disturbance and/or a significant loss of host species (see Table 3-37). Loss of even a few known sites could adversely impact this species persistence within the Northwest Forest Plan area (USDA, USDI 2000, p. 154). The potential for actions proposed in the Deadman's Palm project to affect populations of this species are low due to both a low probability of occurrence and a low probability of direct impacts.

For two of the 10 BSS fungi, (*Phaeocollybia olivacea, Phaeocollybia oregonensis*) it was determined in the FSEIS that habitat is sufficient to support stable populations in the Northwest Forest Plan area. Species viability condition for these fungi species (based on habitat) would not change under any of the alternatives including the no action alternative.

Noxious Weeds and Invasive Plant Species

In the project area noxious weeds and invasive plant species are established on disturbed sites including roads, landings and gravel piles. These same areas also serve as dispersal corridors. Direct effects of the proposed treatments including skid trails, roads, landings, and pile burning will create openings and disturbed soils that provide suitable habitat for the establishment of noxious and invasive plants. Opening of the canopy may also create potential habitat for weed establishment in fuels treatment areas that are on drier south facing slopes.

Pre-treatment of known weed sites and project design features will provide mitigation for direct and indirect effects of proposed actions. Pre-treatment of noxious weed populations prior to propose Actions will reduce

existing populations. Project design features including washing equipment along with seeding decommissioned roads, fill slopes of new roads, landings, and burn piles will minimize colonization of new sites. Given adequate funding to continue inventories and treatment of weed populations it is anticipated that existing weed populations will decline and establishment of new populations will be minimal.

Alternative C – Proposed Action – treat with no roads

Effects are the same as Alternative B with the following exceptions:

- Acres of tractor yarding is the same. Acres of cable yarding decreases by about 130 acres. Acres of helicopter yarding decrease by about 200 acres.
- No new roads would be constructed.
- This Alternative would have less ground disturbance reducing potential for spread of invasive plants and potential impacts to special status fungi if they are present.

Additional documents pertinent to Botanical Resources are available upon request:

OSO IB-OR-2004-145 *Project Evaluations for Former S&M Species in which Surveys are Not Feasible*, And the *Medford District Special Status Plant List and Medford District Noxious Weed List*.

K. OHV, VISUAL RESOURCES, CULTURAL RESOURCES, NOISE AND TRAFFIC

Issues/Concerns

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action. These effects may or may not occur as a result of the proposed action but were of concern to members of the public or ID team specialists.

- There is opposition to new road construction because construction of new roads may increase OHV activity, which may impact the environment and local residents.

- Timber harvest changes the look and character of the hillsides and the views that local residents and tourists have of the forest.

- Noise from helicopter logging or other activities associated with the project could be irritating to local residents.

- Traffic could increase as a result of the proposed action and be annoying to local residents.

The *No Action Alternative* describes anticipated effects of not implementing an action at this time.

OHV

OHV activity is currently very light in the planning area. All BLM lands in the planning area are currently open to OHV use except for riparian areas. All the existing roads in the project area are open and available to OHVs. It is legal to ride OHVs on federal lands.

The Deadman's Palm project area currently receives limited use by OHVs. The project area is not the typical 'checkerboard pattern' of ownership common in many BLM managed areas. In this project the BLM manages the entire land base within the planning area. There is private land to the east of and directly

adjacent to, the planning area. Due to the pattern of land ownership and the current use rate, it is not expected that illegal OHV use will increase as a result of this project.

No timber would be removed and no contracts created for the local workforce. No timber would be sold or provided. No helicopter noise or road traffic increases would occur.

Visual Resource Management

The entire project area is designated as either visual resource management class III or IV. The management objective for class III lands is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer.

Class IV lands are even less restrictive. The level of change to the characteristic landscape can be high and these activities may dominate the view and be the major focus of viewer attention.

It is important to note, that the system is based on observations of a causal observer and not local residents who are very sensitive to minor changes that may take place in the local neighborhood.

The proposed activity is to manage commercial timber stands with a variety of treatments including thinning, density management, and a small regeneration cut (16 acres). Several roads are proposed for construction as well as decommissioning.

The planning area was evaluated for visual contrasts from major travel routes and all proposed activities within the Deadman's Palm Planning area will meet visual resource management objectives. The activities proposed are predominately thinning and density management which leaves the largest tress and removes the smaller trees. This type of harvest has a low visual impact because the forest canopy is not altered much. The roads proposed for construction are far from the valley and away from local residents. The overall visual impact of the project is low.

Cultural Resources

The Deadman's Palm project area was surveyed for cultural resource concerns in FY 2004. All sites that were discovered were flagged, recorded, and will be avoided. The locations of any historic and prehistoric sites discovered, along with any artifacts found, are sensitive and are not revealed to the public. Assuming all known cultural sites will be avoided; there are no negative impacts to cultural resources anticipated from this project.

Noise and traffic

The Jackson County zoning within the planning area is 99% forest resource and approximately 1% woodland resource. It is expected that forest management activities will be occurring on the lands zoned forest resource.

During the implementation of the Deadman's Palm project, traffic on the roads within the planning area is expected to increase. There would be a small increase of vehicle traffic from workers traveling to and from the work site. Traffic will increase as a result of log truck traffic hauling on Star Gulch and Upper Applegate Roads. During the most intensive and productive periods of commercial timber sale operations, up to 25 log truck trips could be expected in a day. These truck trips would be spread over several road routes within the planning area but ultimately would all use Upper Applegate Road and HWY 238. Commercial Timber sale operations are typically performed using three year contract periods. Timber haul does not usually occur

during the entire year and is highly variable with periods of little to no activity and other periods of more intensive activity. Highway vehicle traffic is regulated by state and county laws and regulations. The BLM does not have jurisdiction over traffic traveling on state and county roads.

During portions of the commercial conifer thinning, helicopters will fly through the area's airspace and increase the amount of noise typically heard in the area of the project. Previous experience indicates that rural interface residents are most often impacted in the early morning and late evening hours (Medford District RMP/EIS, 1995). Project Design Features (PDFs) have been created to help mitigate some of the impacts. Noise disturbance to local residents would be partially mitigated by regulating operating hours, day, and seasons through portions of the project area. Generally, any helicopter logging closer than ½ mile of a residence would be restricted to an operating period of 8:00 AM to 5:00 PM, Monday through Friday. Any helicopter logging located ½ to one (1.0) mile from a residence would be restricted to an operating period of 6:00 AM to 6:00 PM, Monday through Saturday; and no operating time restrictions would be enforced when helicopter operations are greater than one (1.0) mile from a residence.

Helicopters can work based on Visual Flight Rule (VFR) conditions. The safety is up to the pilots and if clouds, fog or wind are not threatening the safety of the operation and they can see from the landing to the woods they will fly. A loaded helicopter, carrying material that could be released, may not fly over any structure at any altitude. An unloaded helicopter may fly over a structure or people if they maintain the proper altitude. In many locales that is 1000 feet but in rural settings it can be 500 feet. When loaded, the aircraft must maintain a minimum horizontal distance of 500 feet from any structures or people. The aircraft may pass over private property under load if they maintain this distance. Individual property owners do not control airspace over private property. The pilots must maintain Federal Aviation Administration (FAA) requirements. BLM has no jurisdiction or control over flight regulations.

There can be short term disturbance through noise as a result of helicopter logging. The use of helicopters is based on the need to limit road development in the project area and the Northwest Forest Plan direction to emphasize the use and testing of aerial systems and low impact logging practices in the Applegate Adaptive Management Area. The short term noise disturbance is a trade off against the development of new roads that would be needed to implement project goals.

Helicopter logging is one of the approaches that the Adaptive Management Area was established to test. Helicopter logging typically reduces the number of miles of road construction required to reach a given piece of ground.

Employment

The Deadman's Palm project is expected to provide several small timber sale contracts along with one or more large timber sale contracts. The small sales would provide opportunities for small local companies to bid on and perform work. In addition to small timber sale contracts, fuel hazard reduction projects will allow opportunities for local forestry contractors to bid on contract work in the Deadman's Palm project area. It is expected that the total package of proposed work on this project will take 4-8 years to complete. The forest products harvested from the project would help in part to provide some of wood products used by the local community.

Monitoring

Riparian Fuels Study

Approximately 45 acres of fuel reduction activities will be monitored as part of a study to examine the effects and/or benefits of reducing fuel loading in riparian areas. Specific sites have not been chosen at this time, but basins selected must be small, as outlined in the study proposal. Two small drainage basins in the Star Gulch basin will be identified in the fall of 2005 for this study. Fish bearing streams will not be

selected. In the two selected treatment basins, riparian vegetation will be treated: both of the basins will receive hand-pile and burn treatments in the fall of 2007, and one of these will receive a broadcast burn treatment the following spring. A fifty-foot no-treatment zone will be left on either side of all stream channels. Overstory, shade-producing trees will not be targeted for removal in this study; only brushy species in the understory will be hand-piled and burned. Broadcast burning would be conducted as conditions allowed with the objective of no mortality of overstory trees. All treatments will utilize hand-crews to accomplish the work. Handlines constructed will be located on ridges, and will be rehabilitated after burning is completed.

Applegate Fuels Demonstration Project

This study was designed through collaboration with community members, BLM and Forest Service to test several approaches to fuels reduction. Intensive samples of vegetative characteristics will be taken before treatment and after treatment. The study's goals are to display the differences in treatments as they affect environmental, social and economic values.

CRITICAL ELEMENTS

The following elements of the human environment are subject to requirements specified in statute, regulation, or executive order and must be considered in all Environmental Assessments.

Critical Elements

Critical Element	Affected Yes	Affected No	Critical Element	Affected Yes	Affected No
Air Quality		X **	T & E Species		X **
ACECs		X	Wastes, Hazardous/Solid		X
Cultural Resources		X	Water Quality		X **
Farmlands, Prime/Unique		X	Wetlands/Riparian Zones		X **
Floodplains		X	Wild & Scenic Rivers		X
Nat. Amer. Rel. Concerns		X	Wilderness		X
Invasive, Nonnative Species		X	Energy Resources (EO 13212)		X
			Environmental Justice		X

**These affected critical elements would be impacted by implementing the proposed action. The impacts are being reduced by designing the proposed action with Best Management Practices, Management Action/Direction, Standard and Guidelines as outlined in the Environmental Impact Statements (EIS)/Record of Decisions *(RMP) (USDI BLM 1995)(USDA FS; USDI BLM 1994*) tiered to in Chapter 1. The impacts are not beyond those already analyzed and disclosed by the above mentioned documents.

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Deadman's Palm Landscape Project
Appendix A

SILVICULTURAL PRESCRIPTION
2005

SILVICULTURAL PRESCRIPTION
DEADMANS PALM TIMBER SALE PROJECT
(FY- 2005)

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Silvicultural Prescription
Deadmans Palm Timber Sale Project
(FY–2005)

I. Management Direction and Objectives

The prescribed vegetation treatments in this document are designed to comply with both the Medford District Approved Resource Management Plan (RMP) (USDOI, 1994) and the Record of Decision (ROD) within the Final Supplemental Environmental Impact Statement (FEIS – the President's "Forest Plan for a Sustainable Economy and Environment") on Management of Habitat of Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA, 1994). This prescription also complies with the April 1994 interagency ROD and Standards and Guidelines for the Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA, USDOI, 1994), the Western Oregon Program-Management of Competing Vegetation Record of Decision (ROD)(USDOI, 1989), and the Applegate – Star\Boaz Watershed Analysis (USDI, 1998).

The Ashland Resource Area ID team and area manager developed and considered certain objectives for this silvicultural prescription. The objectives are as follows:

A. Reduce the density of all vegetation condition classes across the landscape to improve vegetation vigor and reduce the fire hazard while creating desired vegetation structural characteristics.
B. Maintain and restore natural functions and processes necessary for the stability of ecosystem health and productivity.
C. For the commercial forest stands, create stands with trees of varying size and age (diverse stand structure), and with various seral patterns across the landscape to promote mature/old-growth stand characteristics.
D. Manage mature/old-growth timber stands to maintain their existence, structure, and function.
E. Increase the species composition of pine species and incense cedar into forest stands where appropriate (those species are more fire and drought tolerant than Douglas-fir or true fir).
F. Create a favorable microenvironment for the natural establishment of seedlings (especially pine species and incense cedar) by providing adequate available growing space and woody material of various size classes.
G. Reduce timber stand basal area to increase individual tree vigor, growth, and quality.
H. Minimize impacts to the northern spotted owl and other sensitive species and their habitat.
I. Maintain stream condition and stability in effected watersheds by maintaining appropriate stream buffers, by leaving trees in nonbuffered draw bottoms, and by

avoiding slumps or slide areas.

J. Maintain the stability and productivity of the soils in the sale area.

K. Maintain the integrity and functions of oak woodlands and shrublands and increase early seral stages of vegetation within.

L. Minimize the negative affects of vegetation competing with conifer establishment and growth.

II. Site/Stand Description

A. General Description of the Site

1. Legal Description

The Deadmans Palm landscape design project is in the Applegate Adaptive Management Area (AMA) and is west of and adjacent to the Bald Lick landscape design project. The southern boundary is where BLM lands meet USFS lands of the Rogue River National Forest near Palmer Ridge. The northern boundary is the main east-west ridge overlooking the Applegate Valley. The project area is located on both sides of Star Gulch. Tallowbox Lookout tower is located on the northcentral boundary of the project area. The project is six air miles southwest of Ruch, OR. The project area is comprised of 14 full and 13 partial sections within Township 39 South, Range 3 West, and Township 39 South, Range 4 West of the Willamette Meridian.

