# United States Department of the Interior

BUREAU OF LAND MANAGEMENT
MEDFORD DISTRICT OFFICE
8040 Biddle Road
Medford, Oregon 97504
email address: or110mb@or.blm.gov

IN REPLY REFER TO
1792 (116)
Quartz Fire EA
A6709(WHY:jl)

FEB 14 2002

Dear Interested Public:

The ***Environmental*** Assessment (EA) for the Quartz Fire Project is being advertised in the Medford Mail Tribune for a 30 day public review period beginning February 15,2002. This EA analyzes a proposed action by the Bureau of Land Management (BLM) to salvage approximately 719 acres of high and moderate intensity burned areas, commercially thin approximately 80 acres of low intensity burned areas, and to manage the transportation system (road maintenance, renovation, construction, decommissioning). In the future, prescribed tire would be used as a tool to maintain vegetation density and desired species composition within the range of natural variability. The proposed project area is in the Little Applegate 5th field watershed.

The primary purpose of a public review is to provide the public with an opportunity to comment on the BLM's determination that there are no significant impacts associated with the proposed action and. therefore, an environmental impact statement is not necessary.

We welcome your comments on the content of the EA. We are particularly interested in comments that address one or more of the following: (1)new information that would affect the analysis, (2) possible improvements in the analysis; and (3) suggestions for improving or clarifying the proposed management direction. Specific comments are the most useful. Comments, including names and addressees. will be available for public review. Individual respondents may request confidentiality. If you wish to withhold your name and/or address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

All comments should be made in writing and mailed to Bill Yocum, Ashland Resource Area, 3040 Biddle Road, Medford. Oregon 97504. Any questions should be directed to Bill Yocum at (541)618-2384.

Sincerely,

Richard J. Drehobl
Field Manager
Ashland Resource Area

Enclosure as stated

# ENVIRONMENTAL ASSESSMENT

**for**

# QUARTZ FIRE PROJECT

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

EA No. OR-110-02-001

This environmental assessment (EA) for the proposed Quartz Fire Project was prepared utilizing a systematic interdisciplinary approach integrating the natural and social sciences and the environmental design arts with planning and decision making.

Richard J. Drehobl
Ashland Field

02-14-02
Date

Public notice of the availability of this EA was provided through the BLM Medford District's central register and advertisement in the Medford Mail Tribune.

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

EA COVER SHEET

RESOURCE AREA: Ashland ACTION/TITLE: QUARTZ FIRE

LOCATION: T.39S.,R.2W., Sections 34-36, T.40S.,R.2W., Sections 2 & 3, Willamette Meridian

EA NUMBER: OR-110-02-001

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**ASHLAND RESOURCE AREA**
**QUARTZ FIRE PROJECT ENVIRONMENTAL ASSESSMENT**
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# CHAPTER I

## A. INTRODUCTION

A lightning strike ignited the Quartz Fire on August 9, 2001. The fire started in thick manzanita interspersed with saplings, just below Lick Ridge in the Quartz Gulch drainage. The Oregon Department of Forestry announced containment of the 6,160 acre blaze on August 21, and full control on August 31, 2001. The Quartz Fire burned on private land, state land, Rogue River National Forest, and Bureau of Land Management (BLM) administered land.

The Quartz fire began on BLM, and burned a total of 954 BLM acres. Approximately 70 percent of BLM lands experienced a stand-replacing (high intensity) wildfire. The fire burned nearly 100 percent of the vegetation in a 100 acre spotted owl core area. Prior to the fire, a pair of spotted owls had routinely nested in the core.

Since fire containment, an interdisciplinary team has surveyed damage caused by the fire and developed an Emergency Stabilization and Rehabilitation Plan (ESR) for immediate implementation on BLM-administered lands. The team identified damage caused by the fire suppression effort as well as damage to natural resources caused by the wildfire. Impacts from suppression efforts include dozer trails, fire breaks, fire lines, tree felling, and the opening of previously closed roads in riparian areas. Damage to natural resources includes vegetation loss, forest mortality, modification of wildlife habitats, loss of soil organic matter, and the loss of riparian vegetation.

Emergency measures prescribed to mitigate damage include road and dozer trail decommissioning and rehabilitation, seeding native grass and planting conifers in burned areas, road blocks, ditch cleaning, water bars, sediment traps, and riparian restoration. Implementation of these measures started immediately following the fire.

In evaluating and planning activities following the Quartz fire, including the recovery operations proposed in this Environmental Analysis (EA), a review of existing literature was undertaken to identify potential issues and project effects. At the center of the ongoing debate on post fire activities lies an opinion paper prepared in 1995 by Beschta et al. titled, *Wildfire and Salvage Logging, Recommendations for Ecologically Sound Post-Fire Salvage Management and Other Post Fire Treatments on Federal Land in the West.* Known as the Beschta report, it generalizes the ecological conditions of the West stating, "Land management practices in the interior Columbia and upper Missouri basins have profoundly impacted forest, grassland and aquatic ecosystems."

The authors of the Beschta report are of the persuasion that human intervention is not warranted for ecological recovery following wildfire and advocates a virtual hands-off approach to long-term site recovery. Generally the report advocates "... natural recovery and recognition of the temporal scales involved with ecosystem evolution. Human intervention should not be permitted unless and until it is determined that natural recovery processes are not occurring." It should be noted however, that these recommendations are overarching, and not based on quantitative or site specific information. Further, they do not consider the management objectives for the lands involved. Since 1995, numerous publications and letters by equally qualified scientists have expressed disagreement to the Beschta 'rules' introduced in the original report (Ice 1999, Crandall 1995, Everett 1995). They also site examples of situations were various forms of post fire management are appropriate and even necessary.

The BLM has considered the Bechta report recommendation and found them to be useful in illuminating the many issues involved in wildfire ecology, however the BLM requires that each fire situation be evaluated individually on a site specific bases. This analysis incorporates additional pertinent factors, including the specific land allocation and the associated land use objectives. Several land use allocations were impacted by Quartz fire including, non forest oak/woodland, Adaptative Management Area and a northen spotted owl reserve, each involving criteria relevant to their specific management goals and objectives. These objectives influence the need, appropriateness, methods and time frame for all post fire activities.

This Environmental Assessment (EA) has been prepared to be clear and forthright. The "project's purpose and need" states a need for product recovery. Therefore the recovery of wood is an objective of this project. However, the dead trees proposed to be salvaged, in all alternatives, are only those deemed "available" after the ecological needs of the particular site have been accommodated based on analyses and recommendations by an interdisciplinary team of scientists and biologists and other experts. Such site accommodations include, standing and downed trees for wildlife habitat, input and cycling of organic matter, future recruitment of large woody material and the retention of logs for erosion control. These features are derived by integrating fundamental ecological principles like those outlined in the Bechta report and others, and local knowledge of site specific characteristic such as, the historic natural fire regime, pre-fire stand conditions, soil properties, burn intensity, potential natural vegetation and species composition, localized wildlife populations and their habitat needs, riparian conditions and inherit site productivity.

The Quartz fire area is within the Applegate Adaptive Management Area (AMA) established by the Northwest Forest Plan[1]. The assigned emphasis for this AMA is "to develop and test variations on established management practices including partial cutting, prescribed burning, and low-impact approaches to forest harvest (e.g., aerial systems) to provide for a broad range of forest values, including late-successional forest and high quality riparian habitat"[2]

**B. PURPOSE AND NEED**

An interdisciplinary team (ID Team) of resource specialists was formed to design the Quartz Fire project. The Medford District Record of Decision and Resource Management Plan (RMP) (USDI 1995b) and this EA respond to dual needs; forest habitat and forest products.

- Healthy forest ecosystems provide habitat that will support populations of native species and includes protection for riparian areas. For the Quartz Fire area on BLM lands, this would return the ecosystems or habitats towards their original structure and species composition (ecological restoration).
- Forest ecosystems can provide a sustainable supply of timber and other forest products that will help maintain the stability of local and regional economies and contribute valuable resources to the national economy on a predictable and long-term basis.

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[1] Applegate Adaptive Management Area Guide, September, 1998, Pg. 9

[2] 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 (NWFP) (USDA and USDI 1994), page D-12.

The Ashland Field Manager directed the ID Team to:
1) Comply with the RMP.
2) Design a project that would minimize the ecological impacts to the land.
3) Minimize the financial burden to taxpayers by utilizing the value of existing resources.

Three alternatives were developed for this project. A description of these alternatives can be found in Chapter II of this document.

## C. CONFORMANCE WITH EXISTING LAND USE PLANS

The proposed activities are in conformance with and tiered to the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USDI, USDA 2001) and the RMP. These Resource Management Plans incorporate 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* (NWFP) (USDA and USDI 1994). These documents are available at the Medford BLM office.

## D. 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.

## E. DECISIONS TO BE MADE

This EA is being prepared to determine if the proposed action and any of the alternatives would have a significant effect on the human environment thus requiring the preparation of an environmental impact statement (EIS) as prescribed in the National Environmental Policy Act of 1969. It is also being used to inform interested parties of the anticipated impacts and provide them with an opportunity to comment on the various altematives.

The Ashland Resource Area Field Manager must decide:

- Whether or not the impacts of the proposed action are significant to the human environment beyond those analyzed in other tiered documents as listed above. If the impacts are determined to be insignificant, a Finding of No Significant Impact (FONSI) can be issued and a decision implemented. If any impacts are determined to be significant to the human environment, then an EIS must be prepared before the Manager makes a decision.
- Whether to implement any of the action alternatives or defer to the no action alternative.

## F. ISSUES OF CONCERN

There was an open process for identifying and addressing issues related to the action alternatives of this project during scoping for the Quartz Fire Project. Invitation for participation of Federal, State, Local agencies, and interested parties was accomplished by letters, phone calls, field tours, public meetings, and individual meetings. Issues and concerns were taken into consideration throughout the development of this project.

The following issues were identified and reviewed by the ID Team. Not every issue is analyzed in detail

by this EA.

1. Aquatic Habitat and Water Quality - Soil disturbance and loss of vegetation and organic matter may put aquatic habitat and water quality at risk.
2. Invasive, Nonnative Species - Sustained heat reduced the native seed bank and increased the potential for the spread of invasive, non-native species.
3. Standing and down dead trees - Snags are needed for wildlife trees and down woody material is needed for soil productivity. In high intensity burned areas nearly 100% mortality occurred. Future snag recruitment is limited.
4. Re-burn Fire Potential - Through time, if too many dead trees are left, with the re-growth of brush species, there will exist a future high hazard/re-burn fire potential.
5. Timely Salvage - In high and moderate intensity burned areas deterioration of severely burned trees is ongoing and will influence the economics of any potential salvage.
6. Spotted Owl Habitat - The Quartz Fire removed spotted owl habitat in an identified 100 acre core area. The objective for the core area is to provide late-successional habitat as soon as possible.
7. Dense Stands/Forest Health - In low intensity burned areas, stands of conifer and hardwood trees are overly dense. Dense stands are not vigorous (i.e., slow growth rates, too much competition for water and nutrients, susceptible to insects and drought) and constitute a forest health concern.
8. Access - Roads (long-term access) are needed for long-term management. Because of the high ecological impacts caused by the fire, there is a concern regarding road construction.

# CHAPTER II
# ALTERNATIVES

## A. ALTERNATIVES

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. This chapter also outlines specific project mitigation features that are an essential part of the project design for the alternatives. The action alternatives include project design features (PDFs). Each alternative is followed by the PDFs for that alternative. Some PDFs are common to both Alternative 2 and Alternative 3. The PDFs are included for the purpose of reducing or eliminating anticipated adverse environmental impacts. Analysis supporting the inclusion of PDFs can be found in the appendices of this EA and Appendix D and E of the RMP.

The Ashland Resource Area has developed alternatives designed to meet the project objectives outlined in the Little Applegate Watershed Analysis (pages 10-24) and in accordance with the best management practices as outlined in the Medford District RMP (pages 149-177). The objectives in the watershed analysis are broad and general and this document provides a more detailed analysis at the project scale.

### ALTERNATIVE 1: NO ACTION

Under the "no action" alternative, no vegetation management projects would be implemented and there would be no salvage or thinning. No roads would be constructed, renovated or decommissioned.

### ALTERNATIVE 2: PROPOSED ACTION–SALVAGE, DENSITY MANAGEMENT AND TRANSPORTATION MANAGEMENT

Salvage on approximately 719 acres is proposed for high and moderate intensity burned areas located within the uplands, Riparian Reserves and spotted owl core. Density thinning on approximately 80 acres is proposed for low intensity burned areas, located within the uplands and Riparian Reserves. Transportation management would include road maintenance, renovation, construction and decommissioning.

Future use of prescribed fire would be used as a tool to maintain vegetation density and desired species composition within the range of natural variability.

Details of this action alternative are listed in Appendices**.** The PDFs are listed below in Section B.

### ALTERNATIVE 3: SALVAGE, DENSITY MANAGEMENT AND REDUCED TRANSPORTATION MANAGEMENT

Salvage on approximately 509 acres is proposed for high and moderate intensity burned areas located within the uplands. Density thinning on approximately 60 acres is proposed for low intensity burned areas located within the uplands. Transportation management would include road maintenance, renovation and decommissioning.

Future use of prescribed fire would be used as a tool to maintain vegetation density and desired species composition within the range of natural variability.

Details of this action alternative are listed in Appendices**.** The PDFs are listed below in Section C.

## B. PROJECT DESIGN FEATURES - ALTERNATIVE 2

Details of PDFs are located in the appendices and / or the EA file.

### 1. Roads and Helicopter Landings

Road Decommissioning & Obliteration The upper proposed new road would be decommissioned after use. The lower proposed new road would be obliterated and decommissioned after use. Some existing roads would be decommissioned as listed in the Appendices. Types of decommissioning are as follows:

- 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.

- Mechanical Decommission - Some roads would be decommissioned mechanically. This usually includes ripping, removing drainage structures, seeding and/or planting, mulching, constructing water bars and barricades.

Helicopter landings

Helicopter landings on BLM land 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.
- No treatment may be necessary where natural rock occurs

Fill slopes of helicopter landings would be seeded with native grasses or other approved seed mixes and mulched, except where rock occurs.

Hauling Restrictions

A seasonal hauling restriction would be required on natural surfaced (dirt) roads during the wet season (usually October 15 to May 15). 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. Refer to Appendices for all hauling seasonal restrictions.

Rock Surfacing and Quarries

Rock would be used to stabilize and minimize erosion on selected roads and landings. Rock would be obtained from the existing quarry located in W1/2SW1/4 Section 35, and/or from the SE1/4SW1/4 Section 36, T39S, R2W. Rock encountered during construction activities could be used for road stabilization. Roads would be surfaced as shown in the Appendices.

Dust Abatement

Dust abatement would provide driver safety and protect the road surface by stabilizing and binding the aggregate road surface. Water, lignin, magnesium chloride, road oil, or Bituminous Surface Treatment (BST) would be used. Oil or BST may appear to be a permanent surface improvement, however, after log and rock haul the road would revert to a rocked road.

Road Maintenance

Roads would be maintained on a long term basis. Minor improvements and design changes may be needed to stabilize and correct conditions that are causing erosion or unsafe situations.

Road Closure
All new and decommissioned roads would be closed to Off Highway Vehicle (OHV) use except for administrative and emergency purposes. OHV road closures proposed to protect resources are consistent with the existing OHV strategy and 43 CFR Part 8340.

Road Construction and Renovation
For road renovation details see Appendix A.

Road construction would occur during dry conditions (usually May 15 to October 15) in order to reduce the potential for soil erosion and degradation of water quality. However, it is sometimes necessary to construct roads during the fall or spring when soil moisture is optimum for compaction. This also helps to prevent fill settlement and cracking. All construction activities would be stopped during a rain event of 0.2 inches or more within a 24-hour period. If on-site information is inadequate, measurements from the nearest Remote Automated Weather Station would be used. Construction activities would usually not occur for at least 48 hours after rainfall has stopped or on approval by the Contract Administrator.

Rolling grades (<10% road grade) would be used to reduce concentration of flows and minimize accumulation of water from road drainage which may contribute to unnaturally high peak flows in natural drainages..

Outslope of the road prism would be used for surface drainage.

Slash from road construction would be windrowed at the base of the fill slope to catch sediment.

Drainage dips would be used in place of culverts. Energy dissipators (e.g., rock material) would be used at the outfalls of waterdips.

At the completion of log hauling roads would be decommissioned. This would include ripping the road surface, reestablish natural draw crossings by removing material, constructing water bars, seeding and/or planting, mulching, and constructing barricades.

**3. Harvest and Logging Systems**
All landing locations would be approved by BLM. No landing would be located within any Riparian Reserve. Landing size would be kept to a minimum. Normally, this would be less than ¼ acre for tractor and cable units, and less than one (1.0) acre for helicopter units.

Cable and tractor yarding would be avoided in draw bottoms.

Cable and helicopter yarding systems would utilize maximum operational suspension to minimize disturbance to the forest floor.

For all tractor yarding, skid road locations would be approved by BLM. Skid road locations would avoid ground with slopes over 35 percent. Maximum unit area in skid trails would be less than 12 percent. Trees would be felled toward the skid trails. Existing skid roads would be utilized when possible. All skid roads would be water barred to BLM standards after use. Tractor yarding would normally take place when soil moisture is less than 20 percent at a depth of four inches (usually May 15 to October 15).

Noise disturbance to local residents would be minimized by regulating operating hours, days, 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 a.m. to 5:00 p.m., 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 a.m. to 6:00 p.m., Monday through Saturday; and no operating time restriction would be enforced when helicopter operations are greater than 1.0 (one) mile from a residence.

**Fuels**
In high and moderate intensity burned areas proposed for salvage, due to the small amount of surface and ladder fuels that exist, fuels reduction work after the salvage operations is not proposed.

In low intensity burned areas proposed for thinning, fuels reduction work is proposed. The fuels reduction work (a combination of manual treatment and prescribed fire) would reduce the existing ladder fuels as well as surface fuels produced from the thinning operations.

Prescribed burning would include underburning and handpile burning. Handpile burning would be used as the initial entry for burning in the majority of stands. This type of burning takes place in the late fall and winter. Underburning would be used in some stands as the initial entry but in most stands it would be the follow up treatment after handpile burning.

To minimize loss in soil productivity and surface erosion, burning would be planned and scheduled to result in low intensity burns, whenever possible, to reduce the loss of organic matter, nutrients, and subsequent site productivity. All fuel management activities which would occur within the project area would meet Aquatic Conservation Strategy and Riparian Reserve objectives.

**Hydrology, Riparian and Fisheries**
Watershed conditions are currently in a degraded state following an intensity of fire that occurred due to fuel loading that was outside the range of natural variability. The actions proposed are not to *maintain* Aquatic Conservation Strategy objectives, as conditions are currently degraded. Rather, the proposed action is intended primarily to *restore* biological and physical processes within their ranges of natural variability. This proposed restoration would focus on restoring function to the riparian ecosystem as a whole, rather than managing for one individual process to the detriment of other processes. Riparian Reserves would be treated to meet Aquatic Conservation Strategy and riparian objectives, while providing some economic benefit from quantities of large wood considered to be “excess” - beyond what would be expected on the site if conditions were within the range of natural variability. This includes taking actions to move the riparian area toward a late-successional condition as quickly as possible while to the extent possible simultaneously meeting Riparian Reserve objectives and conducting restoration that would return the area to a condition within the range of natural variability, able to function properly in an environment characterized by frequent low-intensity fire.

No activity buffer areas of soil creep and/or slumping.

Use a helicopter, or other means, to place 5 to 10 conifer trees (>30" dbh, roots attached, and longer than 2 times bankfull width) in Yale Creek as located by the Authorized Officer.

Riparian PDF’s for all activities

- Leave all existing down wood intact, including trees felled as part of emergency rehabilitation projects and wood that has fallen or been felled before, during and after the fire. This wood is intended to meet current down large woody debris needs.
- Snags (see Appendix for description of snag classes) identified for large woody debris purposes would be left standing - these are for future large woody debris recruitment needs. Within the Riparian Reserves, if there is a safety conflict between leaving a conifer snag standing and implementing a treatment, modify or eliminate the treatment in favor of leaving the snag intact.
- Due to the post-fire condition of soils, lack of any duff layer, and little vegetation which would provide significant organic input, full suspension yarding would be required for any salvage operations in Riparian Reserves to prevent soil disturbance.
- To prevent soil disturbance, off-road operation of tracked or wheeled vehicles within Riparian Reserves would not be allowed. Conditions may be reevaluated after 2006.
- Slash piles would be placed outside of draw bottoms.
- Do not burn piles within 25' of any stream.
- Live hardwoods would be protected per standard riparian stipulations (protect all sizes of riparian species such as maple, alder, ash, willow, etc. at any location they occur on the landscape). Within Riparian Reserves, do not eliminate clumps of madrone, oak, maple and other sprouting hardwoods. Thin sprout clumps to the three largest stems per plant to produce trees that would eventually have large crown ratios and increased canopy closure.
- No treatment would be done within the streamside Riparian Reserve around two small springs in the NE1/4 SE1/4 Section 2.

The following areas would be designated as “no treatment” for trees 8" dbh and greater (the greatest distance applies):
- within one site-potential tree height distance of any fish-bearing streams;
- within 25' of other stream channels or water bodies or landslide deposition areas (the ‘flat bottom’ valley areas along some streams);
- on any Riparian Reserve slopes greater than 50%;
- from the stream channel to the top of the slope break on Riparian Reserve slopes over 25%, to a maximum of 100';
- within 5' of the bottom of dry draws (non-Riparian Reserve).

The following areas would be designated as “no treatment” for trees under 8" dbh:
- within 50' of any fish-bearing streams;
- within 25' of other perennial and long-duration intermittent (seasonal) streams;
- within 5' of short-duration intermittent (ephemeral) streams;
- dry draws (non Riparian Reserve) should be treated to the adjacent upland prescription.

Because areas designated as “no treatment” for this project may need future treatment prior to introduction of prescribed fire, soil and vegetation conditions would need to be reevaluated on site after five years, prior to prescribing treatment.

Within 100% mortality areas
- The Riparian Coarse Woody Debris prescription (Appendix C) would be the minimum quantity of standing wood remaining (where such quantities of wood were present on site). Where standing snags are not available to meet or exceed the dbh guidelines, they would be replaced with standing

snags from the largest available size class on the site.

- Trees that would be 20" dbh and greater at the point they would fall into the stream (constrained channel areas where the stream cannot move laterally) or onto landslide deposition areas (unconstrained areas where the stream can move laterally) would be left standing. In observing how down large wood reacted in the Quartz Fire, pieces over 20" diameter generally came through the fire relatively intact, with only a half inch or so outer layer that burned, probably due to the high moisture content of these pieces. Pieces less than 20" diameter were largely consumed, contributing significantly to the intensity and duration of the fire. This points to the importance of favoring larger diameters of wood to meet course wood guidelines, especially in areas of frequent fire, if such wood is to persist in the environment for long periods of time. As prescribed fire is a probable and necessary management tool in restoring these riparian areas to properly functioning condition within the range of natural variability, reduction of the quantity of smaller diameter wood while retaining more natural levels of large wood should increase the probability of success in reintroducing fire without totally burning up the recovering riparian area. Outside of the stated no-treatment areas, dead trees that would not meet this requirement or not otherwise identified as leave trees in the prescription would be removed or treated to reduce fuel load prior to introduction of prescribed fire.

Within Density Management/underburn areas (for density management prescription see Appendix C).

- Maintain at least 60% canopy closure within all Riparian Reserves.
- Outside of no-treatment areas, treat to the density management prescription to the extent the canopy closure stipulation allows.
- Future recruitment of down large wood would be provided at more natural levels from the remaining live tree component.

**Noxious Weeds**

All logging skidders, yarders, hauling, construction, and maintenance vehicles would be cleaned to remove mud, debris, and vegetative material prior to arriving at the project area, especially the undercarriage, to prevent the spread of noxious weeds and nonnative plants.

### Wildlife

In the Late Successional Reserve (LSR) known as the Spotted Owl Core a management assessment would be prepared before any salvage activities would occur.

### C. PROJECT DESIGN FEATURES - ALTERNATIVE 3

Details of PDFs are located in the appendices and / or the EA file.