2. Drainage/Watershed

The project area is located within three subwatersheds of the Applegate River – McKee Bridge Watershed: Applegate River-Star Gulch, Applegate River-Beaver Creek, and Applegate River-Palmer Creek. Within Star Gulch, Benson Gulch, Lightning Gulch, Alexander Gulch, Ladybug Gulch, 1916 Gulch, 1917 Gulch, and 1918 Gulch are the major tributaries. Many other smaller unnamed tributaries flow into Star Gulch and the Applegate River. More details can be found in the water resources discussion of the Deadmans Palm Landscape Design Project environmental assessment.

B. Abiotic Conditions

1. Geomorphology/Soil Type

Tree height growth and the quantity of wood grown on any site is determined by the soil characteristics and properties. The characteristics and properties of soils are determined by physical and chemical processes that result from the interaction of five factors: climate, plants and animals, parent material, topography, and time. Parent material, climate, and topography account for most of the differences among soils in our area.

The project area is on the northern flank of the Klammath Mountain Province. This area's

geologic history dates back approximately 150 million years. About fourteen million years ago, the area around the Applegate River began uplifting, centering under Condrey Mountain. The area uplifted an estimated 23,000 feet (USDA and USDI, 1998). Since this time, the mountaintops have eroded away, depositing sediment and creating the broad, relativity flat valley bottoms seen in the lower sections of the Applegate River. The uplifting is continuing today, although at a much slower rate. Numerous rock types exist in the area including limestone, marble, granite, mica, schist, and serpentine. During past climate changes, the Klammath Province provided a geologic "bridge" that still functions today for plants and animals migrating in all directions. The Klammath River provides a "corridor" originating in the Great Basin and flowing west to the Pacific Ocean through the province (Atzet,1995).

Widespread great soil groups in this province include Haploxeralfs, Haploxerolls, and Xerochrepts.

The slopes have long concave profiles with steep ridge lines and moderate toeslopes. The soils grade from shallow, skeletal soils near the ridgetops to deeper, finer textured on the lower slopes.

This landscape is highly dissected. The mid to upper reaches of the south slopes tend to be nonforested due to the shallow soils, low rainfall and high evaporation rates. By contrast the northern slopes are cooler and are favorable for conifer growth.

The most common upland soil series in the project area include Caris Offenbacher, Vannoy-Voorhies complex, Tallowbox, and Manita series.

The Caris (Typic Xerochrepts - soils formed in a dry climate with thin or light colored surface horizons and little organic matter)/ Offenbacher series is widespread and commonly occurs on steep to very steep slopes (50 to 80%). Both soils are well drained colluvium. Typically the soils range from 20 to 40 inches in depth and overlay fractured metamorphised volcanic bedrock. Caris contains a dark brown gravelly loam over dark, very gravelly clay loam subsoil. Offenbacher has a grayish brown gravelly loam over reddish brown loam subsoil. Both soils are stable and permeable (.6 to 2.0 inches/hour). The available water capacity ranges from .03 to .19 inches/inch of soil and the site index ranges from 65 to 75 depending upon the aspect (Douglas-fir 50-year base).

Vannoy (Mollic Haploxeralfs - thick, dark colored, high base saturation, and strong structure, formed in a warm and continuously dry summer for long periods, moist in winter but with a minimum horizon), another widespread series, developed on moderate to steep slopes from metamorphic material. It is well drained and ranges from 20 to 40 inches in depth. Vannoy has a dark brown silt loam surface over yellowish red clay loam subsoil. Permeability is only moderate due to the dense subsoil (B horizon; .2 to .6 inches/hour). Surface protection is warranted due to the slow infiltration rate. The available water capacity ranges from .12 to .20 inches/inch of soil and the Douglas-fir site index ranges from 75 to 80 depending upon the aspect (50-year base). The Voorhies series has a dark brown gravelly loam over brown gravelly clay loam subsoil. Permeability ranges from .6 to 2.0 inches/hour. The available water capacity ranges from .07 to

.12 inches/inch of soil and the Douglas-fir site index ranges from 65 to 75 (50-year base).

The Tallowbox series (Typic Xerochrepts) is a moderately deep, somewhat excessively drained soil found on hillslopes and ridges. It formed in colluvium derived from granitic rock. The slope ranges from 30 to 80%. The surface layer is dark brown gravelly sandy loam about 6 inches thick. The upper 6 inches of the subsoil is dark brown sandy loam. The lower 11 inches is brown gravelly sandy loam. Weathered bedrock is at a depth of 23 inches. Permeability is moderately rapid and ranges from 2.0 to 6.0 inches/hour. Available water capacity is about .07 to .1 inches/inch of soil. The site index for Douglas-fir ranges from 70 to 90 (50-year base). Tallowbox soils are most commom in T39S-R3W-29 and the southeast corner of section 30. There is also a small area of Tallowbox soil between T39S-R4W-Sections 16 and 23.

The Manita series (Mollic Haploxeralfs) is a deep, well drained soil on hillslopes. It derived from metamorphic rock and formed in colluvium. The surface layer is dark brown loam about 8 inches thick. The upper 5 inches of the subsoil is dark reddish brown clay loam. The lower 45 inches is yellowish red clay loam. Depth to bedrock ranges from 40 to 60 inches. Permeability is moderately slow (.6 to 2.0 inches/hour) Available water capacity is about 8 inches. The site index for Douglas-fir is 75 (50-year base).

2. Topography/Elevation/Aspect

Elevations range from 1,577 feet near the confluence of the Applegate River and Star Gulch to 5,023 feet above sea level at Tallowbox Lookout which is the northcentral part of the project area. In general the major ridges are oriented in an east to west direction and most forest stands have a north or south aspect.

3. Precipitation/Snowfall/Temperature Extremes

The Applegate Valley is one of the driest areas west of the Cascade Mountains. Average annual precipitation in the Deadmans Palm project area ranges from approximately 26 inches along the Applegate (elevation 1,440 feet) to 52 inches in the highest elevations. Precipitation usually occurs in the form of rainfall over most of the area, although a mixture of rain and snow occurs between 3,500 and 5,000 feet. The majority of precipitation falls during November through March (68 percent of the yearly total). The annual precipitation fluctuates widely from year-to-year in the Applegate Valley. The 30-year average annual precipitation at Buncom is 23.56 inches (NOAA 2003). The nearest NOAA temperature station is at Ruch, OR, approximately 5 miles to the northwest of the project area.

Summer months are predominately hot and dry with maximum daytime temperatures averaging 89 degrees Fahrenheit during July and August. During the winter, daytime temperatures average 51 degrees Fahrenheit during January. Minimum nighttime temperatures at Ruch average 49 degrees Fahrenheit in August and 31 degrees Fahrenheit in January. Summer temperatures normally are accompanied by low humidity, typical of a Mediterranean-type climate.

Prevailing winds during the summer are from the north or northwest and are usually light. Summer thunderstorms can have winds in excess of 50 mph from any direction, but most of the storms enter the area from the south or southwest.

C. Biotic Conditions

1. Tree Series/Plant Associations

There are three tree series in the Deadmans Palm project area: Douglas-fir, ponderosa pine, and white oak. Plant association descriptions within these series can be found in Preliminary Plant Associations of the Siskiyou Mountain Province (Atzet and Wheeler, 1984) and Field Guide to the Forested Plant Associations of Southwestern Oregon (Atzet et.al., 1996; see Table 1).

On north slopes where the aspect is more conducive to cooler, more moist conditions, the PSME (Douglas-fir)/BENE (dwarf Oregongrape) plant association can be found. The PSME – PIPO (Ponderosa pine) plant association is also found on the cooler sites. In the southwestern corner of the project area, white fir is abundant in the forest understory, but Douglas-fir should be the preferred species.

On the drier sites the PSME/RHDI(poison oak) and PSME/RHDI-BEPI (Piper's Oregongrape) plant associations are most prevalent. Pine and white oak series forests are usually found on south and west aspects and the lowest elevations ((PIPO-QUKE (California black oak) and PIPO-PSME)).

Another tree species not described by tree series is knobcone pine (*Pinus attenuate*). Historically, this species lived on low fire intensity sites with rapid fire return intervals. Pure stands existed because of frequent fire. Since fire has been suppressed, Douglas-fir has overtopped many knobcone pine stands and now only scattered trees to small patches exist. Knobcone pine is a short-lived species that may die after 110 years or younger. Knobcone pine was found in 16 stands in 10 sections of the southwest corner of the project area. Prescribed fire is necessary to prepare a mineral soil seedbed, open the serotinous cones, and to perpetuate this species.

Table 1. Tree Series/Plant Associations Common to the Deadmans Palm Project Area.

Douglas-fir Series/Plant Associations	**Ponderosa Pine Series/Plant Associations**	**White Oak Series/Plant Associations**
PSME (Douglas-fir)/BENE (dwarf Oregongrape)	PIPO – QUKE (California black oak)	QUGA (Oregon white oak)/CYEC (Hedgehog dogtail)
PSME/RHDI (Poison oak) – BEPI (Piper's Oregongrape)	PIPO – PSME	QUGA – PSME/RHDI
PSME/RHDI		QUGA – CEMO (Birchleaf Mountain Mahogany)
PSME/DEPAUPERATE		
PSME – PIPO (Ponderosa pine)		
PSME – ABCO (White fir) – HODI (Oceanspray)		
PSME – ABCO/BENE		

2. Stand History

Fire profoundly influenced upland systems and was used extensively by Native Americans and Euroamerican settlers until fire suppression began in the early 1900's. The lack of frequent, low-intensity fire in recent history has changed the landscape. Stands of widely spaced large diameter trees such as ponderosa pine and Douglas-fir were common in the lower elevations. On xeric sites pure stands of knobcone pine were found. Grass or light underbrush was often found under the large trees. Records from the General Land Office surveys in the late 1800's describe the lower elevation slopes generally as "open ridges" or "rolling, open timber with an undergrowth manzanita and chaparral"(Lalande,1995). Notes indicate that mid to upper elevations consisted of mature "old-growth" pine and fir stands, remnant oak and cedar openings, brush fields and numerous patches of young seedlings.

After pioneer settlement, the density of endemic tree and shrub species was reduced as a result of anthropogenic disturbances (lighting fires, human caused fires for land clearing, hunting, mining, grazing, protection and food, mining, logging, and other factors related to urbanization).
Due to the frequent disturbance regime, historic forest lands were generally more open, had fewer trees per acres, trees of larger diameter, and a different species composition. These stands generally had more large diameter ponderosa and sugar pine, oak species, incense cedar and native grasses. On dry micro sites Douglas-fir probably never reached the climax stage because of the frequent disturbance regime. Disturbances were probably as frequent as every 1 to 25 years. According to a USDA approximation of ecosystem health, the Applegate basin was composed of 10 to 40 percent early successional vegetation historically (USDA, 1993). In this project area, most of the commercial stands originated between 1786 and 1932. Most of the forest stands became established within 10 years after a fire, although the harsher sites may have taken 30 to 40 years to become forested. The oldest forest stands are found in riparian areas with

north to east aspects. The oldest trees found were 474 and 500 years-old.

3. Structure Description

The next level of dichotomy from tree series/plant associations is vegetation condition class. The Medford District Watershed Analysis Committee (1994) has designated the following classes: Grass, Forbs, Herbaceous; Shrubs, Non-forest Land; Hardwood/Woodland; Early (0 to 5 years) and Seedlings/Saplings (0 to 4.9 inches DBH); Poles (5 to 11 inches DBH); Mid (11 to 21 inches DBH); and Mature/Old-growth (21 inches + DBH). The following is a description of the stand development and structure of each vegetation condition class:

a. Grass, Forbs, Herbaceous

During the nineteenth century the area of open grassland was also more extensive because of frequent disturbance. Since that time the ecological processes of relay and initial floristics have occurred and areas that may have been grasslands have given way to shrubs and tree species. There are 153 acres of grassland in the project area. The grasslands in the project area are limited to areas with severe environmental conditions such as south to west aspects with shallow, rocky soils. Mixtures of grasses, shrubs, and multi-layered tree stands can occur here. Common grasses include California fescue, blue wildrye, and hedgehog dogtail.

Common herbs in moist areas include snow queen, western starflower, woods strawberry, Oregon fairybell, pathfinder, catchweed bedstraw, rattlesnake plantain, miner's lettuce, starry false solomon's seal, and western swordfern. In the dry Douglas-fir and pine sites, hairy honeysuckle, white-flowered hawkweed, woodland tarweed, mountain sweet root, common yarrow, and hedge parsley are the common herbs.

b. Shrubs/Non-forest Land

The shrublands have been influenced by a lack of fire disturbance. As a result, extremely dense stands of shrubs and tree species are present. Most of the shrublands are heterogeneous in species composition, arrangement of species, and structure. The vegetation tends to be late seral with a lack of early seral stages. There are approximately 404 acres of shrubland in the project area.