**1. Roads and Helicopter Landings**

Road Decommissioning Some existing roads would be decommissioned as listed in the Appendices. Types of decommissioning are as follows:

- 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.
- Mechanical Decommission - Some roads would be decommissioned mechanically. This usually includes ripping, removing drainage structures, seeding and/or planting, mulching, constructing water bars and barricades.

Helicopter landings

Helicopter landings on BLM land 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.
- No treatment may be necessary where natural rock occurs

Fill slopes of helicopter landings would be seeded with native grasses or other approved seed mixes and mulched, except where rock occurs.

Road Renovation

For road renovation details see Appendix A.

Hauling Restrictions

A seasonal hauling restriction would be required on natural surfaced (dirt) roads during the wet season (usually October 15 to May 15). 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. Refer to Appendix A for all hauling seasonal restrictions.

Rock Surfacing and Quarries

Rock would be used to stabilize and minimize erosion on selected roads and landings. Rock would be obtained from the existing quarry located in W1/2SW1/4 Section 35, and/or from the SE1/4SW1/4 Section 36, T39S, R2W. Rock encountered during construction activities could be used for road stabilization. Roads would be surfaced as shown in the Appendices.

Dust Abatement

Dust abatement would provide driver safety and protect the road surface by stabilizing and binding the aggregate road surface. Water, lignin, magnesium chloride, road oil, or Bituminous Surface Treatment (BST) would be used. Oil or BST may appear to be a permanent surface improvement, however, after log and rock haul the road would revert to a rocked road.

Road Maintenance

Roads would be maintained on a long term basis. Minor improvements and design changes may be needed to stabilize and correct conditions that are causing erosion or unsafe situations.

Road Closure

All new and decommissioned roads would be closed to Off Highway Vehicle (OHV) use except for administrative and emergency purposes. OHV road closures proposed to protect resources are consistent with the existing OHV strategy and 43 CFR Part 8340.

**3. Harvest and Logging Systems**

All landing locations would be approved by BLM. No landing would be located within any Riparian Reserve. Landing size would be kept to a minimum. Normally, this would be less than ¼ acre for tractor and cable units, and less than one (1.0) acre for helicopter units.

Cable and tractor yarding would be avoided in draw bottoms.

Cable and helicopter yarding systems would utilize maximum operational suspension to minimize disturbance to the forest floor.

For all tractor yarding, skid road locations would be approved by BLM. Skid road locations would avoid ground

with slopes over 35 percent. Maximum unit area in skid trails would be less than 12 percent. Trees would be felled toward the skid trails. Existing skid roads would be utilized when possible. All skid roads would be water barred to BLM standards after use. Tractor yarding would normally take place when soil moisture is less than 20 percent at a depth of four inches (usually May 15 to October 15).

Noise disturbance to local residents would be minimized by regulating operating hours, days, 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 a.m. to 5:00 p.m., 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 a.m. to 6:00 p.m., Monday through Saturday; and no operating time restriction would be enforced when helicopter operations are greater than 1.0 (one) mile from a residence.

**Fuels**
In high and moderate intensity burned areas proposed for salvage, due to the small amount of surface and ladder fuels that exist, fuels reduction work after the salvage operations is not proposed.

In low intensity burned areas proposed for thinning, fuels reduction work is proposed. The fuels reduction work (a combination of manual treatment and prescribed fire) would reduce the existing ladder fuels as well as surface fuels produced from the thinning operations.

Prescribed burning would include underburning and handpile burning. Handpile burning would be used as the initial entry for burning in the majority of stands. This type of burning takes place in the late fall and winter. Underburning would be used in some stands as the initial entry but in most stands it would be the follow up treatment after handpile burning.

To minimize loss in soil productivity and surface erosion, burning would be planned and scheduled to result in low intensity burns, whenever possible, to reduce the loss of organic matter, nutrients, and subsequent site productivity. All fuel management activities which would occur within the project area would meet Aquatic Conservation Strategy and Riparian Reserve objectives.

**Hydrology**
No cutting of trees 8" dbh and greater within 5' of the bottom of dry draws (non-Riparian Reserve). All slash piles would be placed outside of draw bottoms.

**Noxious Weeds**
All logging skidders, yarders, hauling, construction, and maintenance vehicles would be cleaned to remove mud, debris, and vegetative material prior to arriving at the project area, especially the undercarriage, to prevent the spread of noxious weeds and nonnative plants.

# CHAPTER III
# AFFECTED ENVIRONMENT

## A. PRESENT CONDITION BY RESOURCE SPECIALIST

This chapter describes the present conditions within the proposed Quartz Fire Project area that would be affected by the alternatives. The information in this chapter would serve as a general baseline for determining the effects of the alternatives. No attempt has been make to describe every detail of every resource within the proposed project area. Only enough detail has been given to determine if any of the alternatives would cause significant impacts to the environment. The information is organized around the major issues.

### Botany

Special Status and Survey & Manage Vascular Plants

Surveys for Bureau special status and Survey & Manage vascular plants were completed in 1999, prior to the fire in 2001. No sites were discovered.

The project area is within the range of one threatened plant (*Howellia aquatilis*) and one endangered plant (*Fritillaria gentneri*) as listed under the Endangered Species Act. However, no habitat for *Howellia aquatilis* occurs within the project area and no populations were found during surveys. Habitat for *Fritillaria gentneri* does occur within the project area, although much was lost to the fire, but no populations were found during the 1999 surveys. There is no effect to either of these listed species due to the proposed alternatives.

Additionally, two plants proposed for listing as endangered (*Lomatium cookii* and *Limnanthes floccosa* ssp. *grandiflora*) and the endangered plant, *Arabis macdonaldiana* occur on the Medford District. The project area is not within the range of these plants nor is there suitable habitat. Surveys did not discover any populations of these plants. There is no effect to species due to the proposed alternatives.

Survey & Manage Fungi, Lichens, and Bryophytes

Surveys for Survey & Manage fungi, lichens, and bryophytes were performed in Autumn 1997, Autumn and Spring 1998, and October 2001. The October 2001 surveys targeted additional species requiring surveys as per the Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines, January 2001. The areas searched were unburned and incompletely burned areas within the fire perimeter. No sites were discovered.

Noxious weeds and nonnative plants

Surveys for noxious weeds and nonnative plants were completed in 1999, prior to the fire in 2001. No species from the Federal noxious weed list were found. Seven species of noxious weeds, listed by the Oregon Department of Agriculture, have been documented either within the project area or along the proposed haul routes. Because weed infestations on adjacent lands can be a source of seed, weed data on adjacent lands, regardless of ownership, was considered when available. Most of these invasive plants are associated with the road system and other recently disturbed sites. Some weed occurrences are associated with high levels of historic disturbance, such as past uncontrolled grazing. List of species is in Appendix B.

As approved in the Quartz Fire Burned Area Emergency Stabilization and Rehabilitation (ESR) Plan, noxious weeds would be monitored and treated for up to three years. After this time, weed treatment

would be prioritized and scheduled based on District and Resource Area analysis.

**Dense Stands/Forest Health**

The fire was stand-replacing and burned with high severity on approximately 70 percent of the BLM land base. Approximately 25 percent of the area burned with a moderate severity rating. Less than 10 percent of the commercial forest land base burned with a low severity where patches of green trees now exist. The commercial forest land base within the fire area is 718 acres, and it is estimated that no more than 80 acres of green trees remain.

The fire area was extensively inventoried by the Ashland Resource Area Silviculture group in 1998 and 1999 for the Bald Lick and Prince Castor Landscape Projects. The main plant associations encountered before the fire as described by Atzet and Wheeler (1985) were Douglas-fir (PSME)/Poison Oak (RHDI)-Piper's Oregongrape (BEPI) and Ponderosa Pine (PIPO) - PSME on southerly aspects. On north slopes or in riparian areas the PSME/Dwarf Oregongrape (BENE) plant association was found. Some pole stands had the PSME/Depauperate plant association because of the high tree stocking levels and the resulting dense canopy closure.

The pole stands ranged in age from 70 to 102 years of age. The pine and Douglas-fir series forests ranged from 90 to 142 years of age. Small patches or scattered individual trees of older age classes are scattered across the landscape. One uneven-aged ponderosa pine stand was inventoried and modeled where the oldest pine trees are 230 years of age. Forest stand basal areas range from 100 to 380 square feet per acre. In 25 forest stands average basal area is 220 square feet per acre. In two forest stands trees per acre ranged from 781 to 906 trees per acre before the fire. A 38 tree sample of codominant and dominant trees shows that tree diameter growth ranges from .5 to 1.7 inches in 10 years. Average diameter growth is 1 inch per decade.

Now that trees have been killed and stressed by the fire, the probability of bark beetle infestations has increased in the project area. Western pine beetles *(Dendroctonus brevicomis*) could attack the pines while flatheaded fir borers *(Melanophila drummondi*) and Douglas-fir beetles *(Dendroctonus pseudotsugae*) could kill 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 is apparent that the disease is most common in stressed trees (where trees are growing on shallow soils, on hot southerly aspects, and where tree stocking levels are high). 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.

In the project area previous to the fire, the amount of coarse woody material (CWM) ranged from 3.2 to 8.9 tons per acre. This can be explained by the relatively young age of the forest and the hot, dry southerly aspect. The coarse woody material stem diameters were concentrated in the 9 to 19 inch classes at the large end, but some pieces as large as 31 inches were found. Total length of the material ranged from 513 to 556 feet per acre. Coarse woody material was most often found to be in a decomposition class 3 which is characterized by very little bark, no twigs, but a solid stem.

**Fish and Fish Distribution**

The Little Applegate River and it's tributaries support populations of ESA listed fish species. Southern Oregon/Northern California (SONC) coho salmon (*Oncorhynchus kisutch*) are listed as threatened under the Endangered Species Act (ESA). Klamath Mountain Province (KMP) steelhead (*O. mykiss*) were a candidate species for listing under the ESA however, in April 2001, the National Marine Fisheries Service (NMFS) ruled that the listing was not warranted. The status of coastal cutthroat trout (*O. clarki*) is under review by U.S. Fish and Wildlife Service. Other native species known to occur in the Applegate basin include chinook salmon (O. tshawytscha), sculpin (*Cottus* ssp.), Klamath smallscale suckers (*Catostomus rimiculus*), and Pacific lamprey (*Lampetra tridentata*). Information on the distribution of sculpin, suckers, and lamprey in this drainage is incomplete.

Coho and chinook salmon spawn and rear in the lower Little Applegate below a falls that is a potential barrier to their migration. The falls is approximately 8 miles downstream of the Quartz Fire project area. The barrier is a two-part chute, approximately 12 feet long that is only passable during periods of high flow. Steelhead negotiate this barrier in high flows, to spawn in the upper sections of the Little Applegate, Yale Creek, Glade Creek and possibly the lower sections of Quartz Gulch. It is unlikely that coho negotiate these falls, and none have been observed above the falls since the 1950's (ODFW, BLM, Watershed Council). Chinook salmon are known to occur in the Little Applegate River below the falls and snorkel surveys have confirmed this. Rainbow and cutthroat trout occur in many tributaries upstream of the falls.

In addition to the falls at river mile 1.4, two dams on the Little Applegate River are barriers to fish migration. Farmer's Ditch dam, located at river mile 2.0 is equipped with a fish passage device, but the efficiency of this device is not well known. The Buck & Jones dam is a barrier to upstream migration at river mile __ and provides only limited downstream migration for all species. Both of these dams are scheduled for removal in the near future and once removal is complete, coho migrations up to Yale Creek are possible, especially during years with early fall rains.

In the Quartz Gulch drainage, the project area is located along the first 2 1/4 miles of Quartz Gulch. Quartz Gulch flows through a culvert under the Yale Creek Road and water backs up behind the culvert in a holding pond. An ODFW survey conducted in 2000 found rainbow trout above this pool, approximately 1000 feet below the project area. There was no visible barrier but this appeared to be the end of fish distribution. Fish were not observed in Quartz Creek during a survey conducted by BLM, on BLM land, in the middle of section 3. From the confluence of Quartz Gulch and Yale Creek, Yale Creek flows for approximately 3 miles before entering the Little Applegate River.

In the Mule Creek drainage, the project is proposed in the headwaters, approximately one mile upstream of Glade Creek. Glade Creek flows for approximately one mile before entering the Little Applegate River. Glade Creek supports populations of steelhead, cutthroat trout, and sculpin.

Activities proposed in the Lick Gulch sub-basin would also occur in the headwaters, approximately three miles upstream of it's confluence with the Little Applegate. Fish have not been observed in Lick Gulch.

In summary, none of the units proposed in the Quartz Fire project are adjacent to fish bearing stream reaches. Coho and chinook salmon are located 8 miles downstream of the project area, in the Little Applegate River. Steelhead occur in Yale Creek (1/4 mile downstream of the project area) and in Glade Creek (1 mile downstream of project area). Resident fish occur in Quartz Gulch approximately 1000 feet downstream of the project area.

Fish Habitat

In general, our native fish and other aquatic organisms need clean, cool water with cover, spawning gravel, and

food to survive. Riparian vegetation plays an important role in maintaining healthy habitat for aquatic organisms. Large wood creates habitat for salmonids by providing cover from predators, refugia from current, and by creating pools. The water that flows through these systems must be of cool temperatures to support cold water fish such as salmon and trout. Gravel, free of oxygen-choking sediments is a necessity for spawning fish.

Current conditions in the Little Applegate River suggest that connectivity in the basin is reduced as irrigation dams and diversions and culverts limit migration of salmonids. Channelization of the Little Applegate River further reduces connectivity as the river is no longer connected to it's floodplain. In addition, water quantity, sedimentation, and lack of large wood have been identified as limiting factors in this basin. Water diversions limit the quality and quantity of habitat for aquatic species in about 45 percent of the Little Applegate River watershed (Little Applegate River Watershed Analysis 1995). Sedimentation caused by past management practices has been identified as a limiting factor for fish and aquatic organisms in Yale Creek and Glade Creek. Large wood is lacking throughout the entire system as a result of past management practices. Current resource management practices on private and water diversions which are beyond the scope of Aquatic Conservation Strategy objectives would continue to limit potential for recovery of salmon and steelhead populations and habitat (Little Applegate River Watershed Analysis 1995).

Most of the proposed project area is located in headwater areas characterized by dry draws. The table below (Table 1) identifies stream types located within the project area.

Table 1. Stream type within the Quartz Salvage project area.

| | Fish bearing | Non-fish bearing | | | |
|---|---|---|---|---|---|
| | | Perennial | Intermittent | Dry draw | Total |
| Miles within Quartz Salvage | 0.1 | 1.2 | 2.2 | 9.4 | 12.9 |

Critical Habitat

Southern Oregon/Northern California (SONC) coho salmon (*Oncorhynchus kisutch*) is listed as a threatened species under the Endangered Species Act. On May 5, 1999, NMFS designated "Critical Habitat" for SONC coho [FR64(86):24049]. The distribution of coho salmon in the Little Applegate watershed is not well known. Coho salmon have not been observed above the falls in the last 15 years, however the possibility exists that coho can migrate above the falls in years with early fall flows. Coho presence has been confirmed to River Mile 1.5, about 5 miles downstream of Yale Creek. The only recorded siting of SONC coho salmon above this point was during 1951 (Personal communication, Chuck Fustish, Oregon Department of Fish and Wildlife). This observation is questionable, as no coho adults or juveniles have been observed above the barrier, however steelhead pass the "barrier" and coho should be able to negotiate the falls in years with early fall flows. In this case, coho may be able to use mainstream Little Applegate habitat as far upstream as the confluence with Glade Creek. Therefore, Yale Creek would be included in coho Critical Habitat. Glade Creek would not because a natural barrier exists 0.1 miles upstream of the mouth of Glade Creek, which prevents anadromous fish passage. Quartz Gulch, where the fire started, is a tributary to Yale Creek. The main portion of the fire is approximately 8 miles upstream of known *occupied* coho Critical Habitat.

**Fuels**

**Wildfire History -** Fire is recognized as a key natural disturbance process throughout Southwest Oregon (Atzet and Wheeler 1982). 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.

Climate and topography combine to create the fire regime found throughout the project area. Fire regime refers the frequency, severity and extent of fires occurring in an area (Agee 1991). Vegetation types are helpful in delineating different fire regimes. One broad fire regimes within the project area was identified using vegetation types as a basis for fire regime delineation. Fire regimes are based on the effects from fire on the dominant vegetation.

*Low-Severity Regime* - This regime is characterized by vegetation types such as grasslands, shrublands, hardwoods and mixed hardwood, and pine which are similar to the Interior Valley Vegetative Zone of Franklin and Dyrness (1988). These plant communities recover rapidly from fire and are directly or indirectly dependent on fire for their continued persistence. The dominant trees within this regime are adapted to resist fire due to the thick bark they develop at a young age. A low-severity regime is characterized by nearly continual summer drought; fires are frequent (1-25 years), burn with low intensity, and are widespread.

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. From the 1950s to present, suppression of all fires became efficient because of an increase in suppression forces and improved techniques. As a result of the absence of fire, there has been a build-up of unnatural fuel loadings and a change to fire-prone vegetative conditions.

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 has 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.

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.

Several shrub species are directly dependent on the heat from fires for germination - without fire, these stands of shrubs cannot be rejuvenated. Grass and forbs species may show increased seed production and/or germination associated with fire.

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 shrub lands in the absence of fire because of their short-lived seed-bank.

Fire history recorded over the past 20 years in Southwest Oregon indicate a trend of more large fires which burn at higher intensities in vegetation types associated with low-severity fire regimes and moderate-severity fire regimes. This trend is also seen throughout the western United States. Contributing factors are the increase of fuel loading due to the absence of fire, recent drought conditions, and past management practices. The Quartz fire is a good example of this trend. This fire burned approximately 954 acres of BLM managed land. Approximately 70% of these acres were a stand replacement fire. Only 5% of this fire that burned on BLM land burned at low intensity.

*Air Quality* - Prescribed burns are conducted within the limits of a Burn Plan which describes prescription parameters so that acceptable and desired effects are obtained. Smoke produced from prescribed burning is the major air pollutant of concern.

Fuels management activities generate particulate pollutants 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. The use of prescribed fire for ecosystem restoration can produce enough fine particulate matter to be a public health and/or welfare concern. Fine particulates in smoke can travel many miles downwind 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. If properly managed, most negative effects of prescribed fire smoke can be minimized or eliminated.

The National Ambient Air Quality Standards (NAAQS), set by the authority of the Clean Air Act (CAA), cover six "criteria" airborne pollutants: lead, sulfur dioxide, carbon monoxide, nitrogen oxides, ozone and particulate matter. The lead and sulfur content of forest fuels is negligible, so these two forms of air pollution are not a consideration in prescribed burning.

Prescribed burning does emit some carbon monoxide (CO), from 20 to 500 lb. per ton of fuel consumed. This would be a concern if there were other persistent large CO sources in the immediate vicinity. CO is such a reactive pollutant, however, that its impact is quickly dissipated by oxidation to carbon dioxide where emissions are moderate and irregular and there is no atmospheric confinement.

Burning also emits moderate amounts of volatile organic compounds (VOC) and minor amounts of nitrogen oxides (NOx). These are precursors to formation of ground level ozone. Here, fire-related emissions may be seen as important only when other persistent and much larger pollution sources already cause substantial nonattainment of NAAQS .

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.

Smoke Aloft - 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.

Ground Level Smoke - 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.

Nonattainment Areas - The population centers of Grants Pass, Medford/Ashland (including Central Point and Eagle Point), and Klamath Falls in the past were 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 is not attributable to prescribed burning. Major sources of particulate matter within the Medford/Ashland nonattainment area is smoke from woodstoves and 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 seven years the population centers of Grants Pass and Medford/Ashland have been in compliance for the national ambient air quality standards for PM 10.

The pollutant most associated with the Medford District's resource management activities is PM 10 found in smoke produced by prescribed fire. Monitoring in southwest Oregon consists of nephelometers (instrument designed to measure changes in visibility) in Grants Pass, Provolt, Illinois Valley, Ruch and eventually in Shady Cove. One medium volume sampler is collocated with the nephelometer at the Provolt site. The medium volume sampler measures the amount of PM 10 and smaller at ground level.

Administration of Smoke Producing Projects - The operational guidance for the Oregon Smoke Management Program is managed by the Oregon State Forester. The policy of the State Forester is to:

1. Regulate prescribed burning operations on forest land...
2. Achieve strict compliance with the smoke management plan...
3. Minimize emissions from prescribed burning...

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.

**Soils**

The soils identified in the project area are Vannoy silt loam, Voorhies very gravelly loam, Caris gravelly loam, and Offenbacher gravelly loam. All of these soils are moderately deep (20"- 40") and are on slopes ranging from 20 to 70 percent. The mean annual precipitation ranges between 25 and 40 inches (Soil Survey of Jackson County Area, Oregon).

The Vannoy soil is on about 75 percent of the landscape in the project area. The Vannoy soil is moderately deep and well drained. It formed in colluvium derived predominantly from metamorphic parent material. Typically, the surface layer is dark brown silt loam about 4 inches thick. The next layer is reddish brown silt loam about 7 inches thick. The subsoil is yellowish red clay loam about 27 inches thick with weathered bedrock about 38 inches. Permeability is moderately slow in most areas, although infiltration rates have been slowed as a result of the intense burning which made a lot of the soil surfaces hydrophobic. Because of the hydrophobic

characteristics, the potential for rapid run-off and water erosion is high.

The Voorhies soil is on about 10 percent of the landscape in the project area. The Voorhies soil is moderately deep and well drained. It formed in colluvium from metamorphic rock. The soil surface layer is very dark grayish brown very gravelly loam about 8 inches thick. The upper 10 inches of the subsoil is brown very gravelly loam. The lower 18 inches of the subsoil is brown very cobbly clay loam and weathered bedrock is at a depth of about 36 inches. Permeability is moderate in most area although infiltration rates have been slowed as a result of the intense burning which made a lot of the soil surfaces hydrophobic. Because of the hydrophobic characteristics, the potential for rapid run-off and water erosion is high. This soil has a high potential for soil movement on steep slopes.

The Caris soil is on about 10 percent of the landscape in the project area predominantly located in section 36. The Caris soil is moderately deep and well drained. It formed in colluvium from metamorphic rock. The soil surface layer is very dark gray brown about 7 inches thick. The upper 13 inches of the subsoil is dark yellowish brown very gravelly clay loam. The lower 11 inches is dark yellowish brown extremely gravelly loam and bedrock is at about 31 inches. The depth to bedrock ranges from 20 to 40 inches. Permeability is moderate in most area although infiltration rates have been slowed as a result of the intense burning which made a lot of the soil surfaces hydrophobic. Because of the hydrophobic characteristics, the potential for rapid run-off and water erosion is high. This soil has a high potential for soil movement on steep slopes.

The Offenbacher soil is on about 5 percent of the landscape in the project area predominantly in section 36. The Offenbacher soil is moderately deep and well drained. It formed in colluvium from metamorphic rock. The surface soil layer is dark grayish brown and dark brown gravelly loam about 9 inches thick. The subsoil is reddish brown loam about 25 inches thick. Bedrock is at about 24 inches. The depth to bedrock ranges from 20 to 40 inches. Permeability is moderate in most area although infiltration rates have been slowed as a result of the intense burning which made a lot of the soil surfaces hydrophobic. Because of the hydrophobic characteristics, the potential for rapid run-off and water erosion is high.

Caris and Offenbacher soils are found in this area only as a mixed soil group, the Caris-Offenbacher Complex.

**Soil Effects**
Fire has been an important influence in the development of forested ecosystems and soils in the Little Applegate Watershed. The effects of fire on soils are variable depending on the intensity of the fire and the type of fuels consumed. If forest litter and the decomposed organic material on and in the soil are not totally consumed by fire, then fire effects on soil are usually minimal.

High intensity fires that burn all the duff and litter on forested sites including logs laying on the forest floor, can heat the soil enough to make fine textured soils such as clays and silts increase in coarseness. At the same time, loss of all the surface cover has the potential to decrease the movement of water into soil, increase the potential for overland flow of water, and increase the risk of erosion.

Fire recycles nutrients that otherwise are stored in organic matter on the forest floor and are unavailable for plant use. After a fire, many nutrients used by plants are available for vegetation that returns to the site. Usually following wildfire there is a short-term increase in soil fertility that can last several years. However, if the organic matter of the mineral soil is lost or reduced, which can occur in hot, long duration fires, then the ability of the soil to hold nutrients leached from the ash is reduced. As a result, nutrients can be lost from the nutrient cycling system.

The effects analysis for this proposal will look at how soil disturbances impact slope stability, burned soils, soil

erosion, soil compaction, and loss of organic material and. A summary of the biological and physical systems that influence the type or degree of impact follows:

Slope Stability
The loss of vegetation has increased surface erosion and the potential for mass wasting. Leaves, needles, twigs and other surface organic matter no longer intercept or dissipate rainfall which will increase soil particle displacement. There was already quite a bit of rill erosion on some of the steeper slopes from the rain that occurred in September and October (Dammann 2001).

Dead trees and shrubs no longer pull water from the soil; evapotranspiration is low, consequently water availability has increased. In areas with hydrophobic soils, the layer between the surface and the repellent layer can become saturated. Burned and decaying roots expose soil, creating pipes that funnel water downslope. This will increase and locally intensify subsurface flows that will amplify the potential for slumping and mass wasting (the downslope movement of soil and rock as in a landslide) in soils with high rock content that are prone to this process. Old slumps are evident throughout the Quartz Gulch drainage indicating that the watershed is at risk for mudslide (BLM 2001 ESR report).

The Little Applegate Pilot Watershed Analysis developed a system describing the geomorphology of the watershed, titled *Landscapes at a Glance (**LAG**)*. Within the boundary of the Quartz Fire, as administered by the BLM, there are essentially only two LAG units found. The Lick Gulch basin is almost entirely represented by Resistant Metamorphics. The BLM administered portion of Quartz Gulch basin is entirely represented by Subdued Metamorphics. Neither of these LAG units are considered to be unstable. Approximately 15 acres of a third LAG unit, Bench and Earthflow, is located along the eastern edge of Section 36.

Resistant Metamorphics and Subdued Metamorphics have a low-moderate erosion potential,
Bench and Earthflow are high or very high (*Draft* Little Applegate River Watershed Assessment, ARWC, January 2002).

Bench and Earthflow terrain is also found in the headwaters of Quartz Creek on USDA Forest Service and privately owned lands. Granite is found in a portion of the headwaters of Quartz Creek; granite is generally considered highly erosive and unstable. These headwaters may be the source of "prehistoric upland landslides, and may fill valley bottoms to a significant depth", as described in Hydrologic effects of slope stability and erosion, under Hydrology and Riparian (next section).

Burned Soils
The entire burned area was examined and assessed for burn severity following the fire. Burn severity is not the same concept as fire intensity. Fire intensity is related to heat per unit area, flame length, rate of spread, etc. Although burn severity may be related, it more specifically describes the effects of the fire on soil and hydrologic function. Burn severity is classified as high, moderate and low. In some cases there may be complete consumption of vegetation by fire, with little to no effect on soil and watershed function. Other indicators of burn severity are depth, color, nature of ash, size of unburned fuels remaining, soil structure, and infiltration characteristics. In general, the denser the pre-fire vegetation, the longer the residence time, and the more severe are the effects of the fire on soil and hydroponic function.

Detrimentally burned soils are defined in Region 6 by USDA Forest Service (USDA Forest Service Manual, 1998), as soil in which the mineral soil surface has been significantly changed in color, oxidized to a reddish color, and the next one-half inch blackened from organic matter charring by heat conducted through the top layer. The detrimentally burned soil standard applies to areas greater than 100 square feet, which are at least five feet in width. Detrimentally burned soils have not yet been found on the Quartz fire.

Soil Erosion

Soil erosion occurs infrequently in undisturbed forests because the soil surface is protected by both vegetation and organic matter. The abundant layer of organic debris (duff) on the soil surface and the decomposed organic matter incorporated into the soil profile (humus) protect soil from erosion by allowing the rate at which water moves into and through the soil profile to equal or exceed the rate of precipitation or snowmelt. Organic matter reduces the likelihood of overland flow and subsequent soil erosion.

Several factors influence the amount of erosion that follows fire and management activities. These factors include climate, soil characteristics (texture, organic matter, structure, and permeability) topography, and ground cover.

Ground cover refers to any surface cover that protects the soil from erosion. These covers would principally be vegetation, but can also include rocks, needle fall from burnt trees, woody debris from slashed brush from logging activities, and surface treatments placed by man such as mulches, netting, and erosion blankets.

Intense storms or rapid snowmelt can exceed the capacity of the soil to accept, store, and move water through the soil profile. When this occurs, water runs over the surface of the ground and erosion is possible if the soil lacks a protective ground cover.

Loss of organic matter and reduction of soil permeability, as a result of management activities or wildfires can increase soil erosion. Organic matter itself holds large quantities of water. It also improves soil structure, and increases permeability and water holding capacity of the soil. Organic matter on the soil surface reduces impacts to the soil of raindrops and provides a rough surface that slows runoff and traps sediment.

Topography includes slope length and slope steepness. These two factors determine in large part the velocity of runoff. The erosive potential of water flowing over the surface of the ground increases as the square of the velocity.

Micro-topography can have a mitigating affect on erosion. On breaks-in-slopes and cat roads eroding material could collect and possibly stabilize, once vegetated. Stump holes and burned out roots could act as below ground reservoirs for eroding ash and soil.

Erosion could also occur on the seedling and sapling stands that burned in the fire. These and other areas were previously harvested and some have skidtrails that can efficiently channel running water. These areas should revegetate quickly with grasses and forbs that are still viable in the soil surface.

Blowdown has potential to cause soil erosion in unmanaged forests. Blowdown can disturb large areas of soil, but it typically does not provide a direct linear path for sediment to reach streams. It can add debris and surface irregularities that trap soil particles. The erosion potential from blowdown is greatest when trees on the streambank fall over.

Fire also has the potential to make soils hydrophobic, or resistant to the movement of water into and through the soil profile. When a fire is burning hot gasses can be seen rising upwards, vaporized organic substances are also driven into the ground. The hotter the fire the deeper these gasses are driven until they reach cooler surfaces where they condense, sometimes forming an impermeable barrier (Debano, et. al., 1998). Hydrophobic (water repelling) organic compounds that volatilized during combustion have coated soil particles on the Quartz Fire. In some instances, the soil's water infiltration rate has been reduced by this water-repellant layer. Decreased infiltration results in increased surface runoff or redistributed subsurface water. Water-repellent soils produce more erosion (USDA PNW-GTR-486, 2000, pp. 51). This phenomenon is expected to last for at least 4 years

following fire(USDA PNW-GTR-486, 2000, pp. 28). Salvage logging can improve watershed conditions by breaking up hydrophobic soils (USDA PNW-GTR-486, 2000, pp. 57). Beschta also says that the use of ground-based yarding systems may assist in disrupting the surface hydrophobic condition (Ice, et.al., 1999).

A study of fire salvage logging found: Over the 3 years following salvage, no accelerated erosion or sediment transport resulted when best management practices were implemented. Salvage had a positive effect by increasing ground cover, with slash (USDA PNW-GTR-486, 2000, pp. 50).

A study of the Yellowstone Fire found that postfire logging had little effect on runoff or soil loss compared to that resulting from the wildfire only (USDA PNW-GTR-486, 2000, pp. 51).

Harvest methods in order of increasing soil disturbance and erosion are helicopter, skyline, tractor skidding and cable skidding (USDA PNW-GTR-486, 2000, pp. 46).

Salvage logging can improve watershed conditions by adding ground cover (USDA PNW-GTR-486, 2000, pp. 57).

By creating patches of disturbed soil, postfire logging can encourage more establishment of plant species relative to postfire unlogged sites (USDA PNW-GTR-486, 2000, pp. 63).

In a controlled study on the Stanislaus National Forest, using tractors and cable logging, there was no difference in sediment output between logged and unlogged units; sediment contributed by logging was overwhelmed by sediment produced as a consequence of the fire itself (USDA PNW-GTR-486, 2000, pp. 16).

Soil Compaction

Compaction and displacement are caused by management activities that require the use of heavy equipment. Soil displacement also occurs in unmanaged forests when trees fall over with their roots attached. Neither of these disturbances have a significant affect on soil productivity when they occur in limited extent under natural conditions.

Climate influences the amount of soil compaction or soil displacement because wet soils compact more easily than dry soils

Pore spaces in soil are disrupted by soil compaction and soil displacement. Water will concentrate on the soil surface rather than flow into the soil if soils are detrimentally compacted.

Detrimental soil compaction can make nutrients inaccessible to plant roots.

Detrimental compaction is defined in Region 6 (Oregon and Washington) by the Forest Service Manual Chapter 2520 as an increase in soil bulk density of 15 percent, or more, over the undisturbed level, a macropore reduction of 50 percent or more and/or a reduction below 15 percent macro porosity.

The majority of soils in the study area have high rock content (35-65% gravel and cobble), bridging of rock particles tends to decrease the affects of heavy equipment.

A 1997 study, by Amaranthus, that took place within the fire perimeter found that after six trips while yarding small-diameter Douglas-Fir with a small tractor that soil compaction increased 6.7 percent when conditions were dry. Most of this increase in bulk density occurred in the first few trips and no significant increase after the third trip (USDA PNW-RP-504, 1997), (note that 15 percent is the lower limit for detrimental compaction).

This US Forest Service study took place on Applegate Metavolcanics that are in the Taxonomic Class fine-loamy, mixed, mesic Mollic Haploxeralf soils. Soils on US Forest Service lands have not been mapped by the Soil Conservation Service, however, in general, in Jackson County, metamorphosed volcanic and amphibolite rocktypes are mapped as either Vannoy soils or if on slopes above 50 percent as Caris-Offenbacher Complex soils. Additionally, Vannoy and Voorhies soils are also classed taxonomically as fine-loamy, mixed, mesic Mollic Haploxeralf soils. Vannoy and Voorhies soils constitute 85 percent of the soils on the BLM administered portion of the Quartz Fire. Consequently, the results of this study should be applicable to most of the BLM administered lands in the Quartz Fire.

Loss of Organic Material

Soil productivity is the ability of the soil to supply the nutrients needed to sustain plant growth. Nutrients that are available to plants are contained in the soil profile. They are also released as organic matter decomposes. Organic matter must be decomposed by either soil organisms or fire before the nutrients it contains are available to plants. A shortage of any one nutrient can reduce the growth potential of vegetation. Nutrient shortages can result from changes in soil chemical or physical processes caused by fire, timber management or road construction. Soil compaction can make nutrients inaccessible to plant roots. Loss of organic matter can reduce the amount of nutrients available to plants.

Soil nutrients are lost naturally as a result of leaching, burning, surface erosion (particularly water erosion) and mass wasting. Leaching and erosion are usually the major pathways of nutrient loss. Fires can volatilize both nitrogen (N) and sulfur (S), and through wind-blown removal of ash, cause significant nutrient losses. Hot wildfires may remove greater than 500 kg/ha of N (Edmonds et al).

Soil organisms and their interactions profoundly affect forest-site productivity though capture and uptake of nutrients, nitrogen fixation, protection against pathogens, maintenance of soil structure, symbiotic interactions between species and buffering against moisture stress. Soil organic matter, humified material and decaying wood (See Appendix for Description of Decomposition Class) are centers of microbial activity and can substantially diminish as a result of intense fire (Amaranthus et al). In areas of high severity effects of the wildfire, the microbial and fungal populations have been substantially diminished.

Large woody debris, as it decomposes, provides important habitat for fungi that form symbiotic relationships with tree roots, helping the tree acquire both nutrients and water.

Fires affect productivity by reducing the amount of organic matter on a site, which in turn alters the way a site cycles nutrients between living vegetation and decaying organic matter on the forest floor. Fires increase the nutrients that are available for immediate use by plants that colonize a site after fire. Fires also decrease the total amount of some nutrients stored in organic matter. Over time, as vegetation returns, nutrient levels increase and eventually reach pre-burn levels.

In areas of high severity effects, very little litter and duff remain on the forest floor. The loss of organic matter upon and within the soil reduces moisture-holding capacities, decreases soil aggregate stability, increases surface runoff, and depletes much of the soil nutrients. Remaining large pieces of down woody material tend to be heavily charred with a weather-resistant charcoal coating that slows the rate of natural decomposition and mineralization.

Typically soils types on the BLM administered portion of the Quartz Fire would have a maximum of one-inch surface cover of needles, twigs and leaves but the wildfire consumed most of the soil organic matter. Post fire reconnaissance indicates that the soils in section 3 (T.40S.,R.2W.) were exposed to burn intensities during the wildfire that resulted in moderate severity effects to the soil resource. In section 2 (T.40S.,R.2W.),

approximately 90 percent of the soils in the project area received high severity effects and 10 percent moderate severity. In section 36 (T.39S.,R.2W.), about 40 percent of the soil area had high severity effects and the rest of the area was moderate severity.

An in-depth soil organic matter study on another fire also within the Klamath Mountains Geologic Province was completed for the Silver Fire, outside of Grants Pass, Oregon. Summarized results are on the following chart.

**Organic Matter Distribution**

| | Pre-Fire | Post-Fire High Severity Fire | Post-Fire Moderate Severity Fire | Post-Fire Low Severity Fire |
|---|---|---|---|---|
| **Above Ground (trees and shrubs)** | 57% | 46% | 50% | 54% |
| **Surface (duff and litter)** | 6% | 1% | 3% | 4% |
| **Below Ground (roots and organic matter)** | 37% | 31% | 33% | 35% |
| **Total Organic Matter** | 100% | 78% | 86% | 93% |

In a 1990 study of the Yellowstone Fire found that postfire logging had little effect on organic matter compared to that resulting from the wildfire only (USDA PNW-GTR-486, 2000, pp. 51).

Beschta recommended that no management activity should be undertaken which does not protect soil integrity, Salvage logging should be prohibited in sensitive areas and tractors and skidders should be generally prohibited (Beschta, et. al., 1995). On the BLM administered lands in the Quartz Fire all but 15 acres have a low-to-moderate erosion potential, soils are not likely to be compacted if small tractors are used and as defined by the BLM Medford Resource Management Plan there are no Fragile Soils. Ice responds to Beschta by stating that though sensitive areas need to be recognized, sensitive areas may be the sites most in need of management. The most severely burned sites may be the very ones that will benefit the most from post fire logging (Ice, et. al., 1999).

**Hydrology and Riparian**

Vegetation, climatic, geologic and other processes related to hydrology are discussed in depth in the Little Applegate Watershed Analyses.

Quartz Gulch is a perennial tributary to Yale Creek. Yale Creek is a major Little Applegate River tributary. A portion of the project is located in the uplands of Mule Gulch, a tributary to Glade Creek, also a major Little Applegate River Tributary. A small portion of the project is also located in the uplands of Lick Gulch, a Little Applegate River tributary. Riparian Reserves within the project area are primarily in the Quartz Gulch drainage area of the Yale Creek Subwatershed, with two short ephemeral stream Riparian Reserves on unnamed tributaries to Mule Gulch in the Glade Creek Subwatershed.

Riparian

Riparian area vegetation species diversity within the project area was good, with a broad range of riparian species present along perennial and seasonal streams. Ephemeral streams within the project area generally were comprised of the same plant communities as the surrounding uplands. Streams and draws within the project area were surveyed in 1999, prior to the fire. The widest riparian areas were along the perennial portions of Quartz Gulch, with total widths of 15-30' (width from one side of the

riparian area to the other, including the stream). Long duration intermittent streams (seasonal streams) had riparian area widths ranging from 5-12 feet. One short duration intermittent stream (ephemeral stream) had a 10' wide riparian area; all remaining short duration intermittents and dry draws had no riparian vegetation present - vegetation was essentially indestinguishable from the surrounding uplands. Riparian conditions prior to the Quartz Fire were outside the range of natural variability, largely due to past fire suppression policies and timber management activities that did not mimic natural processes. Given the natural fire frequency in this area, many low-severity fire events had likely been suppressed over the past century, leading to riparian vegetation densities much higher than would be expected under a more natural fire regime. Exclusion of low-intensity fire coupled with removal of the largest size classes of trees lead to many of the riparian areas being composed of dense, suppressed small-diameter vegetation and high mortality rates for the large, more fire-resistant trees.

With Riparian Reserve vegetation conditions well outside of the range of natural variability, the intensity of the resulting wildfire also was likely outside of the range of natural variability, leading to the loss of even the most fire-resistant trees in much of the upper Quartz Gulch area. The organic layer of the soil was damaged or destroyed in many areas, and much of the down woody debris under ~20" diameter was completely consumed. The majority of the large woody debris over ~20" diameter came through the fire relatively intact, probably due to significantly greater moisture storage within the larger sized pieces even given the severe drought conditions in 2001.

In the intensely burned areas, the amount of standing dead wood is much greater than would be expected, even from a stand-replacement fire under more natural vegetation conditions. Where large trees had not been previously removed, large wood volumes are greater than would be expected due to the exclusion of natural disturbance mechanisms, specifically the result of past fire suppression policies. In virtually all stands, volumes of small diameter trees are at extremely high densities, again due to fire suppression.

In most of the project area, significant numbers of hardwoods survived the intense wildfire. Crowns and trunks may have been destroyed, but are quickly resprouting from the roots. Maple were observed with resprouts up to 18" in length less than one month after the fire had been controlled. By late fall, many oaks, madrones, hazel, and other hardwoods were observed to be resprouting, although browse by wildlife was heavy.

Areas where forest canopy was completely consumed have very little fine organic material remaining on the forest floor. Areas where mortality was high, but where canopy was merely scorched rather than consumed, have provided a significant litter layer of leaves and twigs. As part of emergency rehabilitation, many small diameter trees were felled on hillslopes to capture sediment, slow overland flow during storm events, and to provide some input of organics as the soil recovers from the fire. Small numbers of larger diameter trees were felled into active stream channels to also provide some larger instream structure, dissipating stream energy.

Stream Channels

Within the project area, Quartz Gulch and its tributaries are small streams, with bankfull (1-2 year return interval flow event) widths under 4.6 feet and bankfull depths under 0.4 feet. Floodprone area widths (the width in common return interval floods, i.e. 20-30 year events) are in the 4-8 feet wide range.

Because of the small stream size and the relatively low stream gradient, flood events or debris torrents are unlikely to transport large key pieces of wood to the downstream aquatic system. Key pieces of large wood in these types of stream systems tend to promote formation of large, stable debris jams, which over time capture large, deep, relatively stable colluvial deposits. These areas tend to store large amounts of ground water, and serve as "sediment filters" through which water can percolate. In all but the largest flow events, these areas can effectively trap and store most of the sediment and turbidity, releasing relatively clear water downstream. These "colluvial filters" have likely declined in frequency in many streams in the Applegate area due to declining inputs of large wood, but are still intact in portions of Quartz Gulch. The effectiveness of these areas in protecting water quality has been observed during the winter of 2001-2002, as visits during large runoff events have revealed extremely turbid, sediment-laden water at one location being filtered to virtually clear flow less than ½ mile downstream.

The Quartz Fire consumed a large portion of the woody debris component in stream channels though much of the fire area, especially the smaller diameter woody debris (less than 20"). The amount of instream wood is already increasing, however, with many areas probably approaching pre-fire levels of wood accumulation due to fire-killed trees and emergency rehabilitation efforts providing new down wood. It is estimated that it would take approximately 80 years, barring an intense reburn of the area, before the new stand would begin to contribute any new large woody debris, so any input of wood to the stream prior to that time would occur only from the remaining fire-killed stand. Areas that were underburned but did not suffer significant mortality of the overstory would continue to produce and provide an input of woody debris from the existing stand over time. Future management of the stand to produce the largest key pieces of instream wood possible is desirable, especially for these headwater riparian areas.

Hydrologic effects of slope stability and erosion

The most significant surface soil erosion is likely to occur in the first five years following any damage to the soil and loss of vegetation caused by the fire. The first rainy season would probably see the greatest surface runoff and subsequent delivery of fine sediment and turbidity to the downstream aquatic system, with each of the following years becoming progressively less. It is likely that any hydrophobic conditions will dissipate within the first few years after the fire. Surface runoff and rilling occurred during an intense rain event in September 2001 in some draws in the upper portion of Quartz Gulch. Based on descriptions provided by BLM personnel on the site during the event, it is estimated that an inch of rain fell in a 20 minute period, an intensity that rarely occurs during winter storms. Frost heave may have reduced hydrophobic soil characteristics, and subsequent above-average rain and small rain-on-snow events up through early February 2002 have not produced additional visible erosion from this source. Field observation of sediment sources indicate that most are originating from roads and ongoing harvest and salvage operations on ownerships other than BLM, rather than from fire effects themselves. Extensive tractor yarding operations are occurring on non-BLM lands in Quartz Gulch, as well as on the rest of the Quartz Fire area. In some areas, draw bottoms are being used as tractor yarding corridors, and draw crossings have been constructed with no provision for passing flows. On non-BLM lands, instream disturbance of the mainstem of Quartz Gulch prior to the fire is now providing a large input of sediment to the downstream aquatic system. At the present time, most of the sediment in Quartz Gulch is being filtered out by a healthy riparian area on BLM, and is not affecting Yale Creek or the Little Applegate river downstream.

Another potential risk appears to be deep-seated, large-scale mass failures, where areas hundreds of feet wide may break loose into valley bottoms below. Past evidence of this is visible in several areas along the main stem of Quartz Gulch, with a broad, relatively flat valley bottom rather than the more "V"-shaped valley common to small streams in much of the Applegate. These areas are the result of mass deposition from prehistoric upland landslides, and may fill valley bottoms to a significant depth. The combination of deep colluvial material and entrained large wood serves as a large groundwater storage source in an area that otherwise geologically stores very little groundwater. These deep colluvial layers provide the source for the springs that feed Quartz Gulch year-around. Because of the relatively deep-seated nature of these slides, vegetation on the surface of the source areas likely has little affect on their frequency of occurrence (although the timing may be changed somewhat based on vegetation conditions). The areas where these slides are deposited, however, are profoundly affected by the size of the vegetation at that location. Large-diameter trees provide "roughness" to the valley floor that would help to slow down and capture the moving material. An area without this large wood component would likely see such mass movements travel much further down-valley. It is estimated that the greatest risk of these types of failures being triggered due to vegetation mortality is during the period when the root strength of the dead trees begins to fail, and the recovering vegetation has not developed any root structure of significant size. The risk from this combination of conditions would likely peak 7-15 years out from the disturbance event. Risk of these kinds of mass failures is estimated to be low in the project area.

Water quality

Yale Creek below Waters Gulch (downstream of the project area) and the Little Applegate River are both listed as Water Quality Limited streams on the 303(d) list for high stream temperatures. Streams within the project area are not listed for any 303(d) list concerns.
(data from ODEQ website http://waterquality.deq.state.or.us/WQLData/SearchChoice98.htm)

Effects of the fire on Quartz Gulch stream temperatures are not expected to be measurable. Although a short section of the perennial section of Quartz Gulch is located in the intensely burned area, summer flows originating out of this area are very low, with much of the flow subsurface. Additionally, most of the perennial portion of Quartz Gulch downstream of the intensely burned area has heavy riparian cover on the stream as well as subsurface flow, so it is unlikely that temperature effects could be transmitted downstream. Any effect on temperature would likely disappear in a few years, as riparian area vegetation quickly becomes very dense in response to the combination of increased sunlight and moist soils. Summer stream temperature will be monitored in Quartz Gulch to document conditions.

Sediment delivery from the upstream intensely burned areas could be significant, especially during the first few years following the fire. The risk of sediment delivery due to effects of the fire itself are probably low to moderate. A greater risk of sediment delivery is from ground disturbance related to suppression activities which occurred during the fire, from fire line, road work, and other heavy equipment operations. Emergency rehabilitation efforts focused on mitigating this disturbance. Culverts were removed from many draw crossings, fill material pulled out of draws to restore natural drainage paths, waterbars installed, seed, mulch and cut vegetation placed on trails. These mitigation efforts reduce the risk of significant impact from suppression activities, but do not eliminate it. The greatest risk of sediment delivery would be from any ground-based yarding of salvage that did not employ adequate best management practices. Such practices occurring on non-federal lands are outside the

jurisdiction of BLM. Wintertime turbidity will be monitored in Quartz Gulch as an indicator of sediment delivery conditions.