Whiteleaf manzanita is the most abundant species and is tree-like in form. Scattered throughout the manzanita patches are clumps of wedgeleaf ceanothus, deerbrush ceanothus, poison oak, mountain mahogany, hardwood trees, and various size classes of conifer species. Conifer tree species migrate into the shrublands during wet climatic cycles but retreat when harsh climatic conditions occur. Five layers of vegetation are possible. Other dry land shrubs include Piper's Oregongrape and silk tassel. Moist microenvironment shrubs, most frequently found on northerly aspects, include snowberry, California hazel, creambrush oceanspray, dwarf Oregongrape, serviceberry, Indian plum, thimbleberry, black raspberry, trailing blackberry, ribes species, vine maple, and Pacific yew.

c. Hardwood/Woodland

Oak woodlands are the lower elevation limit for forest vegetation and are transitional to savanna and grasslands. Oregon white oak occupies sites where available soil moisture is between that supporting grass or ponderosa pine and the greater amount required to support Douglas-fir. The floristic composition and structure of the woodlands have also been disturbed by fire suppression, livestock grazing, the introduction of exotic species, and firewood harvest. Common plant associations include QUGA-CYEC (hedgehog dogtail), QUGA-CEMO (Birchleaf mountain mahogany), and QUGA-PSME/RHDI. Other plant species common to the associations include Pacific madrone, California black oak, ponderosa pine, whiteleaf manzanita, wedgeleaf and deerbrush ceanothus, poison oak, snowberry, hairy honeysuckle, woodland strawberry, wild carrot, and *Torilis arvensis*.

The oak woodlands commonly have 3 to 4 layers of vegetation; the mature oaks, dominate ponderosa pine or Douglas-fir, grass, and the fourth layer sometimes being conifer or oak regeneration. When shrubs are present, the stands can have 5 or more layers of vegetation. It is common for whiteleaf manzanita to be tree-like in form. There are 2,284 acres of woodland in the project area.

d. Early (0 to 5 years) and Seedlings/Saplings (0 to 4.9 inches DBH)

These two condition classes are grouped together because both classes are young trees established after logging or some natural disturbance. Douglas-fir is planted on cool, moist sites with northwest to northeast aspects. Ponderosa pine and incense cedar are planted on low elevation sites and on areas with hot, dry aspects (northwest, west, southwest, south, and southeast aspects). Many plantations and the 1987 Star Gulch fire area are a mixture of species including hardwoods, with Pacific madrone being the most abundant. If residual conifer trees from the previous stand were left standing, as many as 4 layers of vegetation can exist: newly planted seedlings, hardwood sprouts overtopping the planted seedlings, residual saplings to poles, and residual overstory trees. Most often just two layers are present, the seedlings and overtopping hardwoods. This is the time period after a disturbance in which new individual plants and species continue to appear. There are 1,761 acres of plantations in the project area and these plantations are in the stand initiation stage of development. This represents only 14 percent of the project area; 18 percent of the forestland base.

e. Poles (5 to 11 inches DBH)

There are 1,897 acres of pole size trees in the project area and most of these stands are under 100 years of age. Many of the trees are suppressed and diameter growth is less than 1 inch per decade. These stands originated after fires or logging activity. Some pole sized trees may be found on ridge tops or on poor sites and are over 100 years of age. There is a wide range of stand densities and there are stands with over 3,000 trees per acre. In some stands, crown ratios (length

of tree crown divided by total tree height) are less than 30% and released trees would probably not respond to thinning. Trees of the smallest diameter classes have stem diameters less than one percent of the total tree height (tall and skinny appearance) subjecting these trees to snow, ice, and wind damage. Healthy pole stands will often be found on northerly aspects, are in the stem exclusion stage (the time period when new plants do not appear and some of the existing ones die) and are predominantly single layered. Sometimes older residual overstory trees are scattered throughout the pole stands and no understory vegetation is usually present except for scattered forbs.

f. Mid (11 to 21 inches DBH)

The majority of the commercial timber stands in the project area are in the mid-condition class (4,276 acres). Douglas-fir and ponderosa pine dominate the stands, with scattered clumps of sugar pine and incense cedar in the overstory. Canyon live oak, Pacific madrone, and California black oak are often found in the understory. These stands became established over a 10 to 40 year period following a disturbance and most of the stands are now between 79 and 124 years of age. Many of these stands are beginning to enter the understory reinitiation stage (later when a disturbance creates an opening in the forest canopy layer, forest floor herbs, shrubs, and trees again appear and survive in the understory). As mortality from wind damage, bark beetles, and pathogens create small openings in the crown canopy of the trees, regeneration begins to occur in the cleared area below. Two to three canopy layers are present in most of the stands and four layers are present when old-growth trees are found in the overstory. Commonly found in these stands are suppressed and intermediate crown class conifers, suppressed hardwood trees, dominant and codominant crown class conifers, and old-growth trees. Douglas-fir that invaded the dry pine sites are experiencing moisture stress and are also being killed by Douglas-fir bark beetle. Pine series stands have experienced high levels of tree mortality due to stress caused by the competition from Douglas-fir trees and subsequent attacks by the western pine beetle.

g. Mature/Old-growth (21 inches + DBH)

In the project area, 5 to approximately 160-acre timber stands in this condition class are usually found in cool, moist microenvironments. The oldest trees are found along streams and in topographic areas with favorable north to east aspects where protected from fire. According to stand inventory data, there are 1,549 acres of large sawlogs stands (21 inches DBH+) in the sale area. Most of these stands are in the mature seral stage with multiple canopy layers. Dominant crown class trees 500 years of age and younger, large diameter and large diameter limbed trees are present with a variety of other age class trees beneath (vertical structure, multi-cohort stand). A minimum of 4 canopy layers are present.

The ROD and RMP define the mature seral stage as the point when stand growth slows to the time when the forest develops structural diversity; approximately age 80 to 200. Old-growth is defined as the stage which constitutes the potential plant community capable of existing on a site given the frequency of natural disturbance events. This stage exists from approximately age 200 until stand replacement occurs and secondary succession begins again (understory reinitiation

stage of forest development). For purposes of inventory, old-growth stands on BLM-administered lands are identified if they are at least 10% stocked with trees of 200 years or older and are 10 acres or more in size. For purposes of habitat or biological diversity, the BLM uses the appropriate minimum and average definitions as provided by PNW publications 447 (USDA, 1986) and GTR-285 (Franklin, 1981). GTR-285 states that the size of old-growth units should be at least 300 acres in size to function as old-growth forests, and that the working definition emphasizes structural and compositional characteristics rather than the conceptually important functional features that are difficult to measure (Objective D, page 4).

The landscape pattern of the project area can be considered "coarse-grained" because of aspect change and associated vegetation condition classes that are dependent upon aspect. However, at the stand level, the landscape pattern can be considered more fine-grained when compared to historic stands for all vegetation condition classes.

Subtle changes in species composition and stand structure are occurring over the landscape. Many trees with old-growth characteristics are dying as a result of increased competition with second growth trees for limited resources . Douglas-fir, the climax species for some of the forested area, is replacing ponderosa pine, sugar pine and incense cedar because of its more shade-tolerant nature. Douglas-fir is also encroaching upon the edges of the oak woodlands, although mortality of Douglas-fir along these edges has been noticeable during the last few years. Whiteleaf manzanita and ceanothus species are migrating into the oak woodlands and replacing the oaks, pines, and native grass species. In the mid-size vegetation condition class, suppressed shrubs and hardwood trees beneath the dominant tree canopy layer are dying. Pacific madrone and live, white and black oak have dropped out of some conifer stands where light and water have become limiting. Dead greenleaf and whiteleaf manzanita may be found in the understory of some conifer stands and is indicative of a vegetation shift from shrubs to trees. This trend also indicates that greenleaf and whiteleaf manzanita are probably the species that will pioneer the site following future disturbance. Other shrub species dying out of the conifer stands include deerbrush and wedgeleaf ceanothus, creambrush oceanspray, and serviceberry.

It must be recognized that we are observing the landscape vegetation of today at one single point in time. Although current vegetation stem densities are high and are mostly in the mid and late seral stages, the vegetation condition classes of today are atypical when compared to historic vegetation. This is due primarily to the effects of fire suppression on the landscape. It must also be recognized that with or without silvicultural management, the vegetation will be changing continuously because of natural succession. There is no single state of a forest that is the only natural state. The recommended prescriptions in this document will be cultivating late-successional characteristics such as variable stand structure and more vigorous growth within the stands. Latham and Tappeiner (2002) found that old trees sometimes benefited and were not harmed by density reduction activities. Growth increased by 10 percent or more for 68 percent of the trees in treated stands, and nearly 30 percent of trees increased growth by over 50 percent. They also found that when forest stands were not treated, 64 percent of the old trees decreased in growth. Ten to forty years from now the mature stands will be composed of trees larger than 20 inches DBH, although even-aged, mid size stands without residual old-growth trees may still

require an additional 100 years to develop mature/old-growth characteristics.

4. Coarse Woody Material

Many ecological processes have created the even and uneven-aged forest stand structure over the last century. These same processes are responsible for the variable amounts of coarse woody material (CWM) across the landscape. The Guidelines for Snag and Down Wood Prescriptions in Southwestern Oregon (White 2001) states that amounts of coarse woody material across landscapes are highly variable and should vary over time with stand development. Amounts of CWM are influenced by forest stand history, soils and respective plant associations, climate, and topography. A Memorandum of Understanding was signed on January 19, 2001 with the Provincial Interagency Executive Committee (PIEC) to implement the guidelines on a trial basis in southwest Oregon for 5 years.

Bark beetles have killed large diameter Douglas-fir and pine trees where tree stocking levels have been high or where the species is not best adapted to the site. There have been patches of Douglas-fir mortality adjacent to oak woodlands and shrublands especially on southern slopes. Wind also blows down an occasional tree, or small groups of trees, when the shallow soil profile becomes saturated with water. In the dry Douglas-fir prescription areas, overstocked stands have been subject to small scale bark beetle attack and suppression tree mortality in the understory.

On 10,900 feet of transect line, the overall average amount of coarse woody material (CWM) is 10.7 tons per acre. This amount corresponds well with the 70 to 124 year-old forest stands and the number of old-growth trees that are dying. CWM ranges from 0 to 30.6 tons per acre. The coarse woody material stem diameters were concentrated in the 3 to 39 inch classes at the large end but numerous sites had pieces over 60 inches in size, and the average total length per acre is 1,337 feet. Coarse woody material was distributed across all decay classes, although decomposition classes 3 (twigs and branches gone but bole is still round, hard and in large pieces) and 4 (bark and branches are gone and bole is now round to oval) are most common. CWM pieces sampled must have a minimun intersect diameter of 5 inches and a minimum length of 8 feet.

According to Whites data (2001), the Douglas-fir - Poisonoak plant association group (PAG) has an average of 8.9 tons per acre. This PAG is most common in the project area along with the pine tree series associations. In the project area this PAG averaged 8.9 tons per acre. The Moist Douglas-fir PAG should have an average of 19.8 tons per acre. Moist Douglas-fir sites did have 19.9 tons of CWM per acre with an average length of 1,267 feet of downed wood.

D. Insects, Disease, Forest Health

Bark beetle infestations are occurring in the project area. The 2003 Aerial Insect Survey Data map (USFS & ODF , 2003) can be used as a guide for where tree mortality that has occurred recently in the project area. Western pine beetles (*Dendroctonus brevicomis*) are attacking the pines while flatheaded fir borers (*Melanophila drummondi*) and Douglas-fir beetles (*Dendroctonus pseudotsugae*) are killing Douglas-fir. Drought conditions and high stocking

levels are severely stressing the trees physiologically, enabling the beetles to enter and kill the trees. The average Douglas-fir tree vigor rating as measured by leaf area index is 51; 21 for ponderosa pine (when the trees were sampled in 2000 to 2002; vigor has probably declined with 2 years of drought). Trees with vigor ratings below 30 will succumb to attack from bark beetles of relatively low intensity. Trees with vigor between 30-70 can withstand progressively higher attacks but are still in danger of mortality from the insect attacks. Trees with a vigor rating of between 70-100 can generally survive one or more years of relatively heavy attacks and trees with ratings above 100 cannot be killed by bark beetles (Waring, et. al., 1980).

Western dwarf mistletoe (*Arceuthobium campylopodum*) is present in small patches and scattered trees throughout the project area. Infections are usually systemic and form globose brooms. Most brooms are in the lower third of the tree canopy. Heavy infections result in growth loss, wood quality reduction, top-killing and mortality. Although the spread of the infection is slow, as the trees lose vigor from the mistletoe infection the susceptibility to attack from insects and pathogens increases.

Forest pathogens are also changing the forest stand structure and forest development pattern. Phellinus pini (red ring rot) is affecting Douglas-fir and ponderosa pine. It is apparent that the disease is most common in stressed trees. Some of the infected trees are beginning to die or are subject to stem breakage thus allowing light to reach the forest floor and the understory reinitiation stage to begin. Brown cubical butt rot (Phaelous schweinitzii) is also present.

Trees in the project area are growing at the lowest levels since stand establishment in the late 1800's and early 1900's. Ten year radial growth is approximately .42 inches for all tree age classes sampled, less than 1.5 inches of diameter growth every 10 years (Fig. 1). Tree growth is now lower than at any time over the last 300 years. The figure also illustrates a long period of satisfactory tree growth due to lower tree stocking levels (from 1801 to 1911). During this time period it can be speculated that frequent fires kept tree stocking levels low and tree growth high.