Large inputs of sediment would also result if large-scale mass wasting occurs, or if a major flood were to occur in the years following the fire. Sediment input occurring from flood events would not be likely to have a significant negative impact on properly functioning portions of the downstream aquatic system, as fine sediments are typically pumped out of stream channels onto banks and floodplain areas. The areas at severe risk for degradation in these types of events would be streams that have been confined, channelized, straightened, or otherwise disconnected from their floodplains and unable to properly move and store sediment; such streams could suffer further degradation due to fire effects. Many portions of the Little Applegate and Applegate rivers downstream are at risk for this reason.

Water Quantity

Flows in Quartz Gulch and its tributaries will be more flashy for many years. Peak flows will be higher and summer low flows will be lower. Initially there may be less summertime removal of water from the stream by riparian vegetation (or lack thereof), but this should quickly change, and within 5 years the explosive growth of the riparian area will likely be extracting more moisture than was occurring pre-fire. In the initial years, the reduced removal of water by riparian vegetation will probably be more than offset by the reduced infiltration and storage of winter rain (the rain would run off rather than soak in), probably resulting in reduced available soil moisture and ground water.

Flows will likely be outside the range of natural variability, due to the intensity with which the fire burned in much of upper Quartz Gulch, an intensity also outside of the range of natural variability due to the fuel loading brought on by years of fire suppression and lack of the type of proper landscape management necessary in an area with this type of fire regime.

Summary of Cumulative Watershed Effects (CWE)

In assessing the potential risk of adverse CWE of multiple activities within watersheds, the Glade Creek and Yale Creek subwatersheds have been assessed separately for risk. Based on watershed risk factors (road densities and percent of watershed forested stands less than 30 years of age), and on channel condition factors (large woody debris and embeddedness), a current overall watershed condition rating has been determined for these subwatersheds. Both Yale Creek and Glade Creek have poor overall ratings (both pre and post fire) due to relatively high percentages of these basins in young hydrologically unrecovered forests under 30 years of age, high road densities, and low volumes of large woody debris within channels. Embeddedness is expected to increase short term (+/- 3 years) owing to normal increases in sedimentation following severe wildfire; after the initial increase, it is expected to return to pre-fire conditions. The short term differences in sediment embeddedness would be most pronounced in the small 7$^{th}$ level tributaries to Glade and Yale Creeks (such as Quartz Gulch) and to a lesser extent in lower Glade and Yale Creeks. (Mike Zan, USFS Hydrologist, personal communication)

Road densities are very high in the Little Applegate Watershed. The Little Applegate Watershed Analysis (1995) indicated average road density of 3.5 miles per square mile across the Watershed, with densities of 3.0 miles/square mile on federal lands and 4.7 miles per square mile on private lands. In the valley bottom areas along the Little Applegate River, road densities determined from 1996 aerial photography exceed 10 miles per square mile, and ground truthing of this number suggests that this

density is likely underestimated in forested areas due to canopy cover. There are over 400 miles of roads in the watershed, plus uncounted numbers of skid roads. (*Draft* Little Applegate River Watershed Assessment, ARWC, January 2002) Road effects are a major concern related to cumulative effects, especially because they do not mimic any process that would be expected to occur in the watershed under natural conditions. Because of this, it is critical that any proposed projects have a high probability of improving degraded hydrologic conditions related to roads, rather than just maintaining the existing condition.

Major concerns for potential impacts to the aquatic system include the potential for culvert failure and stream diversion where roads cross streams and washes, and roads that increase drainage efficiency by intercepting surface and subsurface water on hillslopes and rapidly routing it to streams. Priorities for restoration of hydrologic impact to the watershed are decommissioning unnecessary roads, separating roads from the stream network, and treating existing roads to reduce erosion and minimize hydrologic impacts (*Draft* Little Applegate River Watershed Assessment, ARWC, January 2002). Where possible, replacing existing roads in riparian areas, high-impact or high-risk areas, or that have severe erosion problems with more stable, less impacting roads designed to be more hydrologically benign can immediately improve conditions at the site level. Cumulatively, over time, these actions can begin to reverse negative impacts to hydrology at the watershed level. Proper design and placement of road decommissions, obliterations, rehabilitation and new construction is critical to reducing current high levels of road-related cumulative impacts in the Little Applegate Watershed.

Within the Watershed, canopy closure and the associated reduction in peak flows and transient snow zone openings are probably still much greater than recent prehistoric conditions. The large increases in canopy closure due to fire suppression are probably many times greater than the decreases brought on by harvest practices, agricultural and residential clearing, and recent wildfires. The negative effects on peak flows and hydrologic function due to road-related disturbance probably offsets the reductions occurring from high vegetation densities. Canopy closures are likely much higher today than in the early 1900's, when the Watershed was still experiencing the combined effects of recent prehistoric vegetation management utilizing fire by Native Americans, landscape burning and hydraulic mining impacts resulting from the quest for precious metals, heavy use of open range, and initial clearing of areas for agricultural development. Although between 1975 and 1995, residences in the Little Applegate Watershed increased from 42 to 148 (*Draft* Little Applegate River Watershed Assessment, ARWC, January 2002), canopy openings from this new development have probably been largely offset by continuing recovery of vegetation on areas cleared through hydraulic mining.

**Wildlife**

In the high-intensity burned area, habitat/vegetative diversity is greatly reduced. Snags and the down woody material that wasn't consumed in the fire provide the primary habitat components. Only a few species (e.g., black-tailed deer, coyote and several bird species) have been observed in this charred area. These animals were probably moving through the area since there is little food or cover available at this time to sustain them. As insects colonize the snags and floral succession progresses, a more diverse faunal assemblage would occupy the high intensity burned area.

The moderate-intensity burned area is characterized by a mosaic of burned and unburned vegetation, but is dominated by burned vegetation. Vegetative structure is more complex than in the high-intensity

burned are so a greater diversity of wildlife species would be expected to be present. The size of the unburned areas, however, are relatively small so resident species in these areas would be those that have small home ranges, e.g., small mammals. As in the high intensity burned area, there is an abundance of snags, but much of the smaller pre-fire down woody material was consumed.

Except for some shrubs and down woody material that burned in the low intensity burn area, pre-fire habitat conditions are essentially unchanged. The low-intensity burned area is adjacent to unburned vegetation to the southwest; therefore, wildlife species diversity would be expected to be similar to that found before the fire.

Threatened/Endangered Species

A 100-acre northern spotted owl activity center was consumed by the fire in the high-intensity burn area. One-hundred acre activity centers for northern spotted owl sites known prior to 1 January 1994 areas were established by the NFP and allocated as Late-successional Reserves (LSR). Direction provided by the Regional Ecosystem Office (REO) stipulates that the activity centers/LSR remain where they were established, even if destroyed by a catastrophic event. The fate of the owls associated with the Quartz Gulch site is unknown. There are 42 acres of suitable spotted owl habitat remaining in the low-intensity burned area of the proposed project. No suitable habitat remains in the high-intensity and moderate-intensity burned areas.

The proposed project is within designated critical habitat (Critical Habitat Unit OR-75) for the northern spotted owl.

Special Status Species

Special Status Species (SSS), for management purposes, 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. Habitat conditions for SSS species that may have been present in the pre-fire environment were changed dramatically in the high-intensity and moderate-intensity burned areas. With the exception of the Siskiyou Mountains salamander, SSS are not likely present in high and moderate intensity burned areas. The fire, however, set the stage for potential occupancy by two SSS woodpecker species (black-backed and three-toed) in these areas. These species exploit burned areas for the improved insect food supply.

Survey and Manage/ Protection Buffer Species

The Northwest Forest Plan provides extra protection for some species through Survey and Manage (S&M) standards and guidelines (S&Gs). The S&Gs provide protection for sites known to be occupied by the species, and for some species also directs that surveys be conducted in proposed project areas if the project is “ground-disturbing”.

The proposed project area was surveyed prior to the fire for great gray owl nest sites and none were located. Surveys for other S&M species (red tree vole, Siskiyou Mountains salamander and mollusks) would be conducted prior to project implementation where the criteria for surveys for these species are met.

# CHAPTER IV
# ENVIRONMENTAL CONSEQUENCES

## A. INTRODUCTION

This chapter forms scientific and analytic basis for the comparison of alternatives. Discussions include environmental impacts of the alternatives and any adverse environmental effects which cannot be avoided should the proposal be implemented. It also identifies and analyzes mitigation measures, if any, which may be taken to avoid or reduce projected impacts.

The impact analysis addresses direct, indirect, and cumulative impacts on all affected resources of the human environment, including Critical Elements.

## B. MITIGATION MEASURE

1. In the Proposed Action, eliminate proposed road construction on the lower slopes (the mid-slope road) in Section 36, T39S,R2W.

Logging Systems: If accepted, the logging system on approximately one (1) acre of land in Section 36 would change from tractor yarding to helicopter yarding and approximately thirty-six (36) acres would change from cable yarding to helicopter yarding. This would increase the weighted average logging cost (with road construction and decommissioning costs included) from approximately $148/MBF to $178/MBF or an increase of 20%. Based on a yield of 10 mbf/ac, there would be an increase in overall estimated project cost of $42,050 (reduction of revenue to the Government).

Hydrology/Fisheries: Hydrologic risks and associated risk to downstream fisheries associated with the proposed road building would be substantially reduced with this mitigating measure. The mid-slope road construction eliminated by this mitigating measure would have been positioned lower on the slope, closer to Riparian Reserves, crossing several dry draw/swale areas, and would have the greatest chance of accelerated delivery of flow and sediment to the downstream aquatic system. The remaining road construction is much higher on the slope, with portions on the ridegtop, and much further from the Riparian Reserves. This remaining section of new road construction would cross no draws or swales.

Elimination of the mid slope road would decrease the potential for sediment to be transported downstream.

2. In the Proposed Action, eliminate all proposed road construction (upper ridge type and mid-sloped road) in Section 36, T39S,R2W.

Logging Systems: If accepted, the logging system on approximately two (2) acre of land in Section 36 would change from tractor yarding to helicopter yarding and approximately eighty-five (85) acres would change from cable yarding to helicopter yarding. This would increase the weighted average logging cost (with road construction and decommissioning costs included) from approximately $148/MBF to $204/MBF or an increase of 38%. Based on a yield of 10 mbf/ac, there would be an increase in overall estimated project cost of $79,680 (reduction of revenue to the Government).

Hydrology/Fisheries: Hydrologic risks and associated risks to downstream fisheries associated with the proposed road building would be eliminated with this mitigating measure.

Elimination of all road construction would decrease disturbance in an already disturbed drainage and also decrease the potential for sediment to be transported downstream.

## C. CUMULATIVE EFFECTS ANALYSIS - Eight Principles of CEA

- Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions.
- Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who (federal, non-federal, or private) has taken the actions.
- Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.
- It is not practical to analyze the cumulative effect of an action on the universe; the list of environmental effects must focus on those that are truly meaningful.
- Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
- Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.
- Cumulative effects may last for many years beyond the life of the action that caused the effects.
- Each affected resource, ecosystem, and human community must be analyzed in terms of the capacity to accommodate additional effects, based on its own time and space parameters.

For this analysis, the affected area is defined at two different spatial scales: Quartz Fire project area (USFS, BLM, with private land) and the HUC-5 watershed (the entire Little Applegate watershed). Quartz Fire project area contains approximately 6,216 acres of which 954 BLM acres, 3,489 USFS acres, 75 State of Oregon acres, and 1,698 private acres. The Little Applegate watershed contains approximately 72,262 acres of which 28,939 BLM acres, 23,219 USFS acres, 320 State of Oregon acres, and 19,784 private acres.

Past actions for this analysis focuses on actions (commercial timber harvest on public and private land, road construction, and agricultural development in the valley bottom) implemented since approval of the NWFP (1994). A general description of the watershed, effects of pre 1994 past actions, areas of concern, recommendations, and data gaps are outlined in the Little Applegate Watershed Analysis. The present action is defined as the Quartz Fire project. Reasonably foreseeable future *federal* actions include upcoming scheduled BLM and USFS projects. For analysis purposes BLM assumes that all industrial private forest land would be clearcut.

Baseline data for cumulative effects analysis is listed below. Impact Analyses (Direct, Indirect, and Cumulative) are listed after this baseline data under the specific resource analysis.

The Quartz fire burned 480 acres of land owned and managed by Fruitgrowers Corp. out of Hilt California. The Quartz fire burned all acres with almost high mortality. Lost approximately 80 acres in plantations and 400 acres in merchantable timber. Fruitgrowers plan to complete salvage of the 400 acres (tractor harvest) by summer of 2002 and plan to replant the entire 480 acres in the spring of 2003.

**Projects on private land coordinated by the Applegate River Watershed Council:**
Riparian Revegetation & Fencing:

Numerous sites along the Little Applegate River, Sterling Creek, Grouse Creek, and Yale Creek have been planted and are being maintained. Includes fencing to limit livestock access on the Little Applegate River and Yale Creek and blackberry control as well as tree planting.

Erosion control and sediment reduction:
Rush Creek Road Rehabilitation; Crepsey Gulch Road Rehabilitation; Upper Little Applegate and Dog Fork Road Rehabilitation. Dog Fork Fire Rehabilitation Project (contour felling, permeable check structures, native grass seeding, tree planting, thinning of small diameter materials).

Upper Little Applegate and Yale Creek watersheds and, to a lesser extent. Glade Creek will be focus areas for future road-related sediment and erosion control efforts, which will include treating failure prone stream crossings, improving drainage, surfacing roads, and decommissioning where possible.

Stream Habitat:
We are identifying locations for the placement of large wood and boulder instream to enhance fish habitat.

Instream Flow:
The Little Applegate Stream flow and Habitat Enhancement Project, currently funded and beginning implementation, will place approximately 12 cfs instream in exchange for stored water rights from the Applegate reservoir.

Fish Passage:
Yale Creek dam improvements (funding proposals have been submitted or are being developed for the construction of jump pools below the two concrete dams on Yale Creek at RM 0.9 and 1.1).

Farmers and Buck and Jones dam will be removed as part of the Little Applegate Streamflow and Habitat Enhancement Project.

Oak Woodland Restoration:
Working on approximately 70 acres in Sterling Creek and 20 acres near the mouth of Yale Creek. Five additional sites have been proposed in the Little Applegate River Valley.

Forest Restoration:
Worked with several landowners to develop forest stewardship plans and with three landowners to thin overly dense conifer forest stands (See fire rehabilitation efforts under erosion control activities).

Boise Cascade has 392 acres on which they plan to complete salvage by the summer of 2002.

Since 1995 federal timber land that has either been thinned or is under contract to be thinned on BLM and U.S. Forest Service managed land within the Little Applegate Watershed. The following Table depicts this acreage by year awarded.

HARVESTED ACRES ON BLM IN THE LITTLE APPLEGATE WATERSHED

| SALE NAME | ACRES | PRESCRIPTION |
|---|---|---|
| Lick II - 1996 | 213 | Commercial Thin |
| DFZ - 1997 | 35 | Commercial Thin |
| Grubby Wells - 1997 | 41 | Commercial Thin |
| Grubby Sailor - 1997 | 313 | Defensible Fuel Mgt. Zone |
| Grubby Sailor - 1997 | 528 | Density Management |
| Grubby Sailor - 1997 | 115 | Pine Regeneration |
| Grubby Sailor - 1997 | 132 | Douglas-fir Regeneration |
| Kins Wood - 1997 | 88 | Commercial Thin |
| Sterling Rogue - 1997 | 94 | Commercial Thin |
| Poor Sailor - 1997 | 57 | Commercial Thin |
| Sailor Mill - 1998 | 20 | Commercial Thin |
| Sterling Wolf - 1998 | 346 | Defensible Fuel Mgt. Zone |
| Sterling Wolf - 1998 | 915 | Density Management |
| Sterling Wolf - 1998 | 260 | Regeneration Harvest |

On the lands managed by the Rogue River National Forest the Wagner Gap/Little Applegate Timber Sale Decision Notice includes thinning and salvage on 1,602 acres and 295 acres of mistletoe treatments on other projects. The USFS has made a decision to improve 1.25 miles of instream fish habitat, precommercial thin 236 acres of plantations, tree planting on 17 acres and control of noxious weeds on 4 acres.

Since 1994, 6.8 miles (6.4 miles on BLM + 0.4 miles on USFS) of new road has been constructed or is under contract to be constructed within the Little Applegate Watershed on federal BLM land. In addition, 47.1 miles (15.1 miles on BLM + 32 miles on USFS) of roads have been or are under contract to be decommissioned within this watershed. Approximately 1.4 miles of temporary roads have been built and obliterated. Approximately 41 miles (38.0 miles on BLM and 3 miles on USFS) have had drainage improvement. See Appendix T for details and the table below for a summary

Summary of Activities since 1994 - Transportation

| Ownership | New Road Construction (miles) | Drainage Improvements (miles) | Decommissioned (miles) | Obliterated (miles) |
|---|---|---|---|---|
| BLM | 6.4 | 38.0 | 15.1 | 1.4 |
| USFS | 0.4 | 03.0 | 32.0 | 0.0 |
| Totals | 6.8 | 41.0 | 47.1 | 1.4 |

A data gap exist dealing with miles of roads on private land through the past to the present.

After the Quartz Fire was suppressed the BLM and Forest Service completed a Burned Area Emergency Stabilization and Rehabilitation Plan (BLM Quartz Fire Burned Area Emergency Stabilization and Rehabilitation Plan, August 2001; USFS Burned Area Emergency Rehabilitation Report, August 2001)..

The emergency stabilization prescribed cost effective post-fire stabilization measures necessary to protect human life, property, and critical natural resources. It promptly stabilized and prevented further degadation to affected resources on lands within the fire perimeter and mitigated damages caused by fire suppression operations in accordance with approved land management plans, policies and federal, state, and local laws and regulation.

Reasonable foreseeable future actions
Landscape projects which includes commercial timber harvesting being planned on federal land within the Little Applegate watershed on the Ashland R.A. in the foreseeable future are portions of Bobar (FY 2003), portions of Bald Lick (FY 2004), and portions of Prince Caster (FY 2004). The amount of acreage to be thinned and the type and amounts of road work are unknown at this time because of the lack of completed pre-treatment surveys and site specific analysis. The analysis area for Bobar (in the Little Applegate watershed) in 5,848 acres, Bald Lick is 12, 221 acres, Prince Castor is 3,741 acres. These planning acres were identified prior to the Quartz Fire which is located in the Bald Lick planning area. The Quartz fire burned a small portion of Bald Lick in Sections 35 and 36, T39S,R2W and a small portion of Prince Castor in Sections 34 and 35, T39S,R2W and Sections 2, 3, and 10, T40S,R2W.

Non-commercial treatments include the Slashbuster 3 and Manual Treatments project which is planned for FY 2002 and includes reducing fuel hazard by thinning approximately 849 acres of BLM administered lands. Vegetation proposed to be thinned include non-commercial conifer trees, oak woodlands, and shrublands. Vegetation would be thinned using mechanical and manual techniques of cutting and chipping, such as the slashbuster, and/or using hand crews with chain saws. Slash created by the project would be chipped on site (if using slashbuster), or hand piled and burned if cut by hand crews. Some material may be removed from the site in the form of poles, firewood or other special forest products. Material to be cut would be under eight (8) inches in diameter at breast height. Future (approximately 3 to 5 years) maintenance treatments are planned utilizing a light underburn in portions of the units.

## D. RESOURCE ANALYSIS

**Botany** Alternative 1: No Action
Direct, Indirect, and Cumulative Effects
Absence of salvage/thinning harvesting and related activities would lessen ground disturbance. This, in turn, would lessen the opportunities for noxious weed and nonnative plants to become established and spread. Roads and streams are known to be effective weed seed transport mechanisms. Avoidance of riparian area treatments and no additional use of the transportation system would reduce the potential for weed spread compared to the other alternatives.

Not salvaging/thinning timber while continuing to monitor and treat noxious weeds within the project area, as prescribed in the Quartz Fire ESR Plan, would provide the greatest probability for successful control of these plants.

Without salvage/thinning, a greater amount of coarse woody material would be available as an important

habitat component for many bryophytes, fungi and vascular plants. European forests have documented declines in fungal diversity. This decline is probably associated with the deterioration of forest health. This problem has been attributed to intensive forestry practices, including the removal of coarse woody debris from the ecosystem (Plochmann 1989, Esseen et al. 1992). Coarse woody material without canopy cover may provide future substrate and micro-habitat conditions for these species.

**Botany** Alternative 2: Proposed Action

Direct and Indirect Effects

This alternative has the greatest potential for increasing noxious weed and nonnative plant populations in the project area. Activities that would produce site conditions favorable to weed and invasive nonnative plant establishment include logging, log hauling, road maintenance and improvements, and new road construction. All known weed populations in the project area occur along the roads to be used for the salvage/thinning operations. Inadvertent spreading of weed seed along and across the road from existing plants by road maintenance operations and rock placement are direct effects likely to occur.

Removal of trees would lessen the amount of future coarse woody material; however, amounts would still remain within the natural range of variability.

Cumulative Effects

Past, present and future activities in the watershed contribute to the noxious weed and nonnative plant problem. Most low elevation private land is infested with the noxious weed yellow starthistle. Vehicles and equipment used in the operations would transport seed throughout the watershed. Disturbed ground adjacent to weed infestations is highly susceptible to invasion. Weeds establishing in previously uninfested areas have greater ecological impacts. Given current conditions, PDFs, and comparative size of the proposed project area, Alternative 2 would contribute minimally to the weed problem in the Little Applegate Watershed.

**Botany** Alternative 3

Direct, Indirect and Cumulative Effects

Effects would be similar to, but less than, those described in Alternative 2.

References

Esseen, P.A., Ehnstrom, B., Ericson, L., Sjoberg, K. 1992. Boreal forests–the focal habitats of Fennoscandia. In: Ecological Principles of Nature Conservation. Application in Temperate and Boreal Environments, Hansson, L. ed. Elsevier App.

Plochmann, R. 1989. The forests of central Europe: a changing view. In: Oregon's Forestry Outlook: an Uncertain Future. Oregon State University, College of Forestry, Corvallis. 1-9.

**Fuels** Alternative 1: No Action

Direct, Indirect, and Cumulative Effects

The current trend of increasing ladder and surface fuels would continue within the stands proposed for commercial thinning. The increased stand densities and fuel loadings would increase the chance of a high intensity wildfire fire within these stands. Fire fighter safety would continue to be an issue as well as the potential of resource damage.

Existing fuel loadings in the area proposed for salvage are currently minimal due to the intensity of the stand replacement fire. Over time fuel loadings would increase in these areas. One source of fuel would be from new vegetation. Over time enough material would grow back that a wildfire could burn again on these sites. There are examples of this occurring in Southwest Oregon. Areas such as the Tin Pan Peak and East Evans Creek area have re-burned within ten years after a wildfire due to a rapid growth response of vegetation.

Another source of fuel would be from dead trees that are left on the site. Under this alternative no trees would be salvaged. As these trees fall down over time they would contribute to fuel loadings. Existing standing fuel loadings from this source range from 80 to 125 tons to the acre.
It has to be recognized that this material would come down at different rates due to the size of material.

Material up to 3 inches in diameter has the greatest influence on the rate of spread and flame length of a fire. In addition to the new vegetative growth which would contribute to this size of material, falling dead trees would also contribute to this size class (approximately 8-13 tons/acre). This material would not come down at one time due the range in sizes of the standing material

The greatest impact to future fuel loadings would be from the large diameter material from these trees. This material does impact fire duration. As this material burns fire duration would be greatly increased which would have negative impacts to the soil and present vegetation. Also, as this large material starts to burn during a wildfire, firebrands can be generated which would contribute to spotting problems.

**Fuels** Alternative 2: Proposed Action
In the short term (10-25 years) the commercial thinning of "green" timber stands would create surface fuels which would be greater than current levels if the fuels are not treated. 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 after commercial thinning would be increased by approximately 3-13 tons to the acre. This would change the existing fuel model of most of the stands thinned. With this change in fuel model higher rates of fire spread and greater flame lengths would occur. Direct attack of a fire could be limited under some weather conditions so indirect measures would have to be taken. This would in turn increase the size and cost of a wildfire.

Slash created from commercial thinning operations, if not treated, would also increase the duration and intensity of a ground fire. Increased fire intensity and duration would cause increased mortality to the smaller diameter overstory trees. To mitigate the impacts that slash created from the commercial thinning operations would have on fire behavior, the slash would be treated.

The proposed commercial thinning would reduce the overall density of the stands treated. These thinnings would reduce some of the aerial fuels present in the stands. Some of the smaller diameter trees that are of commercial size which are proposed for harvest also act as ladder fuels. The combination of removing some of the aerial component as well as the ladder fuels would reduce the chance of sustaining a crown fire in these stands. 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 thinnings would also favor more fire tolerant species such as pine.

Existing fuel loadings in the area proposed for salvage are minimal due to the intensity of the wildfire. Over time fuel loadings would increase in these areas. An immediate source of fuel would be from the tops of trees that are salvaged under the proposed action. The increase in fuel loadings from salvage operations would have minimal impacts on how a future fires would burn in these areas. This is due to these areas presently being void of fuels and the amount of material created from salvage operations would be small (2 to 7 tons to the acre). The material left on site from the salvage operation would be small diameter material and decay rates for this material is more rapid than large diameter material.

A second source of fuel would come from new vegetation. Over time this material would be enough to carry a fire.

Another source of fuel would be from dead trees that are left on the site. Fuel loadings from this source would be dependent on how much of this material is salvaged. The proposed action would leave approximately 5 to 20 tons to the acre standing (outside of Riparian Reserves). This compares to 80 to 125 tons to the acre if no trees are salvaged. The amount of material left in Riparian Reserve areas would be extremely variable. All the material would be left on slopes greater than 50% slope. Approximately half the area in riparian the Riparian Reserves are in this slope category. In areas that would be salvaged within the Riparian Reserves fuel loadings from material that is not salvaged would be a minimal of 40% greater than areas salvaged outside of the Riparian Reserve.

Overtime as this material falls down fuel loadings would increase. Areas that are salvaged would have significantly lower fuel loadings in large diameter material than areas that are not salvaged. Large material as it burns in a wildfire impacts fire duration. Higher fire duration would have negative impacts to the soil and present vegetation. Also, as this large material starts to burn, firebrands can be generated which would contribute to spotting problems.

**Fuels** Alternative 3
No salvage would occur in the owl core area and in the Riparian Reserves. It is estimated that approximately 175 acres less would be salvaged under this alternative. The impacts of increased fuel loadings due to not salvaging has been discussed under the previous alternatives. The increased fuel loadings in these areas over time would make these areas more susceptible to higher intensity fires which would have negative impacts soils and new vegetation.

Impacts - Air Quality
The proposed action propose to use prescribed fire so consequently there would be some smoke related impacts.

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 the proposed action 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.

Commutative Impacts

The BLM is in the process of evaluating the implementation of future landscape projects in the Little Applegate watershed. One of the goals for implementing these projects is to reduce fuels in order to reduce the size and intensity of future wildfires in this area. This proposed project as well as future projects utilize a landscape approach in fuels management. "A landscape-level approach to fuels looks at the large areas as a whole, in an attempt to fragment existing continuous, heavy fuel in high risk areas" (Weatherspoon and Skinner 1996). A Landscape-level approach to fuels management is the most effective method in modifying fire behavior (intensity and size) of a wildfire. "Landscape-level treatments have been proposed as a fuel management strategy that can aid wildfire control and help achieve more broad-based ecosystem management goals" (Agee and Edmonds 1992, Weatherspoon 1996, Weatherspoon and Skinner 1996), "particularly in areas that have historically low- to moderate severity fire regimes" (Agee 1993).

**Hydrology, Riparian, and Fisheries**

Because the scope of some of the projects and future management being proposed under these alternatives reflects implementation of a portion of the Northwest Forest Plan that has not been widely applied (for any length of time) in an area such as the Applegate with low annual rainfall and high natural fire frequency, the long-term results of these actions are not precisely known. The results of implementing landscape-level management to begin restoring an area to a condition that falls within the range of natural variability and returning riparian areas to properly functioning condition are not certain. This technically challenging opportunity for innovation and experimentation in the restoration of riparian areas in the Quartz Fire area fits in well with the intent of the Applegate Adaptive Management Area, and the results would likely benefit future management in many other areas as well. Best professional judgement by an interdisciplinary team is employed extensively, with field review and input on the proposal by specialists from the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and U.S. Forest Service.

On June 18, 1997, the National Marine Fisheries Service listed Southern Oregon/Northern California (SONC) coho salmon as "Threatened" under the Endangered species act [FR 62(17:33038]. On May 5, 1999, NMFS designated "Critical Habitat" for SONC coho [FR64(86):24049]. The Little Applegate River and Yale Creek are Critical Habitat.

**Hydrology, Riparian, and Fisheries** Alternative 1: No Action

Direct, Indirect and Cumulative Effects

Riparian Reserves

*Direct Effects*: With no on-the-ground actions, there would be no direct improvements or damage to Riparian Reserves. Additional mitigation of fire effects would be passive in nature. Maximum available levels of large wood would remain on site, providing structure and organic matter to accelerate recovery of soils, microhabitats, and channel conditions. The non-treatment of dense stands of small-diameter trees has the potential to contribute to further riparian degradation should an intense reburn occur. Fuel loading would increase at an unnatural rate due to regrowth combined with continued fire suppression. Ecological condition would likely remain well outside the range of natural variability.

*Indirect Effects*: In the short-term, large inputs of wood (even outside the range of natural variability) would be a benefit to the aquatic system and many riparian-dependant species, partially offsetting corresponding low levels of large wood in many other areas of the watershed. In the long-term without treatment of small-diameter materials, fuel loading in both the uplands and the outer portions of many Riparian Reserves would likely place these Reserves on the same trajectory they have been on for much of the recent past. This trajectory would be characterized by short intervals of recovery punctuated by severe, stand-replacing fires, a fire regime far outside the range of natural variability. Consequently, small streams would continue to be at high risk for sudden changes in peak flow, sediment input, and down-cutting due to concentrated runoff following wildfires, loss of fallen wood on the forest floor, and loss of any future source of large wood input.

In forest stands with increased vegetation densities coupled with quantities of woody debris outside the range of natural variability, trees would continue to grow very slowly, and would likely be consumed in almost inevitable reburns prior to attaining significant size, perpetuating the lack of late-successional riparian habitat. Without density management, desirable species composition cannot be maintained. Prescribed fire would become an unusable tool due to the unnatural fuel loading and subsequent risk associated with this type of stand. Competition for water in dense stands would continue to stress recovering vegetation (both hardwood and conifer), making it more susceptible to disease and insect outbreaks. All of these factors would impede natural stream functions and processes and ultimately reduce habitat and resources for aquatic animals and riparian-dependant wildlife.

*Cumulative Effects*: Levels of instream large wood are minimal through much of the Little Applegate Watershed. In the short-term, the existing dead large wood from the 148 acres of Riparian Reserves in the Quartz Fire project area would provide a slight (though barely detectable) increase in large wood levels in streams at the watershed scale. Without ongoing treatment of small diameter vegetation and reintroduction of fire to the landscape, little additional new large wood would be contributed by the new stand, as Riparian Reserve habitat and condition would fluctuate between overly-dense stands of small-diameter trees and severe, stand-replacing burns. Stands would not develop late-successional characteristics and of the desired species, or the periodic occurrence of low-intensity ground fire. The ability of Riparian Reserves to withstand forest fires and control sediment impacts would remain compromised and severe fires or other landscape-level changes due to inaction would severely impact already-stressed riparian systems. This would ultimately lead to a non-functioning riparian condition on many streams, with impacts including degradation of stream channel structure as levels of large woody debris declined, increased flashiness of streams, reduced output of cool summertime flows to downstream creeks and rivers, and long-term elevated sediment delivery levels as streams continue to downcut and adjust to the new cycle of intense fire and declining levels of large wood.

If a severe fire is avoided in this area within the time it takes for the woody debris on site to completely decompose, the amount of large wood biomass available would make a significant contribution to recovery and productivity of the soils in the Riparian Reserves. This would help offset the impact the soil resource suffered from the burn.

303(d) listed streams

*Direct Effects*: The No Action Alternative would have no direct effect on stream temperatures in Yale Creek or

the Little Applegate River, the only 303(d) listed streams in the project vicinity.

*Indirect Effects*: Loss of future inputs of large wood and loss of colluvial sediment storage in Quartz Gulch would increase the flashiness of the stream, leading to decreased summer low flows and increased stream width/depth ratios, all of which could have a negative effect on stream temperatures. After an initial pulse of large wood, conditions would decline due to a lack of treatment of small-diameter materials and associated lack of future available large trees to fall into Quartz Gulch.

*Cumulative Effects*: The effect of continued fire suppression combined with a decision to take no action, would create and maintain a cycle of partial recovery followed by stand-replacement fire, a cycle that falls outside of the range of natural variability for this area. With continued lack of treatment of small diameter vegetation and the inevitable risk of future stand-replacing fire, negative impacts would occur over time affecting the stream temperature 303(d) listings in Yale Creek and the Little Applegate River. Unlike many other types of human-caused disturbance, implementation of this alternative, specifically the non-treatment of small diameter fuels, would allow the level of impact to actually increase over time rather than gradually decrease. At the watershed scale, these impacts combined with the continuing level of negative impacts from other sources could lead to accelerated declines in condition.

Fish and Other Aquatic Organisms
*Direct Effects:* There would be no direct effects to fish or other aquatic organisms.

*Indirect Effects:* Over time, the fire killed trees would become part of the large wood component as they fall into streams and adjacent riparian areas. Stand-replacing fires have historically been the source of large wood inputs to streams. Large wood input would improve stream conditions in a watershed that is lacking the large wood component (Little Applegate Watershed Analysis May, 1995). Large wood benefits aquatic organisms by trapping sediment and nutrients, providing habitat, and creating physical complexity in the system. Channel condition and habitat for aquatic organisms should slowly improve, as both small and large snags naturally fall into stream channels.

It is possible that the long-term accumulations of downed wood may be outside the range of natural variability as the pre-fire suppression forest in the project area may have had fewer, larger trees. The no action alternative may create a situation of increased fuel loading and fire hazard as dense understory vegetation becomes reestablished. The potential for reburn in this situation is high which could interrupt recovery of the Riparian Reserve and consequently increase the length of time before the Riparian Reserve recovers and large wood is again available for recruitment into the stream. If severe reburn occurs it may influence peak flow, sediment input and erosion if downed wood and any newly created duff layers keep getting consumed by fire. Reintroduction of fire on a regular basis through prescribed fire programs may alleviate this concern.

Roads would continue to channel water, increasing peak flows and fine sediments until repaired under the normal maintenance schedule or are redesigned under other projects. The risk of crossing failures would remain high until culverts would be replaced to accommodate 100-year flood events.

*Cumulative Effects:*
The Quartz Fire could impact sediment in streams and erosion and runoff rates, especially in severely burned areas. Stream shade and the downed wood component have been impacted in these areas. However, western ecosystems have evolved with and in response to fire (Beschta 1995). Habitat for both aquatic and terrestrial species should slowly improve, with returning channel complexity, increased course woody debris on the ground, improved riparian vegetation, and improved connectivity within riparian areas. Large wood in the streams and adjacent riparian areas would trap nutrients and sediment, provide hydrologic controls, and create habitat for aquatic organisms. This system, limited by high sediment and a lack of large wood, would slowly improve over

time. However, in the longterm, there is the potential that without further fuels reduction activities in the project area, accumulations of ladder fuels and small diameter wood could put the area at risk of future severe wild fires.

Salvage operations would occur on private land, within the Quartz Fire boundary. These activities include tractor logging through perennial streams, within riparian areas, and in dry draws. In Quartz Gulch, below the Owl Core, water flows clear and clean. Below private land where logging operations are occurring, turbidity and sedimentation associated with these activities has been observed on several occasions. This turbidity is effectively filtered in the BLM land below this private operation and the water flows clear at the road crossing in the middle of Section 3. Salvage logging as it is occurring throughout the Quartz Fire boundary would contribute fine sediment to the stream systems. The long-term effects of these actions would likely be more important than the short-term sediment pulses as increased erosion potential and newly established sediment delivery mechanisms may chronically impact stream hydrology and sediment levels for some time into the future.

Salvage logging on USFS land may occur within the Quartz Fire area and would be conducted in a manner similar to the BLM proposed activities. Future activities planned for the Little Applegate watershed include harvest on private and federal land, residential development, agricultural and mining activities.

Fuels treatments on BLM within the Yale Creek Subwatershed would not impact coho salmon, coho critical habitat or essential fish habitat from upland thinning using the slashbuster or from pile burning. Due to the distance of treatment areas from coho habitat; the strict fine-sediment control techniques (PDFs) on all proposed activities, buffering nature of all Riparian Reserves; protection of possible unstable soil areas; and the care to mimic natural fire conditions with prescribed burning; natural ecosystem processes would be improved. No fine sediment, flow problems or other potentially harmful physical changes would negatively impact stream conditions and coho habitat.

The natural process of recovery may be measurable at the project scale but is not expected to change the overall condition of the subbasins within the project area. In addition, these site specific "gains" would probably be eclipsed by other activities occurring in the Little Applegate Watershed.

Summary of Cumulative Watershed Effects (CWE)

There would be no change from existing condition under the No Action Alternative, with both Yale Creek and Glade Creek continuing to have poor overall ratings due to relatively high percentages of these basins in young hydrologically unrecovered forests under 30 years of age, high road densities, and low volumes of large woody debris within channels (Mike Zan, USFS Hydrologist, personal communication/Little Applegate Watershed Analysis). No new canopy openings would be created within the Transient Snow Zone. Overall CWE ratings would not change as a result of this project, remaining in the "poor" category with continued high road densities and deficient levels of instream large wood.

**Hydrology, Riparian, and Fisheries** Alternative 2: Proposed Action

Direct, Indirect and Cumulative Effects

Riparian Reserves

*Direct Effects*: It is estimated that of the 148 acres of Riparian Reserve in the Quartz Fire project area, a maximum of 70 acres of Reserve would be subject to treatment involving removal of some commercial-size timber (see Appendix C for prescription). Within the intensely burned areas of that 70 acres, very few of the trees over 12" dbh would be considered "excess" and available for salvage by the time the riparian standing course woody debris guidelines (Appendix C) were implemented. The resulting

treatments would concentrate on reducing the volume of smaller diameter commercial-sized material as well as non-commercial sized material. With treatment of small diameter materials and reintroduction of periodic fire proposed under this alternative, habitat and function of Riparian Reserves would be improved, moving toward the range of natural variability. Some of the Riparian Reserves in the project area would benefit from thinning and other silvicultural activities, especially in the intermittent stream channels where riparian vegetation is limited and brush and small diameter trees provide a "chimney" of dry materials through which a high intensity fire could be carried. In the portion of the 70 acres that had a low-intensity underburn within the Riparian Reserve, thinning of smaller diameter trees would improve Reserves in several ways. In some perennial and intermittent streams brush and small trees would be thinned within the Riparian Reserves to encourage the growth of remaining trees, increasing stand structure and diversity. The remaining trees would grow bigger and faster, and thinning the smaller trees could encourage development of an herbaceous understory. These treated Reserves would provide more habitat diversity and refugia in the case of future large fires or other landscape-level changes. Riparian Reserves that are overgrown with small diameter trees would benefit from thinning by increasing species diversity and improving growing conditions. Reduction in the numbers of small-diameter snags (trees that dry out quickly and burn rapidly, large quantities of which would not have been present on the site without fire suppression) and leaving many of the largest snags (that as down wood are capable of storing large quantities of moisture and are therefore less likely to burn) would provide current and future levels of large woody debris approximating what is found naturally in Southwest Oregon (Appendix C), while helping create Riparian Reserves more adapted to periodic fire. In fish-bearing streams, the Riparian Reserves generally have wider areas of established riparian vegetation. Treatment of small diameter materials is not proposed within a 50' zone on each side of these streams, and within 1 site potential tree height for trees over 8" dbh. High levels of canopy closure would be maintained (where canopy exists post-fire) within one site potential tree height distance from the stream. In some areas of the Reserves, the volume of the largest diameter wood remaining on site would for a time exceed the maximum levels identified by White (especially in the areas closest to the streams), but this may not be an unreasonable situation following a major disturbance event, and would subside over time.

The non-treatment areas, including those along streams and in the Riparian Reserves around the two springs in NE1/4 of the SE1/4 Sec 2, would protect intact areas and areas that currently exhibit high ecological integrity. The area around the two springs contains a few green conifers and numerous hardwoods that have a chance of surviving the moderate ground fire at this location. They are located at the base of an ancient debris torrent deposit and represent one of the few areas of potentially intact spring refugia in an otherwise intensely burned area. The no-treatment/no ground disturbance along stream riparian areas also would allow for passive restoration of these areas. The no-treatment areas specified exceed the riparian area width of every stream within the Quartz Gulch project area.

Roads being constructed, reconstructed, decommissioned or obliterated would be designed to separate the roads from the stream network, reduce erosion, and minimize hydrologic impacts. Rapid routing of water to streams via road networks would be eliminated within the project area, decreasing the drainage efficiency of the watershed. This means that within the project area, peak flows and sediment delivery from road-related sources would be reduced by implementation of this project. Although not officially part of the Little Applegate Key Watershed, the key watershed direction given in the Northwest Forest Plan Standards and Guidelines (page B-19) to "decommission at least one mile of road"..."for each mile of new road constructed" and "give priority to roads that pose the greatest risk to riparian and aquatic

ecosystems" would be exceeded for this project.

In the larger landscape, subsequent underburns should reduce fuels in the units so future wildfires would produce a more natural, patchy ground burn, with a restorative effect on the Riparian Reserves (healthier and more diverse plant communities, increased food and nutrient abundance for wildlife, birds and aquatic animals, etc.).

*Indirect Effects*: The upland and Riparian Reserve treatments would reduce the risk of stand-replacing fires in Riparian Reserves, although untreated areas of some Reserves would still be at high risk under certain fire conditions. The treatments would consequently reduce the risk for sudden changes in peak flow, sediment input, down-cutting due to concentrated runoff, loss of fallen wood on the forest floor, and loss of protective duff layers following wildfire. Upland and Riparian Reserve thinning might improve soil moisture (although slight), and an increase in soil moisture could improve or prolong humidity in some Riparian Reserves. This humidity creates microhabitat for riparian-dependant plants and animals (like bigleaf maple and salamanders), or extends the growing season for others. Upland treatments, including prescribed fire, would improve overall watershed health, ultimately benefitting aquatic systems by mimicking more natural ecological processes.

Construction and subsequent decommission/obliteration of the new road within the Transient Snow Zone of the Glade Creek Subwatershed has the potential to increase peak flows and sediment delivery by effectively extending the stream network. Project design features would significantly reduce the risk of negative impacts occurring. Soils and runoff processes are already at risk due to the impact of the fire. The greatest risk would be from major storm events between construction and decommission. Any severe summer thunderstorms during the period of use would have the potential to increase flow and sediment, scour out a channel where only a swale exists now, and thereby cause adverse effects on downstream resources and ownerships. Decommissioning of the road utilizing project design features/best management practices should greatly reduce or eliminate any added risk following completion of the project.

*Cumulative Effects*: While ecological condition in this watershed would still remain outside the range of natural variability (due to ongoing effects of past fire suppression policies and associated lack of vegetation management), this project would begin to move the Quartz Fire portion of the watershed back into the range of natural variability. Given all the current and past impacts to riparian areas on both public and private land throughout the watershed (e.g., roads, residences, fire suppression, agricultural use, river channelization, logging, gold mining) it is doubtful that the small amount of vegetation management in Riparian Reserves would significantly improve overall riparian health. However, connectivity and riparian function would be improved in segments of these watersheds. Salvage of some of the dead trees and piling and burning of smaller diameter materials would reduce the amount of biomass available to decompose and replenish the soil (although still within the range of natural variability); this must be weighed against the benefit of being able to reintroduce fire and maintain this landscape in a more ecologically sound manner. It is imperative that areas such as Quartz Gulch have periodic fire reintroduced as a management tool following initial fuel reduction treatments, to reduce or eliminate the need for future mechanical and manual treatments within Riparian Reserves. Otherwise, the beneficial initial effects of the treatments would in time give way to conditions that are actually worse than are present prior to the proposed project.

303(d) listed streams

*Direct Effects*: This project would have no direct effect on stream temperatures in Yale Creek and the Little Applegate River, the only 303(d) listed streams in the project area.

*Indirect Effects*: While there would be no immediate affect, Water Temperature could decline slightly in the very long term if increasing levels of large wood and colluvial sediment storage in treated tributaries enhanced summer low flows and reduced stream width/depth ratios.

*Cumulative Effects*: Riparian Reserve and upland treatments would have a neutral to slightly positive impact on the 303(d) temperature listings for Yale Creek and the Little Applegate River. At the watershed scale, these improvements would probably remain undetectable due to the continuing level of negative impacts from other sources.

Fish and Other Aquatic Organisms

*Direct Effects and Indirect Effects:*

Future accumulations of downed wood may be outside the range of natural variability as the pre- fire suppression forest in the project area naturally had fewer, larger trees. By removing some large wood component it is likely that we are retaining a more natural density of conifers available for large wood recruitment. PDFs for salvage ensure that trees would not be removed from the Riparian Reserves if they are > 20" diameter at the point where they would cross the stream. These PDFs ensure that harvest would not take place on slope greater than 50% and full suspension yarding would eliminate most ground disturbance. PDF's outlined in Chapter 2 would ensure that close to 50% of standing trees in the Riparian Reserve would remain after the salvage operation for future large wood recruitment. This salvage project may decrease the intensity of future fires in the area by reducing some of the fuel loading. Thinning of small diameter material would be beneficial in the Riparian Reserves where a low intensity underburn occurred as it would improve tree growth while encouraging development of a diverse understory. In the more severely burned areas, removing the small diameter material would decrease fuel loading and future fire severity while improving growing conditions.

In Riparian Reserves, most of the large diameter trees would remain to provide structure and future large wood recruitment while thinning some of the small diameter (< 8") material. Road improvements and decommissioning would create short-term increases in fine sediment production, but should ultimately reduce the road-related sediment load in project area streams. Although the overall road miles remain high, roads in riparian areas are being decommissioned while proposed new road construction is located outside Riparian Reserves. Roads in riparian areas impact streams far more than roads outside riparian areas and on ridgetops. Road decommissioning and culvert replacement projects would restore floodplain and Riparian Reserve connectivity in some locations. Finally, road decommissioning and improvements should reduce the amount of road surface area and reduce concentrated flow off of roads, which would decrease winter peak flow levels and associated stream bank erosion from this source.

Temporary road construction is not expected to contribute significant sediment to the system given the soil stability of the area, distance of road from fish stream (1.5 miles from midslope road), and current road building standards. However, burn severity along the proposed road corridor varies between severe and moderate and in high severity areas it is likely that the duff layer, leaf litter, and much of the downed wood were consumed by the fire. Duff and leaf litter are effective filters and downed wood traps sediment before it could enter stream systems. Because of this, it is very important that all road-related

PDFs are followed and maintained to decrease the potential for road-related sediments to enter stream systems. Although constructing this road is not expected to contribute significant sediment to the Glade Creek system, the road densities in this watershed are major contributors of sediment according to the Little Applegate Watershed Analysis. Choosing not to build this road would prevent a temporary increase in road densities in the watershed and would reduce potential sediment inputs to the Mule Gulch drainage.

*Cumulative Effects:*
Reducing future severe fire potential while simultaneously reintroducing fire into the landscape should help keep aquatic ecosystems intact until better connections between refugia areas can be re-established. Habitat for both aquatic and terrestrial species should improve, with returning channel complexity, increased coarse woody debris on the ground and in streams, improved riparian vegetation, and improved connectivity within riparian areas. The potential on-site benefit of these actions would be undetectable at the subwatershed and watershed scale given other activities within the project area.

Fuels treatments on BLM within the Yale Creek Subwatershed would not impact coho salmon, coho critical habitat or essential fish habitat from upland thinning using the slashbuster or from pile burning. Due to the distance of treatment areas from coho habitat; the strict fine-sediment control techniques (PDFs) on all proposed activities, buffering nature of all Riparian Reserves; protection of possible unstable soil areas; and the care to mimic natural fire conditions with prescribed burning; natural ecosystem processes would be improved. No fine sediment, flow problems or other potentially harmful physical changes would negatively impact stream conditions and coho habitat.