Entomologists/silviculturists have found that at least 1.5 inches of tree diameter growth per decade decreases the risk of bark beetle attack (Hall, 1985). Dolph (1985) found that bark beetle attack occurred in unmanaged stands when the trees produced 20 or more rings per inch (less than or equal to one inch diameter growth per decade). Stand vigor can be expected to decrease because timber stands are significantly overstocked and stand age is increasing. Relative density index ratings indicate that stands are at the point of imminent mortality and suppression (RDI of .55; crown closure occurs at a RDI of .15). Relative density index is the ratio of actual stand density to the maximum stand density attainable in a stand with the same mean tree volume (Drew and Flewelling, 1979). Many stands in the project area have a relative density of over .70, so in regard to stand growth and vigor the forest is not healthy. All environments with finite resources can only support a finite amount of living biomass (Oliver and Uzoh, 1997). It should also be pointed out that even if some of the stands are thinned in the near future, mortality of trees may continue because of the loss of tree sapwood (cavitation). Tree roots with a xylem diameter of less than 5 millimeters, were more vulnerable to cavitation than stems (Sperry and Ikeda, 1996). Decreases in tree vigor and growth have contributed to an overall decline in forest

health. Some of the treated timber stands may only experience improved tree vigor with increased precipitation and time.

Wood production per unit of foliage decreases as the total canopy leaf area increases. The rate of that decrease depends not only on competition among trees for light, but also on competition with understory plants for water and nutrients. Low production of stem wood per unit of foliage has been associated with a tree's inability to accumulate reserves or to produce defensive compounds. Stem growth only occurs once the resource demands of foliage and root growth have been accommodated (Waring, 1987). In old trees growth decline is caused by reduced net photosynthesis. Stomatal disfunction in older trees caused lower hydraulic conductance and reduced photosynthesis. Net photosynthesis per unit area of 1-year-old foliage from old lodgepole and ponderosa pine averaged 14 to 30 percent lower than the same-aged foliage in younger trees (Yoder et. al., 1994).

Forest health is quantified by assessing the physical environment itself, the forest's resistance to catastrophic change, tree mortality, changes in tree growth and vigor, changes in species composition, erosion, water drainage, stream flow, and nutrient cycling. According to the Applegate Adaptive Management Area Ecosystem Health Assessment (USDA, 1994c), the physical, biotic, and trophic networks (natural functions and processes) are intact and working in the Applegate Adaptive Management Area except where soil erosion or raveling occurs, where certain stream reaches are aggraded, or where high elevation clearcuts are still non-reforested. These eroded, aggraded, and non-reforested areas represent a small portion of the adaptive management area and none of these areas are known to be within the project area.
A healthy forest ecosystem has the physical environment, biotic resources, and trophic networks necessary to sustain processes and viable populations of indigenous species. When these criteria are met, the ecosystem is able to maintain its productivity and resilience over time when exposed to drought, wildfire, insect attack, or human-induced changes. The Deadmans Palm project area may not be resilient to catastrophic change. As mentioned earlier, vegetation densities are very high and ladder fuels are abundant. Vegetation mortality is already occurring because of plant competition and expanding bark beetle populations, so the stage is being set for catastrophic stand replacement fires. Part of the 1987 Star Gulch fire occurred within this project area (T39S-R3W-17, 18, 19 & 20). Stand species composition and structure shifts previously discussed in the vegetation class description sections could also be considered unhealthy. The replacement of ponderosa pine and sugar pine by Douglas-fir increases the percentage of drought-susceptible trees in a stand, therefore, the risk of beetle infestation and/or wildfire also increases.

E. Specific Stand Data

ORGANON (Hann et.al.,1992) was used to analyze data from 170 plots distributed throughout the project area. For individual stands, trees per acre ranged from 172 to 3,150; basal area per acre (BA/AC), 135 to 342 ft^2; and relative density index .620 to 1.628. Table 2 presents stand information for some of the Operations Inventory (OI) units sampled in the Deadmans Palm project area.

Currently, the stocking levels of stands throughout the project area are high. This is primarily due to the lack of large-scale natural disturbance, fire suppression, and no silvicultural treatments. The overall average for the project area is 709 trees per acre. Average radial growth for the past ten years is .42 inches. The average relative density for the area is .878 and indicates that physiologically the trees are at the point of suppression and mortality.

F. Maps of Proposed Project
(See Attached Maps)

III. Analysis In Support of Prescription

A. Desired Future Condition

A "coarse grained" landscape pattern should be the broad goal of forest management. Over time a wide range of stand densities, stand structural characteristics, age classes, species composition, and arrangement of stand components should be developed to create stands with late-successional characteristics (this implies uneven-aged management). A variety of species in various seral stages of development is necessary to provide for a variety of habitats and perhaps ecosystem functions. The landscape must be managed so that connectivity of mature/old-growth stands is maintained where possible after considering anthropogenic influences. This may only be possible by maintaining the connectivity of the riparian areas and where northern aspects and better soils are located. The south facing slopes with poor forest soils will be able to grow fewer large diameter trees per acre thus a forest appearing more open. It must be reemphasized that the present day even-aged, single storied stands without residual mature/old-growth trees may still require an additional 100 years to develop the desired characteristics. These stands must be shifted from the stem exclusion stage, to the understory reinitiation stage, and finally to the old-growth stage.

Stand densities should not be allowed to reach the point of imminent mortality and suppression. This point is reached when the relative density index is .55 or greater. The relative density index of Douglas-fir stands should range between .35 and .55. Table 3 shows the recommended stocking levels necessary to lower stand relative densities to an acceptable level. Harvesting greater amounts of basal area per acre would result in the removal of more trees than necessary.

Stand densities should be lower on pine sites, uneven-aged understory reinitiation stands where variable relative density indexes are required, ridges, and droughty areas in order to maintain maximum health and stand resiliency. The Applegate Adaptive Management Area Ecosystem Health Assessment recommends 60 to 120 ft^2 BA/AC as an acceptable level of basal area in these areas. On these sites the relative density index may be below .35 because there is evidence that heavy thinning to a relative density index of .25 is necessary for the development of the understory and vertical diversity (Hayes et.al., 1997). In contrast, this is considered to be a heavy thinning in Douglas-fir stands and landscape designing should be used for locating the desired areas for heavily thinned stands.

Dense pole and mid-sized trees should be harvested from around the crowns of trees with old-growth characteristics to ensure their survival. Resulting stand densities should be lower than present levels though the stand densities will still be higher than historic levels as discussed in a previous section of the prescription. The ROD and RMP directs that stands must not have fewer than 16 trees per acre. Biologically, good sites in the Applegate Valley can support approximately 20 healthy, 50-inch DBH trees per acre. At this stocking level there is likely to be a rich understory.

On harsh pine sites the species composition of stands should contain at least 75% ponderosa pine, which is a drought resistant species. This species exhibits characteristics that allow them to avoid and tolerate desiccation. Hydration of the protoplasm and stomatal closure characteristics effect the rate of photosynthesis. Stomatal closure occurs at higher water stress levels in ponderosa pine than in Douglas-fir, grand fir or sugar pine. As stomata close, resistance to CO_2 transfer increases and rates of photosynthesis decrease. Closure of the stomata allows trees to conserve water. Ponderosa pine can maintain higher levels of photosynthesis as foliar stress builds up to -12 atmospheres and then drops as stress increases. On these harsh sites, hardwood species, especially large diameter trees, should also be maintained in stands. In some conifer stands, where canyon live oak is the predominant species in the understory, prescribed fire will be needed to control the sprouts. Variety in the arrangement of species is also important.

Diverse stand structure (horizontal and vertical) is also necessary to support a wide variety of species. Wildlife species respond to ecological characteristics of trees regardless of forest age. Future stands should be multi-cohort stands with as many vertical layers of vegetation as the endemic species permits. Trees should develop large crowns, large diameter limbs, and deep fissures in the bark. A variety of seral stages will also add to the diversity. The end result should be a healthy forest ecosystem that has the physical environment, biotic resources, and trophic networks capable of sustaining processes and viable populations of indigenous species. An ecosystem that, when exposed to drought, wildlife, insect attack, and human-induced changes, remains productive and resilient over time.

Table 2. Diameter Growth in Thinned vs. Unthinned Stands Grown For 20 Years

O.I.# POLES MID MATURE	STAND AGE (BREAST HEIGHT AGE)	PRESENT BA/AC (ft^2)	PRESENT TREES PER ACRE	PRESENT 10-YEAR INCREMENT (INCHES)	PRESENT AVERAGE DBH	PROJECTED DBH IN 20 YEARS (INCHES) UNTHINNED	PROJECTED DBH IN 20 YEARS (INCHES) THINNED
POLES							
154691	47	135	1,279	.54	4.4	5.9	10.7
155019	85	310	1,084	.41	7.2	9.7	15.7
157066	59	319	1,459	.42	6.3	8.4	15.1
157070	58	342	3,150	.68	4.5	6.5	9.4
155023	80	241	529	.42	9.1	11.5	15.2

O.I.# POLES MID MATURE	STAND AGE (BREAST HEIGHT AGE)	PRESENT BA/AC (ft^2)	PRESENT TREES PER ACRE	PRESENT 10-YEAR INCREMENT (INCHES)	PRESENT AVERAGE DBH	PROJECTED DBH IN 20 YEARS (INCHES) UNTHINNED	PROJECTED DBH IN 20 YEARS (INCHES) THINNED
MID							
154638	124	152	656	.60	6.5	8.6	12.1
154670	85	261	451	.43	10.3	12.0	16.2
154688	109	186	638	.42	7.3	11.4	16.1
154724	89	167	786	.68	6.2	8.1	15.9
154761	70	268	997	.94	7.0	9.9	16.5
154898	71	236	450	.78	9.8	13.5	19.5
154935	100	282	595	.44	9.3	11.1	17.0
154963	110	280	306	.48	12.9	17.8	25.5
154981	75	260	332	.56	12.0	14.8	20.8
155011	94	304	678	.56	9.1	11.9	18.5
155115	35	193	428	1.74	9.1	12.4	15.6
155120	80	257	1,293	.84	6.0	8.4	13.8
124244	97	240	234	.54	13.7	16.9	19.8
154711	110	185	289	.46	10.8	12.8	17.3
154738	101	207	340	.34	10.6	13.5	17.7
154771	95	302	835	.46	8.1	9.7	17.9
154968	75	237	407	.89	10.3	11.6	18.6
LATE							
129136	112	232	719	.62	7.7	11.3	19.9
154674	155	198	482	.41	8.7	11.2	16.7
154868	158	216	334	.69	10.9	18.5	24.1
154946	216	190	1,007	.28	5.9	8.1	16.4
154962	90	265	172	.60	16.8	18.8	26.7
154969	120	286	766	.58	8.3	10.5	19.7
155060	91	206	741	.87	7.1	11.1	17.1
155072	98	224	242	.65	13.0	17.0	25.2
156198	120	219	441	.50	9.5	11.9	17.6
157057	172	197	521	.28	8.3	10.7	16.6
150501	118	242	740	.62	7.7	10.2	15.4

Table 3. Recommended BA/AC (ft^2) In Order to Lower Stand Relative Density to an Acceptable Level.

O.I.#	PRESENT BA/AC (ft^2)	PRESENT RELATIVE DENSITY	RECOMMENDED BA/AC (ft^2)	REMAINING TREES/ACRE	RESULTING RELATIVE DENSITY
POLES					
154691	135	.647	78	203	.290
155019	310	1.218	114	113	.349
157066	319	1.322	112	120	.349
157070	342	1.628	90	291	.349
155023	241	.863	109	136	.349
MID					
154638	152	.622	101	183	.349
154670	261	.892	115	110	.349
154688	186	.729	89	84	.269
154724	167	.696	112	120	.349
154761	268	1.065	115	107	.349
154898	236	.822	120	92	.349
154935	282	1.004	117	101	.349
154963	280	.875	140	50	.349
154981	260	.838	128	70	.349
155011	304	1.093	122	86	.349
155115	193	.692	112	120	.349
155120	257	1.085	108	144	.349
124244	240	.732	126	76	.349
154711	185	.620	101	87	.301
154738	207	.700	97	78	.286
154771	302	1.131	87	68	.254
154968	237	.810	93	64	.265
LATE					
129136	232	.890	126	76	.349
154674	198	.723	116	106	.349
154868	216	.722	133	60	.349
154946	190	.812	116	106	.349
154962	265	.746	100	31	.244
154969	286	1.065	124	80	.349
155060	206	.813	116	104	.349
155072	224	.697	139	50	.349
156198	219	.770	120	91	.349
157057	197	.732	117	102	.349
150501	242	.926	90	104	.284

B. Silvicultural Options Considered

The environmental assessment for the Deadmans Palm project lists 3 Alternatives:

Alternative I.	No Action.
Alternative II.	Treat the entire landscape with a variety of silvicultural prescriptions, leaving various numbers of trees per acre, in diverse structures, based on distinct tree series and plant association requirements. NLAA for spotted owls and new roads would be constructed as required.
Alternative III.	The landscape would be treated as in Alternative II except no new roads would be constructed.

C. Recommended Treatment or Action

In order to reduce the density of all vegetation over the landscape, reduce fuel loading, support ecosystem based management, and create structurally diverse forest stands, Alternative II of the environmental assessment is recommended to be the proposed action. A combination of 2 silvicultural methods will be used to treat the landscape vegetation (low thinnings and selection methods).