Salvage operations on private land within the Quartz Fire boundary include tractor logging through perennial streams, within riparian areas, and in dry draws. In Quartz Gulch, below the owl core, water flows clear and clean. Below private land where logging operations are occurring, turbidity and sedimentation associated with these activities have been observed on several occasions. This turbidity is effectively filtered in the BLM land below this private operation and the water flows clear at the road crossing in the middle of Section 3 (Field observation by BLM personnel). Salvage logging on private land, as it is occurring throughout the Quartz Fire area, contributes fine sediment to the stream systems. The long-term effects of these actions would likely be more important than the short-term sediment pulses, as increased erosion potential and newly established sediment delivery mechanisms may chronically impact stream hydrology and sediment levels for some time into the future.

Salvage logging on USFS land may occur within the Quartz Fire area and would be conducted in a manner similar to the BLM proposed activities. Future activities planned for the Little Applegate watershed include harvest on private and federal land, residential development, agricultural and mining activities. Cumulative effects of future BLM actions would be analyzed as these actions are proposed and implementation of these actions would be conditional on this analysis.

All watershed and habitat indicators in the National Marine Fisheries Service Matrix of Pathway Indicators Checklist would be maintained in the longterm at the fifth field watershed scale (Little Applegate River). This project is consistent with ACS Objectives (ACS Consistency Analysis) and with terms and conditions of the NMFS LRMP/RMP Biological Opinion (March 18, 1997).

<u>Threatened and Endangered Aquatic Species and Essential Fish Habitat</u>

This project is determined to "Not Likely Adversely Affect (NLAA)" listed coho salmon, their Critical Habitat, or Essential Fish Habitat. The project is NLAA because project design features, Riparian Reserve stipulations and site conditions would ensure that there is a less than negligible chance of negatively affecting water quality for resident and anadromous fishes and other aquatic organisms. This project has been submitted to the National Marine Fisheries Service (NMFS) and a Letter of Concurrence (LOC) is pending.

Summary of Cumulative Watershed Effects (CWE)

In assessing the potential risk of adverse CWE of multiple activities within watersheds, both Yale Creek and Glade Creek have been determined to currently have poor overall ratings (both pre and post fire) due to relatively high percentages of these basins in young hydrologically unrecovered forests under 30 years of age, high road densities, and low volumes of large woody debris within channels (Mike Zan, USFS Hydrologist, personal communication/Little Applegate Watershed Analysis). No new canopy openings would be created within the Transient Snow Zone, as the portion of the project within the Transient Snow Zone was subject to stand-replacement fire. Overall CWE ratings would not change as a result of this project, remaining in the "poor" category. Although road mileage would be reduced and large wood added to the mainstem of Yale Creek, these changes would be small at the subwatershed level, with continued high road densities and deficient levels of instream large wood. Construction of the new road in the Glade Creek Subwatershed, although temporary, would add to already poor CWE levels.

**Hydrology, Riparian, and Fisheries** Alternative 3

Direct, Indirect and Cumulative Effects

Riparian Reserves

Effects of Alternative 3 would be difficult to distinguish from those under the Proposed Action, with the exception of the elimination of the risk of sedimentation and peak flow increases due to temporary Transient Snow Zone road construction under Alternative 2.

In the moderate and high intensity burned areas, elimination of the small amount of salvage that would have been removed within Riparian Reserves would cause a slight increase in the amount of large wood within the Reserves. This in turn would provide increases in available organics, microhabitat, moisture storage, and future soil recovery. This difference would be undetectable at the subwatershed and watershed scales.

Elimination of density management activities within Riparian Reserves under Alternative 3 would have a detrimental impact at the site level, but because of the small acreage involved would be undetectable at the subwatershed and watershed scale. Due to the continued overstocked condition of these stands, stand structure and diversity would not improve, and the remaining trees would not grow bigger and faster. Not thinning the smaller trees would discourage development of an herbaceous understory. These Reserves would not provide as high a quality of habitat diversity and refugia in the case of future large fires or other landscape-level changes as would be possible under Alternative 2.

303d Listed Streams

Impacts to 303d listed streams would likely be indistinguishable from Alternative 2.

Summary of Cumulative Watershed Effects (CWE)

CWE ratings would be the same as Alternative 2.

Fish and Other Aquatic Organisms
The effects of Alternative 3 would be difficult to distinguish from those under the Proposed Action. In the short-term there would be less soil disturbance from road decommissioning and construction.

This alternative does not include salvage in the severely burned Owl Core and Riparian Reserves. As a result, soil disturbance would be reduced and large wood recruitment would be greater which could have short-term beneficial effects to aquatic organisms. Stand-replacing fires have historically been the source of large wood inputs to streams. Large wood input would improve stream conditions in a watershed that is lacking the large wood component (Little Applegate Watershed Analysis May, 1995). This "structure" would benefit aquatic organisms by trapping sediment and nutrients, providing habitat, and creating physical complexity in the system. Channel condition and habitat for aquatic organisms should slowly improve, as both small and large snags naturally fall into stream channels. However, over the long-term there may be negative effects as fuel loading and the potential for reburn increases.

The impacts to fisheries and other aquatic organisms would probably be indistinguishable from Alternative 2 however, given the high levels of disturbance already caused by the fire, any reduction in the amount of additional disturbance would have a positive effect in the watershed.

Salvage logging on USFS land may occur within the Quartz Fire area and would be conducted in a manner similar to the BLM proposed activities. Future activities planned for the Little Applegate watershed include harvest on private and federal land, residential development, agricultural and mining activities. Cumulative effects of future BLM actions would be analyzed as these actions are proposed and implementation of these actions would be conditional on this analysis.

**Dense Stands/Forest Health** Alternative 1: No Action
Direct and Indirect Effects
No action would allow forest stands in the low severity burn areas to remain overly dense. Individual tree vigor and growth would remain poor. A sample of 38 dominant and codominant trees in the project area showed an average of 0.5 inches of radial growth per decade. In dominant and codominant trees, the 10-year radial growth ranges from 0.25 to 0.85 inches. When radial growth is less than 0.5 inches per decade, pine trees cannot pitch-out bark beetles and tree mortality results (Dolph, 1985).

Under this alternative forest structure and species composition would not be controlled. On pine sites, Douglas-fir would remain the most prevalent species. Stands would remain in the stem exclusion stage of development if mortality does not occur. Old-growth ponderosa pine and Douglas-fir trees would continue to die from competition for water where tree density levels remain high. Pine species would continue to decline in number from competition with Douglas-fir because of pine's shade intolerance. Leaf area index may 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 shift is a transition phase when trees in the main canopy layer start to die, either singly or in small groups. This is ecologically significant in that resources previously used by the dead tree are reallocated to the surviving vegetation.

Selection of the No Action Alternative 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.

In the moderate and high severity burn areas excessive amounts of wood would remain. In some areas amounts could exceed 81 tons per acre. This would provide quantities of fuel for future fires that would be outside the range of natural variability.

Cumulative Effects

With no forest stand density reduction in the low severity burn areas, slow tree growth and vigor would result in individual tree and perhaps stand mortality. If severe stand mortality results, silvicultural options in the future would 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 we would not be able to harvest live trees for approximately 30 to 50 years and what little wildlife habitat remains would be degraded. 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 and oak 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.

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 would be approximately 50 to 80 percent. Where large patches of trees die, canopy closure would be 0 to 40 percent.

Fire hazard would remain high with the abundance of dead vegetation and the high number of trees per acre.

In the moderate to high severity burn areas where most of the trees are now dead, excessive fuel would remain for future fires. If this wood were to burn, further soil and site productivity degradation would result.

**Dense Stands/Forest Health** Alternative 2: Proposed Action

Direct and Indirect Effects

The proposed prescriptions applied across the forest landscape in the low severity burn areas are based upon the present vegetation structure, species composition, aspect, and vegetation condition class. This allows for desired old-growth forest structure and desired tree species over time. Through forest stand treatments, tree densities are reduced allowing for improved individual tree vigor, growth, and improved forest health. Projections from the Southwest Oregon ORGANON Growth Analysis model show that the quadratic mean diameter of a representative forest stand (operations inventory key # 153982) increased 10 inches after the forest received a low thinning and grew for an additional 30 years. After thinning, trees would be vigorous enough to withstand bark beetle attacks. Increased leaf area index values would begin after stands are thinned.

In the moderate to high severity burn areas dead trees would be salvaged. Appropriate amounts of coarse woody material (CWM) would be left to provide wildlife habitat, and to assure the maintenance of ecological functions, especially site productivity.

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

Cumulative Effects
In the density thinning areas, utilizing various landscape prescriptions, future silvicultural options would be greater. The majority of forest stands proposed for thinning could be thinned again or regeneration harvested in 10 to 60 years. The prescriptions assume that drought resistant conifer species such as ponderosa pine and incense cedar would be present in the future, where site conditions allow. This is critical to forest health as tree species would be favored on sites where they are best adapted.

There is a wide variety of silvicultural prescriptions reflecting the variation in present day forest stand structure. A variety of prescriptions are needed to create future old-growth forest stand structure. As the aspect and microclimate change within a forest stand, the tree plant association usually change. Pine trees within a dry Douglas-fir forest may need to be "released" as described in the pine prescriptions. Within the pine series, patches of Douglas-fir may be encountered that would be treated as described in the dry Douglas-fir prescription. Variation in canopy closure would remain across the landscape. On Douglas-fir sites, canopy closure would be 50 percent or greater. On pine sites, canopy closure would be 20 to 60 percent. Pine species are shade intolerant so canopy closure must be lower.

If surrounding private lands are clearcut, public forest stands would be the only forested areas providing future late-successional habitat. Surrounding BLM lands would be managed to assure forest health.

In the moderate to high severity burn areas excessive fuels would be removed to reduce the intensity of future fires, while maintaining appropriate amounts of CWM to maintain all ecological functions that have not been eliminated by the fire.

**Dense Stands/Forest Health** Alternative 3
Direct and Indirect Effects
This alternative is the same as Alternative 2 except that the benefits of silvicultural forest management would not be applied in the Riparian Reserves and owl core. As a result of leaving large numbers of dying and low vigor trees in these areas, it is possible that bark beetle populations would increase resulting in more tree mortality in the upland forest.

Cumulative Effects
This alternative is the same as Alternative 2 except that more forest mortality may result on private and public lands because of bark beetle activity.

REFERENCES
Dolph, Robert E..1985. Growth and vigor information in thinned second-growth ponderosa pine stands on the Deschutes and Ochoco National Forests. 10pp.

U.S. Department of Agriculture, Forest Service. 1985. Guide to common forest plants; Rogue River, Siskiyou and Umpqua National Forests. Pacific Northwest Region, Siskiyou National Forest R6-11-021-85.

Waring, R.H.. 1980. Vigor index.

**Soils** Alternative 1: No Action

Direct and Indirect

This alternative proposes no management activities for fire salvage. Post-suppression rehabilitation measures were accomplished before the onset of the rainy season. Recovery would be dependent on fire intensity and duration, area burned, site stability, implementation of the ESR plan, and the rate of re-vegetation.

Where much of the forest canopy is lost, evapotranspiration and interception of rainfall would be greatly reduced. Where surface litter and duff layers were consumed and mineral soils exposed, infiltration and soil water storage would also be reduced. Increased water yield, sedimentation and streamflow would occur in watersheds where the fire burned at high and moderate levels of intensity.

Accelerated surface erosion would occur, particularly on steep slopes, where loss of vegetation and duff has exposed soils. The erosion rates would substantially increase over pre-fire rates as the soil is exposed to raindrop detachment and increased overland flows. Surface gravels would increase as soil particles are displaced resulting in an increased risk of raveling as a result of frost heaving and overland flows. The soils on steep slopes would continue to erode and ravel at a high rate until new vegetation is established. Erosion rates would reduce as leaves, branches, large woody debris accumulate.

Sediment yields from erosion and mass wasting in the project area would considerably increase over the pre-fire yield. Depending on the rate of root decay and weather, most of the mass-wasting events would occur within the first ten years after the fire during major storm runoff events. They would be concentrated within older failure forms and along unstable streambanks. Failure rates would return to pre-fire conditions as vegetation and streambank stability is reestablished. Because of the fire, accelerated rates of erosion may occur on extensively burned slopes adjacent to streams, inner gorges, talus slopes, and the steeper uplands.

Various components of total organic matter, soil organic matter, litter and duff, and trees and shrubs, contribute in different ways to forest productivity. Soil productivity, as influenced by total organic matter, was substantially reduced by the fire. Losses of soil organic matter, litter, and duff reduced productivity by lowering total site moisture capacity and nutrient availability. Nitrogen availability and the presence of mycorrhizae that contribute directly to forest growth was also negatively affected. As much as 22 percent of the total organic matter (see affected enviroment) was consumed in areas that burned with high severity. This loss is not just restricted to the surface vegetation; it also includes surface duff and litter, soil organic matter and roots.

Coarse woody material (CWM) would contribute to forest productivity by functioning as moisture and nutrient reservoirs and as habitat for both forest macro- and microorganisms. Decomposing material would eventually breakdown to become surface litter and soil organic matter. Coarse woody material would also contribute to the bank stabilization of smaller streams and improve the fish habitat in larger streams. The overabundance of coarse woody material on site may cause high fuel loading leading to future high intensity wildfires.

The direct effect of the fire is combustion and loss of organic matter. An indirect beneficial effect is the supply of large woody material to the site over time as dead and dying trees continue to fall. According to Maser et. al. (1988) 8 to 19 inch dbh trees may stand 30 to 60 years in decay class 4. Trees larger than 19 inches dbh may stand 51 to 125 years in decay class 4 (see appendix for decay class information). So trees in progressively larger dbh classes should fall at progressively later times. As plant succession proceeds, the disturbed site would revegetate, root strength would be restored, evapotranspiration would be increased, and soil water storage would be increased. However, the volume of organic matter input would still be severely reduced. Few large trees, the major source of large woody material, survived the fire in areas of moderate and high severity. The recruitment

of future class 1 and 2 coarse woody material would take decades. Total organic matter would be reduced until the forest returns to vegetative diversity and maturity of pre-fire conditions. The table below approximates the percentage of organic matter remaining on the respective severity sites.

Hydrophobic soils would break down naturally over the next 4+ years, gradually decreasing the possibility of soil saturation and soil movement that results in sedimentation or landslides.

Cumulative Effects

Cumulative effects to the soil of the no action alternative would be the continuation of the natural rehabilitation and restoration. The soil erosion rates on low severity sites would stabilize in approximately 3 to 5 years as vegetation re-establishes on the site. It may take up to 10 years for the erosion rates to stabilize in the high severity burn areas on slopes over fifty-five percent. The potential risk of increased slumping and localized mass wasting would subside in about 10 years as root strength and soil cohesion resulting from soil organisms increase.

Soil productivity would remain at a low level for several decades particularly on high fire severity sites, where microinvertebrates and mycorrhizae have been lost. Given time these species would migrate into these sites from less severely burned areas. Without mycorrhizae to inoculate vegetation, symbiotic interactions between vascular plant species and fungi would not occur, and growth would be curtailed.

Varied levels of down woody material in associated decay classes are important for soil productivity. In the severely burned areas, as decay class 1 and 2 snags turn into class 3 and 4, there would be no recruitment of decay class 1 and 2 snags for many decades. Over time, the overabundance of class 3 and 4 coarse woody material on the ground would drain nitrogen sources, decreasing nitrogen availability to growing plants. The remaining coarse woody material would not present a "severe" fire hazard until the live fuels become abundant enough to carry a fire across the landscape.

**Soils** Alternative 3 and 3

The effects of the Quartz Fire and potential alternatives may have varying short- and long-term consequences. The magnitude and duration of these effects depends on storm intensity, burn severity, soil characteristics, the extent of soil disturbance or impact following implementation of the selected alternative, and by following best management practices.

Wildfire and forest management impacts to site productivity include:

- Reduced amounts of organic matter and mineral nutrients lost by fire consumption and erosion;
- Reduced water storage by removal of large woody material;
- Loss of productive soil by surface erosion and mass wasting;
- Reduced duff, litter, large organic matter and associated nutrients;
- Concentration of runoff water by roads, landings and yarding corridors;
- Removal of soil anchoring vegetation;
- Changes in water quality and stream sedimentation due to mass wasting and surface erosion; and
- Increased subsurface water resulting from reduced evapotranspiration.

Of proposed yarding systems, helicopter yarding would cause the least impact to the existing soil and would only slightly increase erosion rates. Building helicopter landings would disturb less than one acre of soil per landing near existing roads but these landings would be surfaced and/or seeded upon completion of the project. Best Management Practices should minimize sediment reaching stream

channels, depending on post harvest weather conditions.

Building the road near the ridgeline would additionally disturb approximately 1.5 acres of soil and about 2 acres on the upper one-third of the hillslope. The entire length of this new road construction is in the Resistant Metavolcanic geomorphic unit. This Landscape unit has a low-moderate erosion potential (Little Applegate River Watershed Assessment, Draft, 2002). The ridge top road would increase the existing erosion rates in the localized area of construction. Most of the eroded particles would not enter stream channels but would re-settle on the hillslope. The mid-slope road would substantially increase erosion rates in the localized area of construction. Although the slope on which the proposed road is to be built is mostly under 40 percent, increased sedimentation in local stream channels is possible. Slope stability would be compromised, slightly increasing the risk of slumping or mass wasting the first few years after the project until vegetation is re-established across the hillslope.

A study of fire salvage logging found that by following best management practices new temporary roads could be built with no accelerated erosion or sediment transport (USDA PNW-GTR-486, 2000, pp. 50).

Salvage logging would add an immediate input of limbs and sawdust to the soil surface. This organic matter would lower sedimentation rates by decreasing the impact and detachment of soil particles by rain. Additionally, it would be a source of organic material available to soil organisms. Salvage logging would also decrease sedimentation rates by the breaking up of hydrophobic soil layers that would result from the impact of falling trees and the soil disturbance produced by the yarding of this material.

Based on similarities of 85 percent of soils present to the site of the Amaranthus compaction study there should be no detrimental compaction of soils if a small tractor is used for yarding (USDA PNW-RP-504, 1997).

The proposed action alternatives would remove an additional 18 to 30 percent of the total organic matter from the site. This would not have an immediate effect on existing soil productivity but would negatively impact soil productivity recovery on moderately and high severity sites. The exact amount of impact to soil productivity is unclear but it would take many decades, if not centuries, for the sites that had high severity effects to recover to pre-fire soil productivity.

The table below estimates, for each burn severity class, the percent distribution of total organic matter after the proposed salvage. This is based on Alternative 2, which would remove an estimated maximum of 35 percent of above ground organic material, relative to post-fire amounts (see Chapter 3, Soils, Loss of Organic Material). Under Alternative 3 total post-fire organic amounts would be greater.

| Organic Matter Distribution | | | | |
|---|---|---|---|---|
| | **Pre-Fire** | **Post-Salvage High Severity Fire** | **Post-Salvage Moderate Severity Fire** | **Post-Salvage Low Severity Fire** |
| **Above Ground (trees and shrubs)** | 57% | 29% | 32% | 35% |
| **Surface (duff and litter)** | 6% | 1% | 3% | 4% |
| **Below Ground (roots and organic matter)** | 37% | 31% | 33% | 35% |

| | | | | |
|---|---|---|---|---|
| **Total Organic Matter** | 100% | 61% | 68% | 74% |

Cumulative Effects
The effects of the proposed action varies on the respective burn severity sites. The proposed action would have a slight to moderate beneficial effect to the low severity burn sites as thinning on these site decreases the competition for existing soil nutrients and decreases the fuel loading. The total organic matter removed would have minimal cumulative effects on soil productivity. Erosion rates would return to pre-fire levels within about 3 to 5 years depending on slope and storm intensity.

On the sites that have moderate or high burn intensity, the proposed action would have moderate to moderately high negative cumulative effects on soil productivity. It is estimated that a minimum of 61 to 74 percent of the pre-fire total organic matter would remain after salvage operations. Erosion rates should return to pre-harvest conditions in approximately 5 to 20 years depending on burn severity, slope, soil characteristics and storm intensities.

References
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– USDA PNW-RP-504, Mike Amaranthus, David Steinfeld, *Soil Compaction After Yarding of Small-Diameter Douglas-Fir with a Small Tractor in Southwest Oregon*, 1997.
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**Logging and Harvest Systems** Alternative 1: No Action
Direct and Indirect

This alternative would eliminate the potential harvest on approximately 718 acres of timbered lands. This acreage includes 100 acres within an owl core and 109 acres within Riparian Reserves.
An estimated four to six million board feet of commercial timber would not be utilized from the project area. The majority of this volume would lose its commercial value if not harvested and utilized within the first couple of harvest seasons, therefore the volume could not be recovered at a later time. At current pond values this would represent a value loss of approximately two to three million dollars.

Cumulative Effects
The Quartz Fire salvage volume would be credited towards the allowable sale quantity (ASQ) for the Master Unit. Therefore, the estimated volume not harvested under this project would be replaced by volume from a different action at a different location. By not harvesting the salvage volume, forest health treatments would be completed in other areas that would not occur until a later time.

**Logging and Harvest Systems** Alternative 2: Proposed Action
Direct and Indirect
This alternative would allow the harvest on approximately 718 acres of timbered lands. An estimated four to six million board feet of commercial timber would be utilized by local mills supplementing the local supply of logs. The federal government would benefit from the receipts received from this harvest and local businesses would benefit from the harvesting and milling of the wood. The general public would benefit from the use of wood products for construction projects.

Cumulative Effects
Harvesting of predominantly dead trees in this project would delay the implementation of forest health projects elsewhere within the resource area.

**Logging and Harvest Systems** Alternative 3
Direct and Indirect
Under this alternative harvesting of trees would occur on 509 acres. Approximately 210 acres would be left untreated commercially yielding an estimated three and one half to five million board feet of commercial timber. This would be a reduction of approximately five hundred thousand to one million board feet of timber when compared to the proposed action.
With the elimination of the proposed road construction, yarding systems for portions of Section 36 would change. The removed trees on approximately two (2) acres of land would be change from being tractor yarded to helicopter yarded and approximately eighty-five (85) acres would change from cable yarding to helicopter yarding. This would increase the weighted average logging cost (with road construction and decommissioning costs included) for the logs in Section 36 from approximately $148/MBF to $204/mbf or an increase of 38%.

**Wildlife** Alternative 1: No Action Alternative
High Intensity and Moderate Intensity Burned Areas
Compared to the two action alternatives, this alternative would provide additional large tree structure, including coarse woody material, in the proposed project area. The additional large trees and coarse woody material would provide more feeding and nesting substrate for a variety of wildlife species; snag dependent species in particular.

Increased potential for long-term vehicular disturbance to wildlife in the vicinity of the road proposed in Alternative 2 would not occur. However, the potential for vehicular disturbance to wildlife along the roads that would be decommissioned under the action alternatives would not be alleviated.

Vegetative succession would progress naturally, and without a decrease in soil productivity (see soil report), late-successional habitat might be attained more quickly. This is particularly important in the spotted owl core area/LSR where the goal, as described in the NFP, is to accelerate or not impede the development of late-successional habitat.

Low Intensity Burned Area
Under the no action alternative, spotted owl suitable habitat in the low intensity burned area would not be modified. The action alternatives would downgrade approximately 42 acres of suitable spotted owl habitat to dispersal habitat.

Cumulative Effects
Under Alternative 1 there would not be any additional cumulative effects to wildlife.

**Wildlife** Alternative 2: Proposed Action
High Intensity and Moderate Intensity Burned Areas
Salvaging in the proposed project area would remove large tree structure and future coarse woody material that would provide additional feeding and nesting substrate for a variety of wildlife species. However, data in Brown (1985) indicate that the number of snags that would be retained (approximately 9 snags per acres greater that 16 inches DBH) would support the maximum population of woodpeckers and other snag dependent species found in the proposed project area, at least in the short term. At some point in time, there would likely be a shortage of hard snags to support maximum populations since most of the snags would be in a "soft" stage of deterioration, and the developing forest would not yet be producing large diameter (> 20" DBH) hard snags. Retaining more large diameter snags could shorten the length of the potential gap in maximum woodpecker populations since larger trees take more time to decay.

The proposed new road could increase vehicular disturbance to wildlife. Even though it would be closed, the presence of a road encourages OHV use. Several roads that are now open to all traffic would be closed. This would decrease vehicular disturbance to wildlife by passenger vehicles that now use the roads.