All of the recommended prescriptions are designed to retain the largest tree DBH classes, restore the vigor of the forest lands, and keep silviculture options open for the future. The selection harvest treatments will help to promote vertical stand structure, match species to appropriate site conditions, and encourage species diversity .

1. Commercial Thinning of the Mid and Mature/Old-growth Condition Classes

The majority of the commercial acreage to be treated would be commercially thinned. The areas to be thinned have the highest stocking densities and will be located between the group selection and single tree selection areas. The treatment will be a combination of crown spacing and basal area thinning. Homogeneous Douglas-fir stands with constant amounts of basal area that fall within the range of 135 to 342 ft^2 per acre will be treated using basal area guidelines to reduce basal area to between 80 and 160 ft^2 per acre depending upon the site conditions. Dry sites may have the minimum amount and moist sites may have the maximum amount of basal area. Heterogeneous stands with a wide range of basal areas when trees tend to be clumped will be treated using crown spacing guidelines. Crown spacing will be used to release old-growth trees and desired early seral species (single tree selection).

Trees on moist Douglas-fir timber sites will be thinned to a 3 to 15-foot crown spacing, but not exceeding 160 ft^2 basal area. On dry Douglas-fir and pine sites, trees will be thinned to a 10 to 25-foot crown spacing. In areas where tree mortality is occurring because of bark beetles, stands will be thinned to a 15 to 35-foot crown spacing. Trees recommended for harvest include suppressed, intermediate, and some codominant crown class trees with live crown ratios of less than 30%, trees lacking branches on one or

more sides of the bole that are not conical in shape, dying trees with pitch tubes, trees with fungus conks, and trees with broken or forked tops. Second growth trees will also be thinned from around trees with old-growth characteristics to assure the survival of the dominant, structurally unique, old-growth trees. Table 4 shows the benefits of commercial thinning in regard to the capture of future tree mortality and an increase in tree growth. Two OI units were chosen to represent the mid and mature vegetation classes and were modeled in ORGANON to provide the data for Table 4. After thinning the stands will be more similiar to historical stands by having larger and fewer trees per acre.

Table 4. Description of O.I. Units 157039 and 154735 With and Without Silvicultural Treatment.

Existing Stand: 157039 (Mid stand)

Stand Age	Trees/ Acre	Basal Area	Scribner Volume	10 Year Change in Volume
87	479	342	48,128	-------
Future Growth of Stand if Not Treated (note the decrease in trees/acre through natural mortality):				
97	400	352	56,452	8,324
107	363	360	64,111	7,659
117	333	368	71,758	7,647
127	306	373	78,649	6,891
137	283	378	84,888	6,239
Future Growth if Stand is Thinned to a Relative Density Index of .349 (139 ft^2 Basal Area/Acre):				
97	87	136	26,051	------
107	86	155	32,541	6,490
117	85	177	39,736	7,195
127	85	198	47,116	7,380
137	84	218	54,350	7,234

Existing Stand: 154735 (Mature stand)

Stand Age	Trees/ Acre	Basal Area	Scribner Volume	10 Year Change in Volume
123	347	182	28,276	------
Future Growth of Stand if Not Treated (note the decrease in trees/acre through natural mortality):				
133	257	187	33,198	4,922
143	208	196	37,993	4,795
153	175	204	42,466	4,473
163	152	213	47,148	4,682
173	134	222	51,765	4,617
Future Growth if Stand is Thinned to a Relative Density Index of .349 (159 ft^2 Basal Area/Acre):				
133	109	122	24,898	------
143	102	135	29,128	4,230
153	95	149	33,427	4,299

163	90	162	37,783	4,356
173	84	174	42,310	4,527

To further portray the prescriptions, the Stand Visualization System (SVS) was used to show what existing forest stands look like today and what they will look like after the proposed prescriptions are applied (U.S.D.A. and University of Washington, 1995). Organon plot data was input into the SVS program for the simulations. The following data is for individual forest stands previously described in Table 4. Many similar stands of each vegetation type were studied to develop the prescriptions. **Even though stand stockability differs , individual stands will be marked approaching the simulation figures because of similar stand structure and existing trees per acre.**

Stand 157039s.001 is a mid-sized Douglas-fir stand that has moist site characteristics (T39S-R3W-18). Presently the stand has 479 trees per acre and a relative density index of 1.122. There are 124 trees per acre that are less than 8 inches DBH. Illustration 157039s.002 shows the stand after harvest (89 trees per acre at a RDI of .349). Illustration 157039s.004 shows the treated stand 50 years later (84 trees per acre, RDI of .554, with trees ranging in size from 14 to 30 inches DBH).

Stand 154735s.001 is a late-sized class Douglas-fir stand with dry site characteristics (T39S-R3W-21). Presently the stand has 347 trees per acre and a relative density index of .634. Illustration 154735s.002 shows the stand after harvest (122 trees per acre at a RDI of .349). Illustration 154336.004 shows the treated stand 50 years later (84 trees per acre, RDI of .463, with trees ranging in size from 18 to 50 inches DBH).

2. Group Selection Openings

On dry ponderosa pine or Douglas-fir sites, group selection areas up to 1-acre in size (236-foot diameter opening) will be harvested adjacent to suitable pine trees creating openings arranged in a random, natural pattern. Old-growth yellow bark pine can be centered in the group selection openings. These openings are needed to increase the stocking level of pine species (ponderosa pine needs 25% full sunlight to grow) and incense cedar. Eighty ft^2 BA/AC of timber will be left standing around the group selection areas to allow more light to enter the openings and to create spatial variability. In areas with a cool, moist microenvironment 1/7 to 1/6-acre group selection areas (88 to 96-foot diameter openings) around suitable Douglas-fir seed trees will be created to establish Douglas-fir seedlings.

3. Single Tree Selection Harvesting for the Purpose of Creating Vertical Stand Structure
(Understory Reinitiation Stage/Variable Relative Density Index; Douglas-fir Regeneration Harvest)

Only 10 Douglas-fir stands 150-years of age or older have been selected for understory reinitiation stage selection harvest (129083, 129087, 154673, 154682, 154945, 155049, 155097, 155099, 155104, and 157041). These stands comprise approximately 1 percent of the forestland base, or 104 acres. The RMP discusses the objectives of this prescription and some trees with late-successional characteristics will have to be harvested to meet the objectives. These trees are most likely in the suppressed, intermediate,

and codominant crown classes and subject to bark beetle attack because of low vigor. The trees may also be infected with dwarf mistletoe. Treatment is needed to release natural regeneration and to create multiple-canopied stands over time. Treatment within these stands may be variable as stand structure conditions are not always homogeneous. After harvest the RDI will range from approximately .210 to .350. Three treatment situations are described in the marking guidelines depending upon the age class of trees found in the OI units.

A selection harvest prescription to be applied in areas (approximately 1/5 to 1 acre in size) where 3 or more trees with old-growth characteristics are encountered is as follows: second growth trees will be selectively harvested from around old-growth trees and for a radius of 200-feet around the old-growth patch. An average of 16 to 25 trees per acre will be left in the 200-foot radius area. The purpose of this is to ensure the survival of the old-growth trees and to create vertical stand structure over time. The leave trees should be healthy and composed of all crown classes with live crown ratios of 30% or more, straight boles and full, conical shaped crowns. This technique will help to develop stands that are multi-species and uneven-aged.

Pine series sites with oak species and whiteleaf manzanita present will be selection harvested in order to reduce stocking levels of undesired species (mainly Douglas-fir) and to improve the vigor of early seral species. This will also create diverse stand structure when a new age class of pine trees is established below the existing vegetation. 16 to 25 of the largest conifer trees per acre would remain as well as an additional 10 to 20 ft^2 BA/AC of 7 to 11 inch DBH trees. All hardwood trees over 8 inches DBH would also remain on site. Smaller hardwoods would be precommercially thinned.

Ponderosa pine/native grass plant associations are also present. These areas will be treated so that pine regeneration can be established beneath the existing pine trees. All of the Douglas-fir trees that have encroached upon the pine sites will be removed, except for 60 to 80 ft^2 BA/AC that will be left standing around these areas for a radius equal to the average height of the existing stand.

4. Selection Harvesting for the Purpose of Releasing Natural Douglas-fir Seedlings and Saplings

In areas where closely spaced Douglas-fir seedlings and saplings are found beneath an overstory of mature trees, selection harvesting can be employed to remove some of the mature trees. It is recommended that no less than 10 of the largest, healthiest trees per acre of various crown classes be left over the Douglas-fir regeneration. The areas of regeneration must be 1/7-acre in size (88-foot diameter) or larger. By removing overstory trees, the seedlings will be released to grow and vertical stand structure will be enhanced over time.

5. Commercial Thinning of Pole Stands

Three situations are common: 1.) There are dense, decadent pole stands on aspects that receive sun for most of the day. The Douglas-fir is short in height and poison oak and grasses are common in the understory; 2.) Decadent patches of trees may be found with the majority of the trees having crown

ratios of 30% or less; and 3.) There are thrifty, young stands with good crown ratios (30% or more) on cool, moist sites.

For the first two situations only, trees with crown ratios of 30% or more will be marked to leave on a 3 to 15-foot crown spacing. Trees with crown ratios of less than 30% will be harvested. Sometimes openings less than 1-acre in size may result.

Thrifty stands should also be marked to a 3 to 15-foot crown spacing but due to better site conditions and trees with high crown ratios, more basal area per acre will probably remain.

Table 5 shows the benefits of commercial thinning in regard to the capture of future tree mortality and an increase in tree growth. OI unit 155037 was modeled in Organon to provide data for the table.

Table 5. Description of O.I. Unit 155037 With and Without Silvicultural Treatment.

Existing Stand: 155037 (Pole stand)

Stand Age	Trees/ Acre	Basal Area	Scribner Volume	10 Year Change in Volume
103	697	240	25,351	-------

Future Growth of Stand if Not Treated (note the decrease in trees/acre through natural mortality):

113	571	260	33,230	7,879
123	478	277	42,354	9,214
133	408	292	50,540	8,186
143	355	306	60,934	10,394
153	314	317	69,062	8,128

***Future Growth if Stand is Thinned to a Relative Density of .35 (110 ft^2 Basal Area/Acre):**

113	129	133	22,666	------
123	127	163	30,480	7,814
133	125	192	39,265	8,785
143	123	220	48,210	8,945
153	120	245	57,132	8,922

*** Note**: Treated stands grow more consistently than untreated stands with less tree mortality.

SVS illustration 155037s.001 is a pole sized Douglas-fir stand (trees 2 to 30 inches DBH) that has dry site characteristics (T39S-R4W-24). Presently the stand has 697 trees per acre and a relative density index (RDI) of .909. Illustration 155037s.002 shows the stand after harvest (132 trees per acre at a RDI of .349). Illustration 155037s.004 shows the treated stand 30 years later (125 trees per acre, RDI of .542, and trees ranging in size from 8 to 48 inches DBH).

6. Selection Harvesting of Dwarf Mistletoe Trees

The stands that will be treated with the Dwarf-Mistletoe prescription are single and multi-storied natural stands consisting of large poles (11 to 21 inches DBH) and/or mature/late-successional trees. Stand structure is mostly in the understory reinitiation stage but some areas of stem exclusion stage will be encountered. Basal area and species composition are variable. A large percentage of the trees are infected with dwarf mistletoe and have DMR ratings of 2-6 (Hawksworth, 1977). There are dead and dying trees in the stand with evidence of bark beetles attacking the less vigorous trees.

The objective of treating these stands is twofold. One objective is to insure the future health and growth of the existing regeneration and to prevent the spread of dwarf mistletoe to uninfected mature trees. The second objective is to increase the species composition of early seral species such as pine and incense cedar thus enhancing species diversity and species resistance to mistletoe.

These areas will be divided into three zones with different treatments in each. The first zone is within 150 feet of a ridge top. All trees with visible dwarf mistletoe shall be removed with the largest openings being created no greater than 1 acre. If areas of 100% infection greater than 1 acre are found, infected trees with the lowest DMR ratings, or trees with broom types 2 and 3, will have to be left. ZONE 2 prescriptions will then apply. Openings shall not exceed one-third of this zone. For example, there should be at least 360 feet of timber between 1-acre openings.

Zone 2 starts past 150 feet from the ridge top and extends to the draw bottom. In this zone the mistletoe will be managed in clumps. All trees with visible mistletoe shall be removed without creating openings larger than 1-acre. Uniform patches of mistletoe infected trees will be removed by the group selection method. Where possible, group selection areas up to 1-acre in size will be created by marking infected trees around or adjacent to resistant species. If resistant species are not present, the group selection areas will be created where the highest concentrations of dwarf mistletoe are found. Openings shall not exceed one-fifth of this zone. The remaining patches of uninfected trees will be thinned to no more than a 15-foot crown spacing.

In areas of 100% infection greater than 1 acre, infected trees with the lowest DMR ratings will be left, or trees with broom types 2 and 3. **One ½-acre patch of infected trees will remain for every 20-acres.** A 30-foot crown spacing shall be created around remaining infected patches removing all susceptible species. If there is more than one patch in the 40 acres, the remaining infected trees will be thinned to a 15-foot crown spacing. Uniform patches of dwarf mistletoe trees up to ½-acre in size will be left every 660 feet. An effort will be made to create the leave patches around infected old-growth trees.

The third zone is in the riparian areas. If possible, infected areas adjacent to riparian zones (ZONE 3) will be left. **Between all infected areas, a 30-foot crown spacing will be created with adjacent uninfected forest stands.** Resistant species will not be removed in this canopy opening area and throughout all zones.

In all zones, all infected old-growth trees, and all trees 34 inches DBH and larger with a DMR rating of 1 and 2 shall remain. A 30-foot crown spacing will be created around these trees, by removing susceptible species. **One ½-acre patch of infected trees will remain for every 20-acres.** When infected trees remain, trees with broom types 2 or 3 will be favored.

It is recognized that Douglas-fir dwarf mistletoe is a necessary and often beneficial part of a healthy landscape. Mistletoe brooms provide a unique microenvironment and tree mortality resulting from infection creates natural openings in the stands. These prescriptions are an effort to confine the mistletoe to the areas where it is most desirable for silviculture and wildlife.

7. Shrubland and Woodland Treatments

Selected noncommercial treatment areas (shrublands and woodlands) will be treated by intermediate treatments (precommercial and commercial thinning), the individual tree selection method, and prescribed burning.

The objectives for treating the woodlands are as follows: reduce the fire hazard by thinning specified vegetation and eliminating most ladder fuels; restore oak/native grass plant associations; enhance the vigor and quality of the hardwood species (mainly oak to induce acorn crops); use the coppice method to introduce another age class of hardwood species; and decrease the abundance of Douglas-fir and shrub species.

Individual, merchantable Douglas-fir trees can be harvested if ponderosa pine trees are also present (this saves the possible habitat and woody debris component of the ecosystem). Strips or patches of merchantable conifers and hardwoods within the woodlands, where favorable aspects and microenvironments exist, should be thinned to approximately 36 trees per acre (1 to 10 of these trees being conifers). Douglas-fir seedlings through the pole timber size classes should be cut. An occasional Douglas-fir tree may be left if no pine or incense cedar are available to leave. All trees with old-growth characteristics should remain and all the vegetation beneath these trees should be cut to ensure their survival. Cut suppressed and intermediate crown class oak trees to establish stump sprouts. Old, tall whiteleaf manzanita shrubs should remain that produce large berry crops. All other whiteleaf manzanita should be cut. Wedgeleaf ceanothus is also desired, but should be thinned to stimulate sprouting. The wedgeleaf ceanothus shrubs should be cut to heights varying from 6 inches to 3 feet.

The objectives for treating the shrublands are as follows: increase wildlife forage production and quality, decrease fire hazard by reducing the stocking levels and ladder fuels of the shrub species, eliminate or reduce the abundance of noxious weeds, and prevent the encroachment of Douglas-fir.

Individual, merchantable Douglas-fir trees can be harvested if ponderosa pine trees are also present. Douglas-fir seedlings through the pole timber size classes should be cut. All trees with old-growth characteristics should remain and all the vegetation beneath these trees should be cut to ensure their

survival. All ponderosa pine and incense cedar trees should be retained. All oak trees except for trees less than 6 inches DBH with crown ratios of less than 10% shall remain. Leave old, tall whiteleaf manzanita shrubs (but prune the lower ladder fuel branches) that produce large berry crops at a 15 to 25-foot crown spacing. All other whiteleaf manzanita should also be cut to the 15 to 25-foot crown spacing. Wedgeleaf ceanothus should also be left, but cut the shrubs to various heights to stimulate sprouting. The wedgeleaf ceanothus shrubs should be cut to heights varying from 6 inches to 3 feet. Small patches of starthistle should be burned by piling slash on top of the patches and then burning them.

Dense manzanita patches can be thinned by cutting a series of trails to desired vegetation such as oak trees. Prescribed burning will also be used where understory fuels are light in the shrub lands and woodlands.

D. Prevention/Avoidance Strategies

Competing vegetation can be shrub, tree, or herbaceous species. When the land management objective is timber production, shrub and hardwood tree species are considered as "competing" for the available growing space. When the land management objective is forage production, tree species may be considered as the undesirable species. Because of the large area and the variable site conditions of the proposed project area, a variety of competing plant species are likely beneath the tree canopy layer in all of the vegetation condition classes.

Competing vegetation may become a problem in the areas harvested by the single tree selection method. Here large openings in the crown canopy layer will be created. Openings as large as 20 to 35 feet between tree crowns may be created and heavy slash accumulations are anticipated. In the PSME/BENE plant association, California hazel, dwarf Oregongrape, thimbleberry, and creambrush oceanspray may become established, or resprout, at the same time as the conifer regeneration. Gravelly soils can compound this problem. It is recommended that prescribed fire (cool underburning) be used in these areas to alleviate the fire hazard and for establishing Douglas-fir regeneration. As an alternative, slash could be handpiled on top of existing patches of shrubs and burned.

In the PSME/RHDI-BEPI or PSME/RHDI plant associations, poison oak, deerbrush ceanothus, whiteleaf manzanita and grass species are likely to invade. Prescribed burning may suppress these species long enough for conifers to become established, but fire will stimulate the growth of grass and ceanothus species. Fire may also kill desired tree species if their roots are too close to the soil surface (this may occur where the organic matter on the soil surface is 2 inches deep or greater). Prescribed underburning is appropriate for reducing areas of dense grass, shrubs, and herbaceous species for the purpose of reducing competition for available soil water. In the pine series forests, prescribed fire is also essential for preparing suitable seedbeds for the pine seed. Scalping is an alternative for reducing the competing grass and ceanothus species. Deerbrush ceanothus and hardwood stump sprouts may also become a problem in these plant associations after the use of fire. Therefore, in the area harvested by the single tree selection method it is recommended that logging slash be handpiled and burned where the regeneration of deerbrush ceanothus would be a severe problem. Prescribed burning can then be used at a later time (3 to 10 years) to control competing vegetation. From an economics standpoint, prescribed

underburning is less expensive than mechanical removal.

The same problems will probably be experienced in the group selection harvest areas and the same treatment is prescribed.

After timber harvesting in the commercial thinning areas, shrub and grass species may become established after harvest, but this vegetation will again become suppressed when the crown canopy layer begins to close. Pacific madrone and oak tree species should not be a problem in regard to competing for available growing space in the thinned areas. The majority of these species are suppressed, well below the height of the codominant and dominant conifer trees and will probably not release. Although, the number of these small diameter trees in the understory of some stands (greater than 100 trees acre) is excessive. Slashing of hardwoods with less than 30 percent live crown ratio would increase stand vigor and reduce fire ladder fuels. Prescribed underburning would be appropriate where dense mats of grass and other herbaceous vegetation will compete for soil water with the tree species.

No competing vegetation problems are anticipated in the hardwood/woodlands and shrublands if future maintenance of these areas is performed with prescribed fire as planned. In some oak woodlands, whiteleaf manzanita and Douglas-fir will probably encroach again, but cool underburning every 3 to 10 years after the first manual treatment should control these species. The oak woodlands may also be seeded with native grass species and the grasses may out-compete the manzanita, Douglas-fir, and even noxious weed and non-native grass species. The same philosophy applies to the shrublands.

IV. Implementation Plan

A. Marking Guidelines

Approximately 4,280 acres of forestland are in need of commercial thinning (only 45% of the total commercial forestland base). Most of the project area is below 5,000 feet elevation and is composed of dry Douglas-fir and pine tree series forest (35% of the forestland base). Grasslands, shrublands, and woodlands comprise 23 percent of the total project area. Only 12 percent of the forestland base is considered moist Douglas-fir site where large trees could persist for centuries. The forests were created by fires in the nineteenth and early 20th centuries and only relatively small forest stands (approximately 5 to160 acres) or clumps of trees with old-growth characteristics can be found. Riparian areas serve as corridors of large diameter trees across the landscape such as along Star Gulch and the larger gulches that flow into it. The diverse topography and aspect changes tend to keep the forest stand size very small across the landscape. In most of the dry Douglas-fir and pine forest there is less than one old-growth tree per acre. One old-growth tree per acre does not necessarily make an old-growth forest. The sites are dry and not conducive to high stocking levels of old trees especially on south facing slopes.

The intent of this forest health project is to maintain biological diversity and sustain productivity of the forests within the adaptive management area. We intend to do this by improving or maintaining forest structure (species composition, a variety of tree size classes and tree heights, genetic diversity, age classes, dead wood, and the heterogeneous forest pattern at various scales of space and time) and natural

processes in the ecosystem. We recognize that large diameter second growth trees and trees with old-growth characteristics are an important part of the forest structure needed for a variety of natural processes. Therefore, low thinning is recommended (which always selects the smallest tree size classes first for harvest) and the saving of trees with old-growth characteristics that are described in the marking guidelines. There is no way to quantitatively measure the characteristics. The characteristics are somewhat subjective, but are reliable guidelines for trained foresters and forest technicians. Low thinning and the description of old-growth tree characteristics will save the majority of large diameter trees that are over 150 years of age in the forest. A small percentage of large diameter trees with old-growth characteristics will be harvested, but only for stated objectives as described in the prescription and marking guidelines (For the Buncom Project only 1.4 percent of all the trees harvested were 29 inches DBH and larger). Some of the large trees are being harvested in planned road right-of-ways. The number of large diameter trees harvested will be monitored for this project also. By abiding by the marking guidelines and prescription, there will be no ecological processes or components of the ecosystem that would be threatened, leading to the destabilization of the forest ecosystem.
See the attached Appendix A (Marking Guidelines) which describes how the silvicultural methods will be applied to the various vegetation condition classes and designated areas for treatment.

B. Recommended Design Features

The following treatments should be applied to respective EA units:

1. Commercial Timber Harvest Units

a. In units where the single tree and group selection methods are used, logging slash should be handpiled and burned (swamper burning). Precommercial thinning should also occur before the handpiling and burning. This site preparation treatment should be used in these areas so that early seral species can be planted.

b. In units where only commercial thinning was performed, logging slash should be lopped and scattered if the tree tops are removed. If tops are not removed the slash should be handpiled and burned (swamper burning). Prescribed, cool underburning in the fall would benefit some Douglas-fir timber stands that have dense mats of grass and shrub species, and where deerbrush ceanothus will not be a problem. Prescribed fall underburning is also recommended in the pine series forest stands in order to prepare suitable seedbeds.

c. After timber harvest, non-merchantable trees with undesirable silvicultural characteristics should be slashed. In areas where precommercial thinning is prescribed, all non-merchantable trees should be cut <u>except</u> the largest live conifer saplings and poles that meet the following criteria:

1) Minimum 4-inch terminal leader with at least the top 40 % of the tree containing live limbs.
2) Non-chlorotic, light or dark green with very little or no yellowish tint.
3) Undamaged top.

4) Free of visible disease, cankers, fire damage, or blister rust.

5) Demonstrates good form and vigor.

6) No multiple tops or ramiforms.

In the absence of conifers that meet the above definition for an acceptable crop tree, include any live conifer seedling that is at least three (3) feet tall that falls within the spacing guidelines.

In the absence of conifer trees, hardwoods will be considered acceptable crop trees. The order of preference will be Pacific dogwood, Oregon ash, bigleaf maple, any oak species, and Pacific madrone. Space the acceptable conifer and hardwood trees at a variable spacing (35 to 45 feet).

In all prescription areas 1/7-acre in size and larger, where overstory trees were marked to release healthy, Douglas-fir seedlings through saplings, the natural regeneration would be precommercially thinned. Seedlings (0-2 inches DBH) should be thinned to a 12 x 12-foot spacing; saplings (2.1 to 4 inches DBH) to an 16 x 16-foot spacing; and poles (4.1 to 8 inches DBH to a 25 x 25-foot spacing.

Throughout the entire project area, all saplings through pole (7 inch DBH and smaller trees) timber should be slashed within the dripline of the old-growth trees that were released with the 15 to 25-foot crown spacing.

2. Pine Slash Disposal to Prevent *Ips* Pine Engraver Beetle Outbreaks

In all pine series stands, logging slash should not be handpiled because this is beneficial for *Ips pini*. *Ips* have several generations per year, so some small (preferably smaller than 4 inches in diameter) green slash should be available spring through summer to absorb populations. Logging slash should be as small as possible and scattered into openings, which would allow the slash to dry and kill the beetle larvae. Slash should only be created through the end of December. The last emerging adults will overwinter in the duff, and if there is no fresh green slash available when they emerge in the spring, they will disperse. Cool, fall prescribed burning is an option for slash removal as long as tree roots are not damaged. Stressed trees are subject to beetle attack.

In all pine series stands, all pine logging slash shall remain within the units to avoid large accumulations of non-merchantable pine material in logging decks.

3. Noncommercial Hardwood/Woodland Units

a. Seed native grasses after treatment.

b. Leave a 350 x 125-foot untreated area for every 10 acres in every unit.

c. Harvest and yard specified merchantable conifer timber within shrublands

and woodlands where stand densities are too high.

C. Coarse Woody Material

Information Bulletin No. OR-97-064 (USDOI, 1996) states, "prescriptions should account for current habitat conditions and the timing and development of subsequent snags and coarse woody material (CWM) until the next stand once again begins to contribute CWM. Leaving green trees and felling to provide a source for CWM should be part of the partial harvest prescription."