Threatened/Endangered Species
The NFP gives direction to accelerate or not impede the development of late-successional habitat in the areas allocated as LSR, e.g., the spotted owl core area in the proposed project. The soil report in the EA indicates that salvaging will reduce soil productivity. A decrease in soil productivity could retard tree growth in the developing forest, and the development of late-successional habitat could be delayed. Salvaging in the spotted owl core, therefore, may not comply with the "accelerate or not impede" language in the NFP.

Special Status/Survey and Manage Species
Alternative 2 would not likely impact any special status or survey and mange species. In the moderate and intensely burned areas, habitat no longer exists for most of the special status and survey and manage species that could have been present in the pre-fire environment. Several small pockets of talus, which is habitat for the Siskiyou Mountains salamander, have been found in the proposed project area. It is not known if salamanders were present before the fire. However, if they were present, it is possible some might have survived the fire if they were down deep in the talus. These areas will either be surveyed prior to project implementation for salamander presence, and protected if found, or they will be assumed to be occupied and protected from physical disturbance.

As discussed in Chapter 3, the fire has set the stage for the proposed project area to be occupied by one special status woodpecker species - the three-toed woodpecker. However, as discussed above, the number of snags that would be retained under this alternative would accommodate the maximum population of the suite of woodpeckers that might be found in the proposed project area, including the three-toed woodpecker.

Low Intensity Burned Area
The density management prescription in the low-intensity burned area would reduce canopy closure which is an important stand feature for a number of wildlife species associated with large pole/mature conifer stands. Reduction in canopy closure would adversely affect these species. Conversely, species preferring or adaptable to open canopies and/or early seral conditions generally benefit from a harvest of this type. However, with the large expanse of nearly adjacent early seral conditions due to the fire, there would be little, if any, benefit to these species.

Threatened/Endangered Species
Approximately 42 acres of northern spotted owl habitat would be downgraded from suitable (nesting, roosting/foraging) habitat to dispersal-only habitat. This would exacerbate the loss of suitable habitat in an area where 340 acres of suitable habitat was lost in the fire. Although, the fate of the Quartz Gulch spotted owl pair is unknown, by definition, removal of suitable habitat is likely to adversely affect spotted owls, and in this case could result in incidental take. The proposed harvest is also in Critical Habitat Unit OR-75, and is likely to adversely affect critical habitat. Formal consultation with the Service is required for the adverse effects to spotted owls and spotted owl critical habitat. The required consultation would be covered by a programmatic consultation that has been completed with the Service for timber sales in the Rogue River/South Coast basin that are to be sold in fiscal years 2002 and 2003. The biological assessment (Biological Assessment for Rogue River/South Coast FY 01/02/03 Timber Sale Projects) and the biological opinion (Biological Opinion 1-7-01-F-032) issued by the Service are available for review at the Medford District Office.

Special Status and Survey and Manage Species
Protocol great gray owl nest (survey and manage) surveys have been conducted in the Quartz Gulch area and none were found. The proposed harvest area provides habitat for red tree voles and molluscs which are survey and manage species. Surveys for these species have not been conducted, but they will be completed before the proposed project is implemented, and appropriate protection, as directed by the NFP, will be provided for any known sites.

No special status species (for management purposes) are known to be present in the proposed harvest area, and based on the habitat present, it is not likely there are any. However, if any are located in the proposed project area, protective measures, if needed, would be implemented.

Cumulative Effects

Under Alternative 2 the number of snags remaining would accommodate (at the 100 percent population level) the full complement of snag dependent species expected to be present in the project area. Retention of larger trees would lengthen the time the 100 percent population level could be maintained in the project area.

Removal of approximately 42 acres of suitable spotted owl habitat would add to the loss of suitable habitat that has occurred in the Little Applegate 5th field watershed as a result of timber harvest and the Quartz Fire. An additional 8,000 acres of suitable spotted owl habitat could be removed by projects scheduled over the next 3-5 years. The full impact of these projects to spotted owls and other species is difficult predict, but the population of species associated with closed canopy conifer forest would surely decline.

**Wildlife** Alternative 3
Under this alternative impacts would be the same as in Alternative 2 except for the following:

- Approximately 610 acres would not be salvaged, including the spotted owl core area. In these non-salvaged areas, additional large tree structure, including coarse woody material, would provide more feeding and nesting substrate for a variety of wildlife species.

- In the spotted owl core area, soil productivity would not be decreased, and it would be expected that late-successional habitat would be attained in a shorter time frame.

- New road construction would not increase the potential for vehicular disturbance to wildlife.

Cumulative Effects
Cumulative effects under Alternative 3 would be the same as those under Alternative 2.

**E. 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 EAs.

| Critical Element | Affected Yes | Affected No | Critical Element | Affected Yes | Affected No |
|---|---|---|---|---|---|
| Air Quality | | ✔ ** | T & E Species | | ✔ ** |
| ACECs | | ✔ | Wastes, Hazardous/Solid | | ✔ |
| Cultural Resources | | ✔ | Water Quality | | ✔ ** |
| Farmlands, Prime/Unique | | ✔ | Wetlands/Riparian Zones | | ✔ ** |
| Floodplains | | ✔ | Wild & Scenic Rivers | | ✔ |
| Nat. Amer. Rel. Concerns | | ✔ | Wilderness | | ✔ |
| Invasive, Nonnative Species | | ✔** | Environmental Justice | | ✔ |

**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 Amended NWFP, RMP, and the NWFP tiered to in Chapter 1. The impacts are not affected beyond those already analyzed by the above mentioned documents.

## CHAPTER V
## List of Agencies and Persons Consulted

### SUMMARY OF PUBLIC INVOLVEMENT

Scoping for this project began on October 24, 2001 when BLM began the process of planning projects in the Quarts Fire area of the Little Applegate Watershed. BLM evaluated land, vegetation, and stream conditions and developed a plan that included salvage of fire killed trees and thinning forests. On January 26, 2002 BLM and the Forest Service held a public scoping meeting at Star Ranger District. Upon completion of this EA, a legal notification was placed in the Medford Mail Tribune offering a 30-day public review and comment period. For additional information, please contact Bill Yocum at (541) 618-2384.

### DISTRIBUTION LIST AND AVAILABILITY

This EA was distributed to the following agencies and organizations.

Applegate Partnership/Applegate River Watershed Council
Association of O&C Counties
Boise Cascade Corp.
Jackson Co. Commissioners
Jackson County Library Applegate Branch
Oregon Natural Resource Council
Oregon Department of Fish and Wildlife
Southern Oregon Timber Industry Assoc.
Klamath Siskiyou Wildlands Center
Applegate Ranger District - USFS
Audubon Society
Headwaters
Jackson County Library; Ruch
Oregon Department Forestry
Southern Oregon University
The Pacific Rivers Council

### TRIBES

The Confederated Tribes
Cow Creek Band of Umpqua Indians
Confederated Tribes of Grand Ronde
Confederated Tribes of Siletz
Klamath Tribe
Quartz Valley Indian Reservation (Shasta Tribe)
Shasta Nation
Confederated Bands [Shasta], Shasta Upper Klamath Indians
Confederated Tribes of the Rogue-table Rock and Associated Tribes

### AGENCIES CONSULTED

U.S. Fish and Wildlife Service
U.S. Forest Service
U.S. National Marine Fisheries Service

## GLOSSARY OF TERMS ASSOCIATED WITH THIS EA

**Allowable Sale Quantity:** The gross amount of timber volume, including salvage, that may be sold annually from a specified area over a stated period of time in accordance with the management plan.

**Adaptive Management Area (AMA)**: Landscape units designated for development and testing of technical and social approaches to achieving desired ecological, economic, and other social issues.

**Commercial Forest Land:** Land declared suitable for producing timber crops and not withdrawn from timber production for other reasons.

**Connectivity:** A measure of the extent to which conditions between late-successional/old-growth forest areas provide habitat for breeding, feeding, dispersal, and movement of late-successional/old-growth-associated wildlife and fish species.

**Core Area:** That area of habitat essential in the breeding, nesting and rearing of young, up to the point of dispersal of the young

**Density Management:** Cutting of trees for the primary purpose of widening their spacing so that growth of remaining trees can be accelerated. Density management harvest can also be used to improve forest health, to open the forest canopy, or to accelerate the attainment of old growth characteristics if maintenance or restoration of biological diversity is the objective.

**Diameter At Breast Height (dbh):** The diameter of a tree 4.5 feet above the ground on the uphill side of the tree.

**Ecological Restoration:** The process of returning ecosystems or habitats to the original structure and species composition.

**Environmental Assessment (EA):** A systematic analysis of site-specific BLM activities used to determine whether such activities have a significant effect on the quality of the human environment and whether a formal environmental impact statement is required.

**Environmental Impact Statement (EIS):** A formal document to be filed with the Environmental Protection Agency that considers significant environmental impacts expected from implementation of a major federal action.

**Fire regime:** The type, intensity, size, and frequency of fires typical for a specific land area. The fires regime determines the scale of fire effects and the way fire influences an ecosystem.

**FY:** Fiscal Year

**Landing:** A cleared area in the forest to which logs are yarded or skidded for loading onto trucks for transport.

**Land Use Allocations:** Allocations which define allowable uses/activities, restricted uses/activities, expressed in terms of area such as acres or miles, etc. Each allocation is associated with a specific management objective.

**Late-Successional Reserve:** A forest in its mature and/or old-growth stages that has been reserved.

**LWD:** Large Woody Debris

**Mitigating Measures:** Modifications of actions which (a) avoid impacts by not take a certain action or parts of an action; (b) minimize impacts by limiting the degree or magnitude of the action and its implementation; (c) rectify impacts by repairing, rehabilitating or restoring the affected environment; (d) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or (e) compensate for impacts by replacing or providing substitute resources or environments.

**Noncommercial Forest Land:** Land incapable of yielding at least 20 cubic feet of wood per acre per year of commercial species; or land which is capable of producing only noncommercial tree species.

**O&C Lands:** Public lands granted to the Oregon and California Railroad Company and subsequently revested to the United States.

**OSHA**: Occupational Safety and Health Administration

**Precommercial Thinning:** The practice of removing some of the trees of less than merchantable size from a stand so that remaining trees would grow faster.

**Prescribed Fire:** A fire burning under specified conditions that would accomplish certain planned objectives.

**Public Domain Lands:** Original holdings of the United States never granted or conveyed to other jurisdictions, or reacquired by exchange for other public domain lands.

**Regeneration Harvest:** Timber harvest conducted with the partial objective of opening a forest stand to the point where favorable tree species would be reestablished.

**Riparian area:** Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, and associated high water tables and soils which exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs, and wet meadows.

**Riparian Reserve:** Portions of watersheds where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply (NWFP Standards and Guidelines pg. B-12).

**Road:** A designated road is a linear "transportation facility" on which state-licensed, four wheeled vehicles can travel. By definition, these do not qualify as trails. BLM creates a road record when known dollars are spent to construct a road. This is the capitalized value. When a road is constructed, the site is

altered. Alterations may include compaction of soil, interception of surface and some sub-surface flows, etc. The site potential for forest development has been altered and the area does not function as forest land.

**Road Closures: Temporary/Seasonal/Limited Access** - These are generally resource roads, closed with a gate or barrier. The road would be closed to the public but would be open for BLM/Permittee commercial activities. The road may or may not be closed to BLM admistrative uses on a seasonal basis depending upon impacts to the resources. Drainage structures would be left in place.

**Road Closures: Decommission (long-term>5 years)** - These would be based on resource protection needs identified in watershed analysis and the RMP directives. The road segment would be closed to vehicles on a long-term basis, but could be used agin in the future. Prior to closure, the road would be left in an "erosion resistant" condition by establishing cross drains, eliminating diversion potential at stream channels, and stabilizing or removing fills on unstable areas. Exposed soils would be treated to reduce sedimentation. The road would be closed with an earthen barrier or its equivalent.

**Road Closures: Full Decommission (permanent)** - Roads determined through an interdisciplinary process to have no future need may be subsoiled (or tilled), seeded, mulched, and planted to reestablish vegetation. Cross drains, fills in stream channels, and unstable areas would be removed, if necessary, to restore natural hydrologic flow. The road would be closed with an earthen barrier or its equivalent. The road would not require future maintenance. This category includes roads that have been closed due to a natural process and where hydrologic flow has been naturally restored.

**Road Obliteration** - Roads determined to have no future need may be filled with earth to a level where there are no signs of a previous road.

**Woodland:** Forest land producing trees not typically used as saw timber products and not included in calculation of the commercial forest land ASQ.

# Appendices

QUARTZ FIRE
TABLE 1
Proposed Action Alternative

| UNIT | UNIT ACRES | SILVI. METHOD 1/ | YARDING SYSTEM 2/ | VOLUME CUT/ACRE (range)(MBF) | VOLUME CUT/UNIT (range)(MBF) |
|---|---|---|---|---|---|
| 1 | 144 | S/Po/P | CR/PS/H | 7 - 10 | 1008 - 1440 |
| 2 | 318 | S/DDF/P/ MDF/Po | PS/H | 7 - 10 | 2226 - 3180 |
| 3 | 5 | S | CR/PS | 4 - 8 | 20 - 40 |
| 4 | 6 | S | CR/PS | 4 - 8 | 24 - 48 |
| 5 | 2 | S | H | 4- 8 | 8 - 16 |
| 6 | 16 | S/P | H | 4 - 8 | 64 - 128 |
| 7 | 5 | S/P | H | 4 - 8 | 20 - 40 |
| 8 | 2 | S | PS | 2 - 4 | 4 - 8 |
| 9 | 7 | S/P | H | 4 - 8 | 28 - 56 |
| 10 | 4 | S/MDF | H | 4 - 8 | 16 - 32 |
| Owl Core | 101 | S | PS/H | 3 - 6 | 303 - 606 |
| Riparian | 109 | S/GC | H | 2 - 4 | 218 - 436 |
| Sum | 719 | | | | 3939 - 6030 |

1/Silvicultural Methods: DDF = Dry Douglas-fir; MDF=Moist Douglas-fir;P = pine; Po=Poles; S=Salvage; GC=Green Conductivity
2/Yarding Systems: CR = Crawler (21 ac.) PS = Cable (219 ac.) H = Helicopter (479 ac.)

Table B-1: Proposed improvements on existing roads that access Quartz Fire project area.

| **Road Number** | **Approximate Length (miles)** | **Existing Surface: Depth (inches) and Type[1]** | **Control[2]** | **Possible Improvements: Depth (inches) and Type[3]** | **Seasonal Restriction[4] (for log hauling)** |
|---|---|---|---|---|---|
| USFS 1099 | 3.05 | ASC | USFS | - | 2 |
| USFS 500 | 2.92 | ASC | USFS | - | 2 |
| USFS 2030 | 1.46 | ASC | USFS | - | 2 |
| USFS 2030-850 | 0.47 | PRR | USFS | - | 2 |

| Road Number | Approximate Length (miles) | Existing Surface: Depth (inches) and Type[1] | Control[2] | Possible Improvements: Depth (inches) and Type[3] | Seasonal Restriction[4] (for log hauling) |
|---|---|---|---|---|---|
| 39-1-31.0 | 0.28 | NAT | BLM | - | 1 |
| 39-2-27.0 | 4.34 | 4" ASC | BLM | 4" ASC | 1 |
| 39-2-27.0B2 | 0.44 | 6" GRR | BLM | 4"ASC | 1 |
| 39–2-28.0 | 1.62 | 4" ASC | BLM | 4"ASC | 1 |
| 39–2-35.1A | 0.66 | 4" ASC | BLM | 4"ASC | 1 |
| 39-2-35.1B | 0.69 | NAT | BLM | 8"ASC | 1 |
| 39-2-36.0A | 0.97 | 6" GRR | BLM | 4"ASC | 1 |
| 39-2-36.2A | 0.57 | NAT | BLM | 4"ASC | 1 |
| USFS | | NAT | USFS | NAT | 2 |
| 40-2-3.0A2 | 1.02 | 4" ABC | BLM | 4"ASC | 1 |
| Total | 18.02 | | | | |

1) NAT = natural; ASC = aggregate surface course; ABC = aggregate base course; PRR = pit run rock; GRR = grid rolled.
2)BLM = Bureau of Land Management; USFS = United States Forest Service
3) - = no improvement; ASC = aggregate surface course; ABC = aggregate base course; PRR = pit run rock; GRR = grid rolled; BST = bituminous surface treatment.
4) 0 = no restrictions; 1 = hauling restricted between 10/15 and 5/15; 2 = same as 1 or more restricted as directed by the USFS under the Licence Agreement.

Table B-2: Proposed new temporary road construction in the Quartz Fire project area.

| Road Number | Approximate Length (miles) | Existing Surface: Depth (inches) and Type[1] | Control[2] | Proposal after use | Seasonal Restriction[4] (for log hauling) |
|---|---|---|---|---|---|
| 39-2-36.0B | 0.49 | - | BLM | Obliterate | 1 |
| 39-2-36.3 | 0.42 | - | BLM | Decommission | 1 |
| Total Mileage: | 0.91 | | | | |

2) BLM = Bureau of Land Management.
4) 0 = no restrictions; 1 = hauling restricted between 10/15 and 5/15.

Table B-3: Proposed road decommissioning[a] in the Quartz Fire project area.

| Road Number | Approximate Length (miles) | Existing Surface: Depth (inches) and Type[1] | Control[2] | Possible Improvements: Depth (inches) and Type[3] | Seasonal Restriction[4] (for log hauling) |
|---|---|---|---|---|---|
| 40-2-2.0 | 0.48 | NAT | BLM | - | 1 |
| 40-2-2.1 | 0.62 | NAT | BLM | - | 1 |
| 40-2-3.2 | 0.45 | NAT | BLM | - | 1 |
| Total Mileage: | 1.55 | | | | |

Natural Decommission - 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.

Mechanical Decommission - This usually includes ripping, removing drainage structures, seeding and/or planting, mulching, constructing water bars and barricades.

1. NAT = natural
2. BLM = Bureau of Land Management.
3. - = no improvement
4) 0 = no restrictions; 1 = hauling restricted between 10/15 and 5/15.

Table B-4: Roads that were decommissioned[a] under the Quartz Fire Emergency Stabilization and Rehabilitation Plan during fall of 2001.

| Road Number | Approximate Length (miles) | Existing Surface: Depth (inches) and Type[1] | Control[2] | Possible Improvements: Depth (inches) and Type[3] | Seasonal Restriction[4] (for log hauling) |
|---|---|---|---|---|---|
| 40-2-3.3 | 0.64 | NAT | BLM | - | - |
| Jeep Road A | 0.74 | NAT | BLM | - | - |
| Total Mileage: | 1.38 | | | | |

Mechanical Decommission - This usually includes ripping, removing drainage structures, seeding and/or planting, mulching, constructing water bars and barricades.

1. NAT = natural 2) BLM = Bureau of Land Management
3) - no improvement 4) - Not Applicable

Alternative 2 - Proposed Action - Project Area Mileage Summary for BLM Controlled Roads

| | | | |
|---|---|---|---|
| Total miles of BLM controlled roads before the project: | = | 2.9 | miles |
| Proposed new temporary road construction: | = | 0.9 | miles |
| Proposed decommissioning/obliteration of existing roads | = | 1.6 | miles |
| Previously fully decommissioned road (Fall 2001): | = | 0.5 | miles |
| Previously decommissioned road (Fall 2001): | = | 0.7 | miles |
| Miles of BLM controlled permanent roads after the project: | = | 0.2 | miles |
| Miles of BLM controlled permanent roads closed after the project: | = | 0.2 | miles |
| Miles of BLM controlled permanent roads opened after the project: | = | 0.0 | miles |

QUARTZ FIRE
TABLE 1
Alternative 3

| UNIT | UNIT ACRES | SILVI. METHOD 1/ | YARDING SYSTEM 2/ | VOLUME CUT/ACRE (range)(MBF) | VOLUME CUT/UNIT (range)(MBF) |
|---|---|---|---|---|---|
| 1 | 144 | S/Po/P | CR/PS/H | 7 - 10 | 1008 - 1440 |
| 2 | 318 | S/DDF/P/ MDF/Po | PS/H | 7 - 10 | 2226 - 3180 |
| 3 | 5 | S | CR/PS | 4 - 8 | 20 - 40 |
| 4 | 6 | S | CR/PS | 4 - 8 | 24 - 48 |
| 5 | 2 | S | H | 4- 8 | 8 - 16 |
| 6 | 16 | S/P | H | 4 - 8 | 64 - 128 |
| 7 | 5 | S/P | H | 4 - 8 | 20 - 40 |
| 8 | 2 | S | PS | 2 - 4 | 4 - 8 |
| 9 | 7 | S/P | H | 4 - 8 | 28 - 56 |
| 10 | 4 | S/MDF | H | 4 - 8 | 16 - 32 |
| Sum | 509 | | | | 3418 - 4988 |

1/Silvicultural Methods: DDF = Dry Douglas-fir; MDF=Moist Douglas-fir; P = pine; Po=Poles; S=salvage
2/Yarding Systems: CR = Crawler (19 ac.) PS = Cable (95 ac.) H = Helicopter (395 ac.)

Alternative 3 - Project Area Mileage Summary for BLM Controlled Roads

| | | | |
|---|---|---|---|
| Total miles of BLM controlled roads before the project: | = | 2.9 | miles |
| Proposed decommissioning of existing roads: | = | 1.6 | miles |
| Previously fully decommissioned road (Fall 2001): | = | 0.5 | miles |
| Previously decommissioned road (Fall 2001): | = | 0.7 | miles |
| Miles of BLM controlled permanent roads after the project: | = | 0.2 | miles |
| Miles of BLM controlled permanent roads closed after the project: | = | 0.2 | miles |
| Miles of BLM controlled permanent roads opened after the project: | = | 0.0 | miles |

**Noxious Weeds and Nonnative Plants**

| Scientific Name | Common Name | Weed List* |
|---|---|---|
| *Aira caryophyllea* | silver European hairgrass | |
| *Arabidopsis thaliana* | mouse-ear cress | |
| *Bromus madritensis* ssp. *madritensis* | foxtail chess | |
| *Bromus hordeaceus* | soft brome | |
| *Bromus diandrus* | ripgut grass | |
| *Bromus tectorum* | cheat grass | |
| *Cerastium glomeratum* | mouse-ear chickweed | |
| *Centaurea solstitialis* | yellow starthistle | B, T |
| *Chamomilla suaveolens* | pineapple weed | |
| *Cichorium intybus* | chicory | |
| *Cirsium vulgare* | bull thistle | B |
| *Convolvulus arvensis* | field bindweed | B |
| *Cynosurus echinatus* | hedgehog dogtail | |
| *Cytisus scoparius* | Scotch broom | B |
| *Dactylis glomerata* | orchard grass | |
| *Dipsacus fullonum* | wild teasel | |
| *Hypericum perforatum* | St. Johnswort | B |
| *Hypochaeris radicata* | rough cat's-ear | |
| *Lactuca serriola* | prickly lettuce | |
| *Leucanthemum vulgare* | ox-eye daisy | |
| *Medicago* sp. | burclover | |
| *Melilotus alba* | white sweetclover | |
| *Plantago lanceolata* | English plantain | |
| *Rubus discolor* | Himalayan blackberry | B |
| *Rumex acetosella* | sheep sorrel | |
| *Rumex crispus* | curly dock | |
| *Taeniatherum caput-medusae* | medusahead rye | B |
| *Taraxacum officinale* | common dandelion | |
| *Torilis arvensis* | hedge parsley | |
| *Tragopogon pratensis* | goat's beard | |
| *Trifolium pratense* | red clover | |
| *Trifolium repens* | white clover | |
| *Verbascum thapsus* | wooly mullein | |
| *Vulpia myuros* | rat-tail fescue | |

*

"B" designated weed: a weed of economic importance which is regionally abundant but which may have limited distribution in some counties.

"T" designated weed: a priority noxious weed designated by the State Weed Board as a target weed species on which the Department would implement a statewide management plan.