Historically, much of the project area was very open with few old conifer trees per acre. Only on northerly aspects with moist environments were uniform forest stands found. The forests of today originated from the late 1800 and early 1900 fires and fire suppression. As a result of fire suppression the present day forests are now overstocked. Tree vigor began to decline as early as 1909. The overstocked stands along with the drought conditions of the 1980's through 2001 have allowed for extensive tree mortality. In some places there may be more snags today than in historic times. Therefore, the 10.7 tons/acre of CWM on the ground at this time may well reflect average conditions for mid to mature seral stands on harsh sites. There is also a substantial amount of standing small diameter dead wood because of suppressed canyon live oak.

Because of the unique habitat created by the large coarse wood and the surrounding vegetation it is recommended that the existing microenvironment remain intact. Where coarse woody material is found that is 20 inches in diameter at the small end, and a minimum of 8 feet long, all trees immediately surrounding this wood shall be left standing to provide shade. This recommendation will apply to all prescription areas.

The majority of the project area will receive intermediate type harvest methods (commercial thinning). It is suggested that all Stage 1 snags be left in the interior of homogeneous conifer stands. Homogeneous conifer stands should be inventoried after harvesting by wildlife biologists to see if snag requirements have been met. If not, damaged or diseased trees should be designated for girdling. In areas adjacent to shrublands and woodlands where tree mortality has been high, it is recommended that all snags be retained. Stand inventory data for the project area indicates that in the mid condition class forest stands (11 to 21 inches DBH) there is an average of 47 damaged trees per acre that are 3 to 44 inches DBH. The mid sized stands also have an average of 119 dead standing trees per acre with an average DBH of up to12 inches. The mature size class stands (21 inches DBH and larger) have an average of 49 damaged trees per acre with an average DBH of 8.5 to 48.4 inches. In the mature stands there is an average of 103 standing dead trees per acre with an average DBH of 3.9 to 13.7 inches. Snags over 60 inches DBH were found. Some of the damaged trees will be retained for green tree retention. The information bulletin also states that 15 to 20% ground cover of downed woody material or 4.5 to 10 tons of fresh downed woody debris is adequate after timber harvest (6,500-feet of post-harvest CWM transects has shown an average of 5.21 tons per acre and a range of 2.2 to 8.1 tons per

acre of additional CWM that has an intercept diameter of 5 inches or greater after commercial harvest; BLM 2002, unpublished data). Therefore, the debris created by partial harvesting in combination with existing CWM and the recommended snags to be retained is sufficient to meet CWM requirements.

D. Subsequent Treatment Planned

The proposed silvicultural methods of Alternative II suggests uneven-aged management over very long periods of time (over 100 years) to create structurally diverse, multi-cohort timber stands as proposed in the Medford District RMP.

After the proposed treatments are performed, the options for future treatment are many. Future management objectives will determine when the commercial forest lands are harvested again. Landscape analysis and design should also determine which types of silvicultural treatments are applied and in what pattern across the landscape. **ORGANON** analysis shows that if the objective is to perform a regeneration harvest when there are 16 trees per acre, 20 inches DBH and larger available to leave, the mid-sized and mature vegetation condition classes could be entered in 40 to 50 years. For pole stands to reach this condition it would take more than 50 years (Pole stands need to be thinned again 20 to 40 years after the first commercial thinning). If the management objective is to manage strictly by density levels (high RDI), pole stands through mature stands can be entered in 20 to 70 years.

At the time of the next stand entry, existing group selection areas can be released and additional group selection areas can be created.

The single tree selection and group selection harvested stands should be planted with the appropriate planting stock. The pine group selection areas should be planted with a mixture of 1-0 or 1-1 ponderosa pine, sugar pine, and incense cedar stock at a 16-foot spacing (40 trees/acre). The 1/6 and 1/7-acre Douglas-fir group selection areas should not have to be planted.

The single tree selection harvest areas around the patches of mature/old-growth trees should be planted also. These areas should be mapped as pine or Douglas-fir sites and planted accordingly. Two year old or older planting stock should be used. The pine sites should be planted with 70% ponderosa pine, 25% sugar pine, and 5% incense cedar at a 16-foot spacing. Douglas-fir sites should be planted with 100% Douglas-fir at the same rate of stocking. The planted sites should have stocking surveys and maintenance performed as recommended by BLM standards.

After manually treating the hardwood/woodlands and shrublands prescribed fire should be used for the maintenance of these areas. In the oak woodlands where the production of frequent acorn crops is desired, cool, prescribed burning should be performed every 3 to 5 years. The shrublands can be burned as necessary to develop the desired seral stages of vegetation.

E. Avoidance Strategies for Animal Damage and Forest Health

At this time no problems with animals are anticipated. After performing density management, more early seral stage vegetation will become established and blacktail deer populations may increase. Unburned slash piles may create habitat for rodents and isolated pockets of seedling damage may result. Tree tubing may be required at a later date.

After the trees respond to release, they should be more resilient to pathogens and insects. Density control of the forest stands is essential to prevent the occurrence of these biotic agents. In the group selection areas seedlings and saplings with mistletoe should be thinned-out.

F. Monitoring Recommendations

The monitoring plan for the Deadmans Palm project has been expatiated by an interdisciplinary team during the environmental analysis process. Monitoring will be focused on selected study areas. In general, site characteristics and trends will be described and measured before and after activities take place. Monitoring is necessary to validate proposed prescriptions and assumptions made about the prescriptions to see that stated objectives are attained. The following disciplines will be monitored as described:

1. Silviculture/Forest Health

The forest stands being monitored are not in the Deadmans Palm project area. They are stands representative of the stand vigor and commercial thinning issues commonly found in the Applegate Adaptive Management Area and are located in the Lower Thompson Creek vicinity.

a. Forest stands are being monitored for vigor by using relative density as an index, leaf area index and sapwood radial growth.

b. Individual tree growth is being measured over time in representative stands on permanent plots in a releasability study. Large and old-growth ponderosa pine and Douglas-fir are of particular interest.

c. Occurrence of natural regeneration and survival of planted seedlings in established group selection and regeneration harvest areas.

d. Oak woodlands will be monitored for vegetational response to fire and thinning.

2. Fuel Hazard and Risk

Fuel characteristics (loading) will be measured before and after treatments in all vegetation types. Size and composition of fuels related to structure will be assessed at regular intervals. The potential fire

hazard and rate of spread will be evaluated for treated and untreated areas.
Particulate matter generation will be measured during selected prescribed burning episodes.

3. Soils

Soils will be monitored for erosion and compaction by type and location before and after prescribed treatments.

4. Wildlife

Wildlife populations and habitat will be inventoried on both treated and untreated areas. In addition, the layout of protection buffers, Siskiyou salamander habitat, spotted owl sites, and great grey owl sites will be monitored.

5. Air Quality

Particulate matter and air opacity are being monitored at the Provolt Seed Orchard air quality facility as part of the Rogue River Basin Interagency Smoke Monitoring Plan.

6. Contracts

Contract work will be developed and performed to meet watershed analysis objectives. Contract work results will be monitored.

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GLOSSARY

Aggradation	The geologic process in which inorganic materials carried downstream are deposited in stream beds, flood plains and other water bodies resulting in a rise in elevation.
Association, plant	A stand or group of stands made up of plants characterized by a definite floristic composition consisting of uniformity in physiognomy and structure and uniform habitat conditions. The term generally is reserved for a climax community.
Coppice Method	Any type of cutting in which dependence is placed mainly on vegetative reproduction.
Defensible Fuel ProfileZone (DFPZ)	An area where tree densities are low enough to reduce the occurrence of catastrophic wildfire by lowering the spread rate and the resistance to control. The zone has light ground fuels shaded by a stand of larger, fire resistant trees where crown closure does not exceed 40%.
Dripline	The outer radius of the tree crown where the limbs touch the soil surface in a downward vertical projection.
Early Seral	Refers to shade intolerant tree species that pioneer a site after a disturbance.
Homogenous	Of the same kind or nature; consisting of similar parts or elements; opposed to heterogeneous.
Live Crown Ratio	The length in feet of the live tree crown divided by the total tree height. Crown length is the total tree height minus the height to crown base.
Microenvironment	The immediate environment surrounding an organism. Variables of concern may be temperature, atmospheric moisture, radiant energy flux, wind, oxygen and CO_2 concentrations, temperature and thermal conductivity of the substrate, and possibly spectral

	distribution of radiation.
Multicohort	Stands where the trees arose after two or more disturbances (uneven-aged or all-aged).
ORGANON	(**OR**egon **G**rowth **AN**alysis and projecti**ON**) growth and yield model for southwest Oregon forest stands.
Permeability, soil	The ease with which gases, liquids, or plant roots penetrate or pass through a bulk mass of soil or a layer of soil.
Planting Stock	Tree seedlings grown in controlled environments for lifting or in containers that can be transplanted in the forest. The seedlings are developed morphologically and physiologically to match particular operational environments.
Relative Density Index	The ratio of actual stand density to the maximum stand density attainable in a stand with the same mean tree volume.
Scalping	Scraping away undesirable vegetation from spots of a specified radius where the trees are to be planted.
Selection Cutting	A method of uneven-aged management involving the harvesting of single trees from stands (single-tree selection) or in groups (group selection) without harvesting the entire stand at any one time.
Series	Term for a group of habitat types having the same tree species dominant at climax; for example, white spruce series or black spruce series.
SVS	Stand Visualization System. SVS generates graphic images depicting stand conditions represented by a list of individual stand components, e.g., trees, shrubs, and down material. Images produced using SVS help communicate silvicultural treatments and forest management alternatives to a variety of audiences.
Swamper Burning	The act of piling logging slash and burning at the same time.
Trophic Dynamics	Energy flow through a community organized into several tropic levels. Pertaining to nutrition.

Deadman's Palm Landscape Project
Appendix B

Analysis of How the Deadman's Palm Landscape Project Implements The Northwest Forest Plan Aquatic Conservation Strategy (ACS) Objectives

Deadman's Palm Aquatic Conservation Strategy

The Northwest Forest Plan's (NWFP) Aquatic Conservation Strategy (ACS) has four components: Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. It is guided by nine objectives which are meant to focus agency actions to protect ecological processes at the 5th-field hydrologic scale, or watershed. How the four components of ACS relate to the Deadman's Palm Landscape Project is explained below:

1. Riparian Reserves: Riparian Reserve widths for streams, springs, wetlands, and unstable soils have been determined according to the protocol outlined in the NWFPs Aquatic Conservation Strategy and are listed in the BMPs for the Deadman's Palm project.

2. Key Watersheds: Tier 1 Key Watersheds contribute directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species. They also have a high potential of being restored as part of a watershed restoration program. Within the Applegate River-McKee Bridge Watershed, the Palmer and Beaver Creek subwatersheds are considered Tier 1 Key Watersheds. Star Gulch is not. The Deadman's Palm timber sale would not affect aquatic habitat in either the Palmer or Beaver subwatersheds.

3. Watershed Analysis: BLM and the USFS completed the Applegate Star/Boaz and Beaver/Palmer Watershed Analysis' in 1998 and 1994 respectively. These two documents cover the Applegate River-McKee Bridge Watershed.

4. Watershed Restoration: Most of the restoration activities in the Applegate River-McKee Bridge Watershed have focused on restoring fish passage to better habitat on federal lands. Projects by the local watershed council, ODFW and/or BLM include culvert removal and replacement, dam removal, road decommissioning, and irrigation ditch fish screens.

Evaluation of This Action's Consistency with Northwest Forest Plan Aquatic Conservation Strategy Objectives

1. Maintain and restore the distribution, diversity, and complexity of watershed and **landscape-scale features** to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Topography, slope, forest fire regime, climate, and the distribution of soil types and plant communities are some of the landscape-scale features affecting aquatic systems in the Applegate River-McKee Bridge Watershed. One of the primary treatment objectives of the Deadman's Palm project is to compensate for an altered fire regime and restore certain plant communities. The intent of this objective is to restore the function of landscape-scale processes like wildfire in order to protect the complexity and distribution of plant communities (including riparian areas) across the landscape.

2. Maintain and restore **spatial and temporal connectivity** within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide

chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

In the Applegate River-McKee Bridge Watershed, BLM-managed land is concentrated in the steeper slopes of tributaries to the Applegate River. Here, longitudinal connectivity and road densities are the primary issues for aquatic species. Planned road decommissioning in the project area would restore or improve migration corridors within streams for aquatic species and eventually improve lateral drainage connections. These improvements would only be noticeable at the site scale, along Ladybug Gulch in the Star drainage basin.

3. Maintain and restore the **physical integrity** of the aquatic system, including shorelines, banks, and bottom configurations.

Decommissioning Ladybug road would help restore the integrity of the drainage. The road that parallels Ladybug Gulch exists literally in the channel of Ladybug Gulch in areas, and is a chronic source of sediment input to the stream system. Over time, Ladybug Gulch would recover, and come to resemble a natural and properly functioning stream. This benefit would only be noticeable at the site level, not at the fifth-field spatial scale. 1917 Gulch Rd. has already been closed, and for the most part has recovered. It would be officially decommissioned through this sale.

4. Maintain and restore **water quality** necessary to support healthy riparian, aquatic and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

There would be no effect on water temperature, because shade would be maintained or improved along all stream channels. There may be some small amount of fine sediment entering stream channels from the culvert placed in the dry draw on a short segment of new road construction, in Ladybug Gulch from the road decommissioning, and from in channel habitat improvement. Upland work would have no effect on fine sediment levels, due to the filtering action of Riparian Reserve buffers, extensive BMPs designed to prevent overland sediment movement, and normal PDFs. In addition, the road renovation and decommissioning would reduce fine sediment at many locations within the Star drainage basin, reducing the cumulative amount of fine sediments reaching stream channels downstream. Any sediment increases resulting from the proposed road work would be minor and would be offset by the substantial sediment decrease resulting from road decommissioning. This would ultimately benefit aquatic systems. The beneficial effects of these actions would be unnoticeable at the large spatial scale of the Applegate River-McKee Bridge Watershed, due to continuing water quality problems from historical and present-day activities.

5. Maintain and restore the **sediment regime** under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Improved roads and decommissioning the Ladybug Gulch Road would decrease fine sediment input to the system. These improvements are too minor to be noticed at the watershed scale. Also see ACS Objective #4. In general, high road densities in the Applegate River-McKee Bridge Watershed would continue to impact the sediment regime.

6. Maintain and restore **instream flows** sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Peak flows and summer low flows are unlikely to be affected by the Deadman's Palm project (see Water Resources). Any effects on stream flow from the project would be too insignificant to be noticeable at the watershed scale. Water withdrawals for agriculture and residential use and the Applegate Dam have the most significant impacts to mainstem river flows.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in **meadows and wetlands**.

Most of the Riparian Reserves remain untreated in the Deadman's Palm project, therefore, any additional water released would likely be used by these trees and riparian vegetation along channels. It is very unlikely that the few riparian meadows and wet areas would experience any restoration of water table inundation. Any extra water in the soil would be used by the remaining trees and shrubs and would not be measurable in the adjacent streams. At the watershed scale, the adverse impacts from over a century of road network development, agricultural irrigation, and settlement in the floodplains dwarf any impacts from the Deadman's Palm project.

8. Maintain and restore the species composition and structural diversity of **plant communities in riparian areas** and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of **coarse woody debris** sufficient to sustain physical complexity and stability.

For the most part, Riparian Reserves would be left completely alone; therefore, their current condition would be maintained. The 280' of new road proposed for construction in the outer 20'-40' of a 160' RR would not affect the channel shading or wood input potential of the reserves. The fuels treatments (in shrub communities) in Riparian Reserves in the Star drainage basin are designed to restore the species composition and structural diversity of riparian plant communities. However, the mainstem Applegate River would remain unaffected by these improvements.

9. Maintain and restore **habitat** to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

The treated Riparian Reserves were chosen carefully to restore habitat and riparian function at those sites. Otherwise, Riparian Reserves remain untreated. Untreated reserves include those with special plant and animal protected areas. The intent is to provide habitat for both species with small home ranges as well as those with large home ranges. Species that must move across the highly developed Applegate River may not benefit from riparian condition in Deadman's Palm project area.

Deadman's Palm Landscape Project
Appendix C

Water Rights/Diversions

Deadman's Palm
Water Rights/Diversions by Analysis Area

Palmer Creek Analysis Area

Other than ditches, no locations on BLM administered lands were identified as having some type of development for the purpose of diverting, storing, and/or transporting water. The Oregon Water Resources Department indicates there are no valid water rights for either diversion or storage at any location on BLM land within this drainage. BLM records[1] show no right-of-ways or any other authorizations for diversion structures, water storage, or water transport facilities in this drainage.

Applegate River between Beaver Creek and Star Gulch Analysis Area

Other than ditches, 3 locations on BLM administered lands (described below) were identified as having some type of development for the purpose of diverting, storing, and/or transporting water. BLM records[2] show a right-of-way for only 1 of 3 water rights in the drainage, but do not show any other authorizations for diversion structures, water storage, or water transport facilities in this drainage.

Oregon Water Right Certificate 12149 authorizes a diversion from a spring in Boaz Gulch located in T39S R3W Section 27 NE¼ SW¼. BLM Right-of-Way OR45238 places the point of diversion 1420 ft. east and 1420 ft. north of the Southwest Corner of Section 27. The right-of-way record states that the 1" diameter pipeline is present on BLM for approximately 200 ft. before entering non-BLM land in the NW¼ SW¼ of section 27. Certificate 12149 authorizes domestic and irrigation use on 20 acres in the NW¼ SW¼ of Section 27. The point of diversion was not noted by survey crews in the late 1990s.

Oregon Water Right Certificate 11166 authorizes a diversion within Boaz Gulch in T39S R3W Section 27 NE¼ SW¼. The certificate, however, does not indicate an exact point of origin. The mainstem reach of Boaz Gulch flows through the SE¼ SW¼ and SW¼ SW¼, not the NE¼ SW¼, of Section 27. The point of diversion may be related to an unused mining ditch that was constructed off of the right bank of Boaz Gulch and enters the NE¼ SW¼ of Section 27. Because the NE¼ SW¼ straddles the two drainages, there is also the possibility that the point of diversion is located in the AU0360 drainage. The point of diversion was not noted by survey crews in the late 1990s. Certificate 11166 authorizes domestic, mining, and irrigation use on 10 acres in the SW¼ NW¼ and mining use in the SE¼ NW¼ in Section 27, transferring water to the AU0360 drainage. There does not appear to be a BLM right-of-way associated with this diversion.

A survey crew identified a point of diversion on BLM along the Applegate River in T39S R3W Section 33 SW1/4 NE1/4. The exact location of the diversion was not mapped by the survey crew. The diversion may be related to Oregon Water Rights Certificate 55459 for irrigation of 0.8 acre in the SE1/4 NW1/4 and NE1/4 SW1/4 of Section 33. There does not appear to be a BLM right-of-way associated with this diversion.

There are no known developments on BLM lands in the drainage for which authorizations could not be identified.

Star Gulch Analysis Area

Oregon Water Rights Certificate 73922 authorizes the diversion and storage of water from Star Gulch in T39S R4W Section 22 SE¼ NE¼. The water would not exceed 0.04 acre-feet and would be used by the BLM for fire prevention, livestock, wildlife, and road construction in the SE¼ NE¼ of Section 22.

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[1] Joe Hoppe, BLM realty specialist, personal communication to BLM hydrologist David Squyres.
[2] Joe Hoppe, BLM realty specialist, personal communication to BLM hydrologist David Squyres.

Certificate 73922 describes the feature as having an area 0.02 ft^2 and a dam height of 6.0 ft. The structure was not noted by a 2000 survey crew and the exact location is not known.

Oregon Water Rights Certificate 15508 authorizes the diversion and use of water from Star Gulch in T39S R3W Section 19 SE¼ SW¼. The water right allocates the water for domestic use and mining. While Certificate 15508 describes location of the point of diversion as "Star Gulch," the mainstem of Star Gulch does not flow through the SE¼ SW¼ of Section 19. The diversion may be located at a tributary entering the Star Gulch mainstem. The diversion was not noted by a 2000 survey crew and the exact location is not known. There does not appear to be a BLM right-of-way associated with this diversion.

Oregon Water Right Certificate 945 authorizes the diversion of water from Star Gulch in T39S R3W Section 29 NW¼ NE¼. The water right allocates water for mining on non-BLM land in the NW¼ NE¼ and NE¼ NW¼ of Section 28. The diversion was not noted by a 2000 survey crew and the exact location is not known. There does not appear to be a BLM right-of-way associated with this diversion.

Oregon Water Right Certificate 1847 authorizes the diversion of water from Star Gulch, but a TRS location for the point of diversion is not given. Because the water right allocates the water for mining use in T39S R3W Section 29 NW¼ NE¼ and NE¼ NW¼, the point of diversion occurs within or upstream of the place of use. The diversion, therefore, would be located either in or upstream of the AU0354 drainage. The diversion was not noted by a 2000 survey crew and the exact location is not known. There does not appear to be a BLM right-of-way associated with this diversion.

Oregon Water Right Certificate 16438 authorizes the diversion of water from Star Gulch, but a TRS location for the point of diversion is not given. The water right allocates the water for use in "placer mines along Star Gulch" in T39S R3W Sections 21 and 22. Use may occur in the AU0354, AU0357, and AU0360 drainages. The point or points of diversion may be related to two unused mining ditches that parallel Star Gulch mainstem on above Star Gulch road in Section 21. One of the two ditches enters Section 22 above the Upper Applegate Road. It is not clear where the diversion originates and the exact places of use are not known. The diversion was not noted by a 2000 survey crew. There does not appear to be a BLM right-of-way associated with this diversion.

Oregon Water Right Certificate 16438 authorizes the diversion of water from Star Gulch, but a TRS location for the point of diversion is not given. The water right allocates the water for use in "placer mines along Star Gulch" in T39S R3W Sections 21 and 22. Use may occur in the AU0354, AU0357, and AU0360 drainages. The point or points of diversion may be related to two unused mining ditches that parallel Star Gulch mainstem on above Star Gulch road in Section 21. One of the two ditches enters Section 22 above the Upper Applegate Road. It is not clear where the diversion originates and the exact places of use are not known. The diversion was not noted by a 2000 survey crew. There does not appear to be a BLM right-of-way associated with this diversion.

Applegate River between Star Gulch and Little Applegate River Analysis Area

A cement structure has been constructed across the channel of the mainstem of Mill Gulch on BLM near the property boundary in T39S R3W Section 15 NW¼ SE¼. Water appears to be carried downstream from below the in-stream impoundment (no dimensions given by 1998 survey crew) by a 3 inch diameter pipe onto non-BLM property below. The diversion structure may be related to Oregon Water Right Certificate 23119, which indicates a point of diversion in the NW¼ SE¼ of Section 15, for domestic, stock, and irrigation of 1.2 acres in the NE¼ SW¼ of Section 15. There does not appear to be a BLM right-of-way associated with this diversion.

An impoundment/diversion structure located in T39S R3W Section 15 SW¼ NE¼ was identified by survey crews in the late 1990s. A concrete casing has been developed below a spring within a perennial stream, impounding water in a pool approximately 4.0 ft. in length, 3.0 ft. in width, and 1.5 ft. in depth (photo). Water is carried downstream via a pipeline in the channel to a trough, approximately 2.0 ft. in width and 10 ft. in length, located approximately 50 ft. below the structure (photo). Although the water has not been allocated for livestock use, there are signs of past grazing near the water trough. Nearly 100% of surface

flow is diverted, with about 10% leaking from the pipeline. The diversion structure appears to be related to Oregon Water Right Certificate 8630, allocating water for domestic use and irrigation of 2.0 acres of garden and lawns in the SW¼ NW¼, SE¼ NW¼, and SW¼ NE¼ of Section 15. There does not appear to be a BLM right-of-way associated with this diversion.

Oregon Water Right Certificate 8630 lists a second diversion, a spring located in Lime Gulch in the NW¼ SW¼ of Section 15. The water right does not indicate a specific point of origin and the diversion may or may not be located on BLM. In 1996, a survey crew inventoried a spring approximately 50 ft. below the upper property boundary. An impoundment, approximately 10 ft. in length and 3.0 ft. in width, appears to capture surface flow from the spring (photo). The water right, however, does not authorize storage or an impoundment structure. An in-channel pipeline, 1" in diameter, emerges from the base of the impoundment within the stream channel and continues toward the lower property boundary. A second 1" pipeline feeds the impounded water to storage tank on the right slope (photo). The stream changes from perennial a wooden diversion structure located 30 ft. above the upper property boundary to long duration intermittent below, indicating the diversion captures most of the surface flow. Certificate 8630 allocates water for domestic use and irrigation of 2.0 acres of garden and lawns in the SW¼ NW¼, SE¼ NW¼, and SW¼ NE¼ of Section 15. There does not appear to be a BLM right-of-way associated with this diversion.

Oregon Water Rights Certificate 46269 authorizes diversion from a spring to a metal storage tank in T39S R3W Section 15 NW¼ SW¼. The storage tank is located 1610 feet north and 200 feet east from the Southwest Corner of Section 15 in Lime Gulch. A buried outlet pipe, 1" in diameter, continues downstream from the storage tank toward non-BLM. Certificate 46269 allocates water for domestic use and irrigation of an undetermined amount of acres in the NW¼ SW¼ of Section 15. While the water right appears to be associated with BLM right-of-way OR8975, the right-of-way authorizes 29 ft. of pipeline on non-BLM (from the wooden diversion structure downstream to the upper property boundary). Right-of-Way OR8975 does not authorize the transfer of water on BLM (approximately 800 ft. within Lime Gulch from the upper to the lower property boundary).

Oregon Water Rights Certificate 55684 authorizes the use of water from a spring in T39S R3W Section 15 NW¼ SW¼. The spring, located 1050 feet south and 30 degrees east from the North ¼ Corner of Section 15, has been designated for wildlife use by the BLM. The spring does not appear to have been inventoried by the 1996 and 1998 survey crews.

Oregon Water Rights Certificate 1871 locates a spring in T39S R3W Section 9 SW¼ SE¼. The water right authorizes domestic use in the SW¼ SW¼ of Section 10. The exact location of the spring is not indicated in the water right. The spring does not appear to have been inventoried by the 1996 survey crew. There does not appear to be a BLM right-of-way associated with this diversion.