## COARSE WOODY MATERIAL (CWM) PRESCRIPTION FOR THE QUARTZ FIRE DEAD TREE SALVAGE AREA

The fire area was extensively inventoried by silviculture in 1998 and 1999 for the Bald Lick and Prince Castor Landscape Projects. The main plant associations encountered as described by Atzet and Wheeler (1985) are Douglas-fir (PSME)/Poison Oak (RHDI)-Piper's Oregongrape (BEPI) and Ponderosa Pine (PIPO) - PSME. On north slopes or in riparian areas the PSME/Dwarf Oregongrape (BENE) plant association was found. Some pole stands had the PSME/Depauperate plant association because of the high stocking levels and the resulting dense canopy closure.

The pole stands ranged in age from 70 to 102 years of age. The pine and Douglas-fir series forests ranged from 90 to 142 years of age. Small patches or scattered individual trees of older age classes are scattered across the landscape. One uneven-aged ponderosa pine stand was inventoried and modeled where the oldest pine trees are 230 years of age.

The quantities of CWM in this prescription are based on the "Guidelines for Snag and Down Wood Prescriptions in Southwestern Oregon" (White 2001). The Memorandum of Understanding for refining and implementing coarse wood requirements following regeneration harvest within the Southwest Oregon Province was signed January 19, 2001. The Provincial Interagency Executive Committee (PIEC) agreed to implement the guidelines on a trial basis in southwest Oregon federally administered forests, for regeneration harvests on matrix lands for 5 years.

The guidelines show that CWM variation across the landscape is high, and recommend that amounts should tend toward the mean. For each respective Plant Association Group (PAG), quantities of CWM are described by decay classes 1 through 5. Because decay classes 3 through 5 were most likely consumed in the fire, amounts recommended for leave would include some additional wood to compensate for the lose of these classes. All hardwoods would also remain on site (approximately 32 hardwood trees per acre), and all conifers less than 8 inches DBH.

The pine series and dry Douglas-fir forests are best described by the Douglas-fir -Oak - Poisonoak PAG. All size classes of wood in decay classes 1 and 2 average 5.1 tons per acre. The maximum amount of CWM in decay classes 1 and 2 is 28.1 tons per acre. The maximum amount of CWM in all decay classes is 56.4 tons. In decay classes 1 and 2 there should be an average of 5 snags 6 to 9 inches DBH and 2 snags 10 to 19 inches DBH. The mean is 0 for trees larger than 19 inches in size. For the 6 to 9 inch DBH snags, it is assumed that all of the hardwoods and non-merchantable conifers remaining would provide sufficient snag numbers.

The Moist Douglas-fir PAG describes the PSME/BENE sites in the fire area. This PAG has an average of 5.8 tons per acre in decay classes 1 and 2. The maximum amount of CWM in decay classes 1 and 2 is 24.8 tons per acre. The maximum amount in all decay classes is 71.8 tons per acre. In decay classes 1 and 2 there should be an average of 3 snags 6 to 9 inches DBH, 4 snags 10 to 19 inches DBH, and 2 snags larger than 20 inches DBH. For the 6 to 9 inch DBH snags, it is assumed that all of the hardwoods and non-merchantable conifers remaining would provide sufficient snag numbers. The following prescriptions would be based on these amounts.

To assure variation across the landscape in regard to the amount of CWM remaining, the landscape would be stratified into various prescription types. Natural variability in tree stocking levels and size classes is already inherent to the landscape. In some places the large tree diameter classes would not be present. The prescription maps for the Bald Lick and Prince Castor Landscape Project areas should be used as a reference. The basic prescription types are Cool, Moist Douglas-fir with north to east aspects, Dry Douglas-fir and Pine Series Forest with west to south facing aspects, Pole stands, and riparian areas in each of the respective prescription types. **These prescriptions apply to only the areas outside of the green tree areas. Within this dead tree salvage**

**area, all green trees shall remain. The green trees should not be included in the dead tree leave count.** Scattered green trees may be present (less than 16 trees per acre), but the majority of the landscape would have dead trees. **A green, live tree is any tree with no more than 50 percent crown scorch. If a tree has more than 50 percent crown scorch, it shall be considered dead. The tree must also have 20 percent or greater live crown ratio (length of live crown divided by total tree height). Your first choice for a leave tree should be a green tree that you expect to die. The trees recommended for leave in this prescription are dead trees.**

The prescription recommends numbers of trees to be felled in the uplands for respective diameter classes. These trees can be felled during the timber sale to provide the decay class 1 and 2 material. To assure future wood recruitment until the new forest is able to provide large wood, a variety of large diameter class trees would be left standing. This would also provide standing tree wildlife habitat. According to Maser et. al. (1988) 8 to 19 inch DBH trees may stand 30 to 60 years in decay class 4. Trees larger than 19 inches DBH may stand 51 to 125 years in decay class 4. So trees in progressively larger DBH classes should fall at different times. In the Riparian Reserves there are already sufficient amounts of CWM on the ground. All green trees would be left standing in designated no treatment areas and in the treatment areas all large diameter trees would be left standing that would provide 20 inch and larger diameter wood when they fall into the stream. These large diameter trees would be left standing to assure that they fall at different time periods over a long period of time.

For erosion control, 248 tons of wood have been felled as of 10/4/2001. Some trees larger than 20 inches DBH were felled. This is an average of .46 tons per acre of decay class 1 and 2 wood on the ground already. This work took place on 148 acres of Riparian Reserve, and on 392 acres of adjacent hill slopes and dry draws.

**Cool, Moist Douglas-fir With North to East Aspects**

On north to east aspects leave 6 tons per acre of decay class 1 and 2 trees. In the respective Riparian Reserve areas leave approximately 25 tons per acre. Use the following stocking tables:

**General Prescription Area**

| DBH Class | Tr/Ac | Ave Bd Ft/Tree | Weight in Tons |
|---|---|---|---|
| 12-16 | 6 | 136 | 4.90 (**3 trees to be felled**) |
| ~~16-20~~ | ~~1~~ | ~~262~~ | ~~1.57~~ |
| 20-24 | 3 | 466 | 8.39 (**2 trees to be felled**) |
| 24-28 | 1 | 775 | 4.65 |
| Totals | 11 (63-foot bole spacing) | | 19.51 |

**Riparian Reserve Guidelines**

In the dead tree salvage area the Riparian Reserves would have the following **No Treatment Areas**:

- Leave a **mimimum 50-foot buffer on each side of perennial streams** and a **mimimum 25-foot buffer on each side of intermittent streams.**
- When the slope break cannot be reached by applying the above mentioned buffers, **continue uphill to the slope break or a maximum distance of 100-feet.**
- From the stream bottom upward, **whenever slopes are 50% or greater these slopes would be buffered.**
- There is a **25-foot buffer around the perimeter of all Landslide Deposition Areas** (the flat valley bottoms along some streams). The distance to the edge of the deposits would be variable and could be wider than the minimums.
- Around springs 4663 and 4666 in the SE 1/4 of Section 2, there is a **160-foot buffer around each spring.**

**Riparian Reserve Marking Guidelines**

- Use theRiparian Reserve Area Stocking Table below to leave a minimum of 13 standing trees per acre (Cool, moist Douglas-fir sites; 12 trees per acre on Dry Douglas-fir and Pine sites) of the recommended diameter

classes. If the 12 to 16 inch DBH trees are found in the No Treatment Zone, they can be harvested in the adjacent Treatment Zone (ex. If six 12 to 16 inch trees are found in the No Treatment Zone, then only 7 or more larger trees would be left standing in the treatment zone).

- All trees that would be 20 inches and greater in diameter at the point they would fall into the stream (constained channel areas where the steam cannot move laterally) or onto a landslide deposition area (unconstrained channel areas where the channel can move laterally) would be left standing.

**Riparian Reserve Area Stocking Table**

| DBH Class | Tr/Ac | Ave Bd Ft/Tree | Weight in Tons |
|---|---|---|---|
| 12-16 | 6 | 136 | 4.90 |
| 16-20 | 1 | 262 | 1.57 |
| 20-24 | 3 | 466 | 8.39 |
| 24-28 | 1 | 775 | 4.65 |
| ~~28-32~~ | ~~1~~ | ~~1094~~ | ~~6.56~~ |
| 32-36 | 1 | 1396 | 8.38 |
| Totals | 13 (58-ft bole spacing) | | 34.45 |

**Dry Douglas-fir and Pine Series Forests With West to South Facing Slopes**

On west to south aspects leave 5 tons per acre of decay class 1 and 2 trees. In the respective Riparian Reserve areas leave approximately 28 tons per acre. Use the following stocking tables:

**General Prescription Area**

| DBH Class | Tr/Ac | Ave Bd Ft/Tree | Weight in Tons |
|---|---|---|---|
| 12-16 | 4 | 136 | 3.26 (**2 trees to be felled**) |
| 16-20 | 2 | 262 | 3.14 (**1 tree to be felled**) |
| ~~20-24~~ | ~~1~~ | ~~466~~ | ~~2.80~~ |
| 24-28 | 1 | 775 | 4.65 (**1 tree to be felled**) |
| Totals | 8 (74-ft bole spacing) | | 13.85 |

**Riparian Reserve Area Stocking Table**

Use the same Riparian Reserve marking guidelines as previously described above:

| DBH Class | Tr/Ac | Ave Bd Ft/Tree | Weight in Tons |
|---|---|---|---|
| 12-16 | 4 | 136 | 3.26 |
| 16-20 | 3 | 262 | 4.72 |
| 20-24 | 2 | 466 | 5.59 |
| 24-28 | 1 | 775 | 4.65 |
| ~~28-32~~ | ~~1~~ | ~~1094~~ | ~~6.56~~ |
| 32-36 | 1 | 1396 | 8.38 |
| Totals | 12 (60-ft bole spacing) | | 33.16 |

**NOTE:** Whenever a tree in any given diameter class in not present, leave a tree in the next higher diameter class, or the largest tree possible. The trees indicated to be felled can be felled during the timber sale.

**Pole Stands**

In the pole stands where there are limited numbers of large diameter trees, leave 5 tons per acre of decay class 1 and 2 trees. In the respective Riparian Reserve areas leave 28 tons per acre only. The same stocking tables can be used as for the dry Douglas-fir and pine forests.

**Additional Leave Tree Recommendations** In addition to the above decay class 1 and 2 trees, leave all dead cull trees (Any Douglas-fir trees with visible Fomes pini conk). This may be difficult since many of the conks have been burned off of the trees.

- Throughout the general prescription area, leave 2 old-growth trees per acre if available. These would be trees with the bottle-brush shaped crowns and diameters above 30 inches DBH. When the crowns are gone, look for large limbs down low on the bole. These trees are in addition to the above decay class 1 and 2 trees.
- In addition to the above decay class 1 and 2 trees, leave before-fire wildlife trees such as old snags and old trees with broken-out tops.
- All hardwoods would remain in addition to the above conifer CWM.

## MARKING GUIDELINES FOR QUARTZ FIRE (GREEN TREE AREAS)

**Use the Quartz Fire Rxs Map to locate the possible green tree areas. This map is approximate and is probably an over-estimate of the green tree area, but some might be out there in the mist. For the high severity burn area use the dead tree prescription:**

1. **UPLAND DRY SITE DOUGLAS-FIR RX** - Apply this prescription when there are areas of live, green trees exceeding 100 $ft^2$ BA/AC. A green, live tree is any tree with no more than 50 percent crown scorch. If a tree has more than 50 percent crown scorch, it shall be considered dead. The green tree must also have 20 percent or greater live crown ratio (length of live crown divided by total tree height).
   **On dry Douglas-fir sites, leave 100 $ft^2$ BA/AC.** Species preference is sugar pine, ponderosa pine, incense cedar, and Douglas-fir respectively. On dry sites, group selection areas can range in size from 1/5 to 1-acre in size (53 to 118-foot radius). Vary the position of pine seed trees in the group selection areas to provide shade for regeneration. Old-growth pines should be located in the center of 1-acre group selection areas. Leave 80 $ft^2$ BA/AC around the group selection areas, the radius of this area being the average tree height of the stand. **Do not do this on flat benches where windthrown trees or a high water table are evident. When suitable ponderosa pine seed trees are found on ridge-tops deemed prone to wind damage, decrease the size of the group selection areas to 1/5-acre in size and leave 100 $ft^2$ BA/AC around the opening if available. On dry ridges and sites in the PSME/RHDI (poison oak) plant association, leave no more than 80 $ft^2$ BA/AC. As always, perform a low thinning marking the least healthiest trees for harvest. Leave the healthiest codominant and dominant crown class trees.** Healthy, fast growing intermediate crown class trees can also be left to create vertical stand structure.
2. **UPLAND MOIST DOUGLAS-FIR SITES** - Apply this prescription when there are areas of live, green trees exceeding 120 $ft^2$ BA/AC. Dwarf Oregongrape would be present.
   **On moist Douglas-fir sites, leave 120 $ft^2$ BA/AC. As always, perform a low thinning marking the least healthiest trees for harvest. Leave the healthiest codominant and dominant crown class trees.** Healthy, fast growing intermediate crown class trees can also be left to create vertical stand structure.
3. **UPLAND PONDEROSA PINE TREE SERIES SITES**
   Ponderosa pine sites with south, southeast, and southwest aspects where oak species and whiteleaf manzanita are present, should be marked to leave **60 to 80 $ft^2$ BA/AC**. Old-growth pines should be located in the center of 1-acre group selection areas. Always try to reduce competing vegetation from around healthy pines and incense cedar to insure their survival. Pine savannah areas (where species composition is 100% pine with an understory of grass sp.) should have the pine and cedar marked to a 15 to 20-foot crown spacing. There are no basal area restrictions and all Douglas-fir should be cut. Mark all but 60 to 80 $ft^2$ BA/AC from around the patches of pine, the radius of the area being the average tree height of the stand. Old-growth pines should be located in the center of 1-acre group selection areas.
4. **UPLAND POLE STANDS** - In the designated areas and other small pockets of green trees where the average stand diameter is below 11 inches, mark trees by using a crown spacing. Space leave trees in pole stands to a 3 to 10-foot crown spacing. Perform a low thinning and leave the healthiest codominant and dominant crown class trees.

5. **RIPARIAN RESERVES -** In the fisheries portion of Quartz Gulch there is a 1 site-potential tree no treatment buffer. In the intermittent stream draws the no treatment area is to the top of the slope break. The Riparian Reserve green tree treatment area has been designated as spotted owl suitable habitat and connectivity corridors. Therefore, 60% canopy cover must be maintained. Mark the treatment zone as follows: Mark suppressed, intermediate and some codominant crown class trees with live crown ratios of < 30% to maintain **a minimum of 60% canopy closure.** Other types of trees to mark include trees lacking branches on one or more sides that are not conical in shape, dying trees (watch for bark beetle pitch tubes or missing bark due to woodpeckers), trees with broken tops, trees subject to immediate breakage or hazard trees. Focus on leaving fast growing trees of various crown classes and different species to create structural diversity. Try to release large diameter hardwood trees with 30% and > crown ratios. Leave trees (all conifers and hardwoods) should have a 3 to 15-foot crown spacing.

**ADDITIONAL LANDSCAPE SILVICULTURAL METHODS TO APPLY**

1. **Mark no old-growth trees.** Locate group selection areas to avoid the harvest of old-growth trees. No old-growth trees should be marked outside of the designated Understory Reinitiation prescription areas. **Where coarse woody material (CWM) is found that is 20 inches in diameter at the small end and a minimum of 8 feet long, leave all trees immediately surrounding the CWM that are providing shade for this material. This recommendation would apply to all prescription areas.** Old-growth trees also have the following characteristics: A) significantly larger and older than the second growth trees in the present day stand; an indication that the tree maybe one of the seed trees of the present day stand. These trees have a bottle-brush shape (non-symmetrical crown). B). Exhibits large diameter limbs indicating that the tree was once open grown and had a large crown. Limbs (live or dead) are usually heavy and gnarled, are covered with mosses and lichens, and are close to the ground. C) Thick bark; Douglas-fir would have deep fissures and have a chocolate brown color. Second growth trees have more gray color in the bark. Ponderosa pines would have thick bark, plate-like and yellow in color.
2. **Mark trees around singly spaced old-growth trees to create < or = to a 25-foot crown spacing**. Do not mark trees that are associated with the old-growth trees and create a unique type of stand structure or wildlife habitat. Sometimes, marking trees with entangled roots or crowns may result in the death of the old-growth tree.
3. Save large diameter hardwoods for stand diversity, structure and wildlife. Mark conifers from around the large diameter hardwoods (10 inches DBH and > for oaks and 16 inches DBH and > for madrone) to release the tree crown. Do not mark any conifers in the vicinity of individual, large diameter hardwood trees if falling the conifers destroys the hardwood reserve tree.
4. STRIVE TO CREATE VERTICAL STAND STRUCTURE BY LEAVING TREES OF ALL CROWN CLASSES WITH CROWN RATIOS OF 30% AND >. STRIVE FOR STAND DIVERSITY IN REGARD TO DBH CLASSES, TREE HEIGHTS (CROWN CLASSES) AND THE VIGOR OF INDIVIDUAL TREES. SOME DISEASED, FORKED-TOP TREES, AND DYING AND DEAD TREES SHOULD REMAIN.
5. Pockets of Douglas-fir with a dense understory of seedlings may be selection harvested to release healthy regeneration. Mark these areas to 16 of the largest available trees/acre; you may leave more trees if healthy intermediate crown class trees are available for vertical structure.
6. Watch for natural openings (windthrow, fire, etc.) in the timber stands. These can be expanded in size if necessary for the group selection areas when suitable for natural regeneration.
7. In draws which are not designated as Riparian Reserves, leave trees in the center of the draw bottoms for soil stability (10-feet on each side is recommended).
8. Leave all Stage 1 snags in the interior of homogeneous conifer stands, and buffer snags 17 inches DBH and > from damage.
9. Maintain tighter canopy closure on ridge-tops to prevent wind damage if deemed necessary.
10. Reserve trees with bird nests, wildlife cavities, wide forks with flat nesting spots, or loose bark (bat roosts). Leave a clump of trees around such habitat.

11. Do not mark our seed trees if present. Do not mark any tree, that if felled, would endanger a seed tree. Be sure to release the pine seed trees.

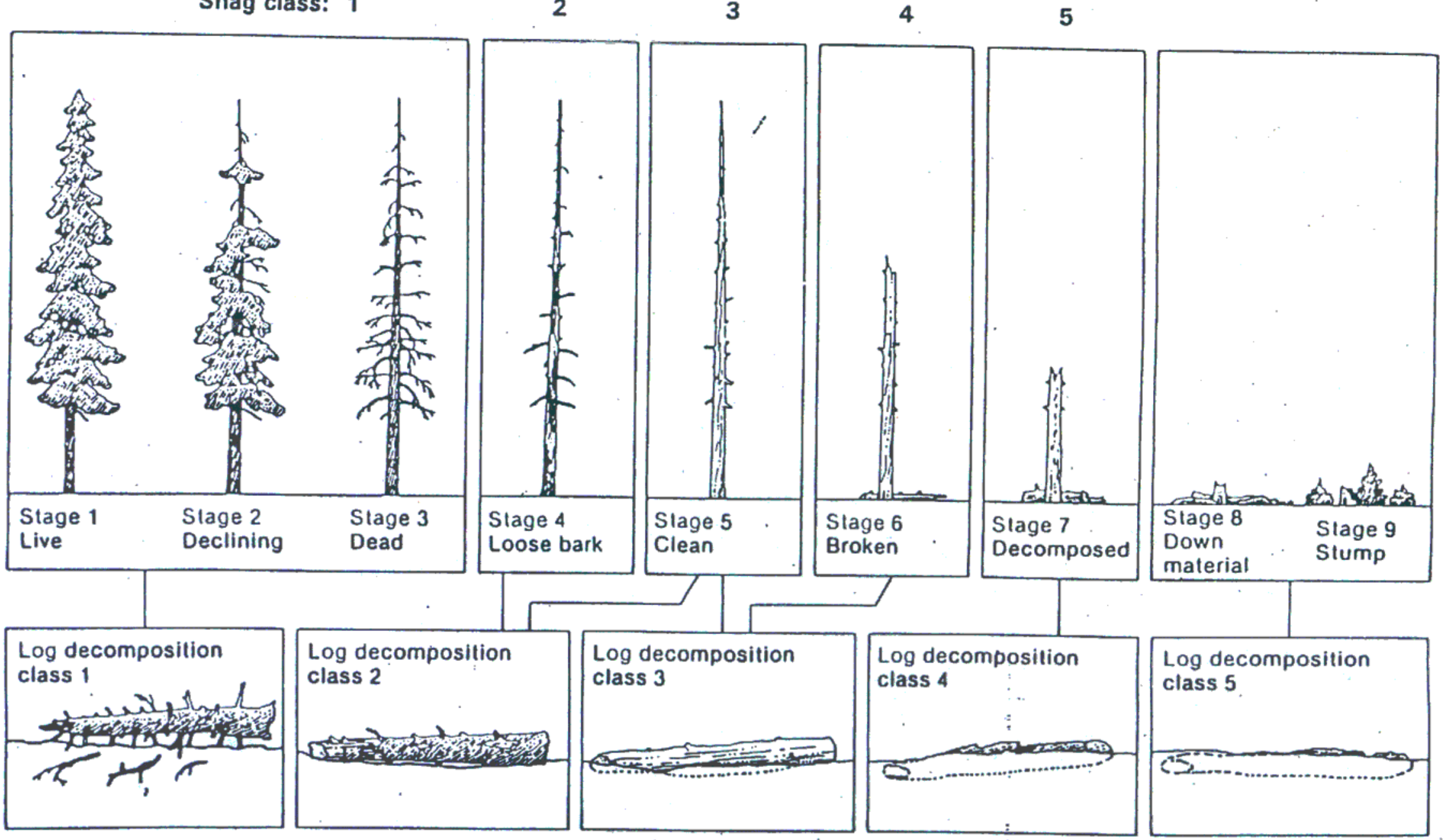
For experienced markers the above items are old-hat. **New guys** must memorize all pages of the marking guidelines and score at least 80% or better on the Silviculture Prescription test before receiving a paint can handle. The prescription writer would monitor marking on a regular basis and may revoke paint can handles when deemed necessary.

Appendix T - Transportation

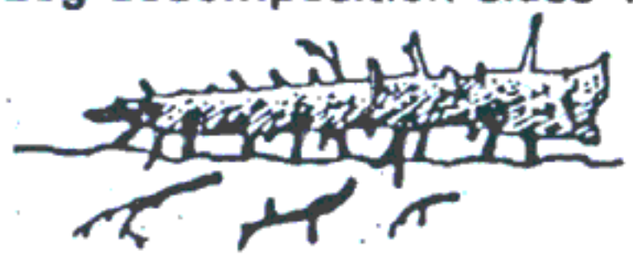
| Road Number | Constructed | Drainage Imp. | Decommissioned | Obliterated | Project Name | Fiscal Year |
|---|---|---|---|---|---|---|
| Skate Gulch Jeep Rd. | | | 3 | | Decommission Contract | 94 |
| 39-2-34.3 | | | 0.8 | | Decommission Contract | 94 |
| 40-2-3 | | | 0.5 | | Decommission Contract | 94 |
| Cinnabar Jeep Roads | | | 2 | | Decommission Contract | 94 |
| 39-3-24 | | | 1 | | Decommission Contract | 94 |
| Deming Gulch Jeep Rds. | | | 2 | | Decommission Contract | 94 |
| Grub Gulch Jeep Rds. | | | 0.2 | | Decommission Contract | 94 |
| 38-2-31 A spur | 0.1 | | | 0.1 | Sterling Wolf TS | 98/02 |
| 38-2-31 B spur | 0.2 | | | 0.2 | Sterling Wolf TS | 98/02 |
| 38-2-31 C Spur | 0.1 | | | 0.1 | Sterling Wolf TS | 98/02 |
| 39-2-31 | 1.6 | 3.3 | | | Sterling Wolf TS | 98/99 |
| 38-2-31.1 | 0.7 | 0.7 | 0.7 | | Sterling Wolf TS | 98/00 |
| 38-2-28 | 0.3 | | | 0.3 | Sterling Wolf TS | 99/02 |
| 38-2-32 | 0.7 | 0.6 | | 0.7 | Sterling Wolf TS | 99/02 |
| 39-2-7.1 | 1.8 | 1.8 | | | Sterling Wolf TS | 99 |
| 39-2-7 | | 1.5 | | | Sterling Wolf TS | 99 |
| 39-2-17 | | 2.3 | | | Sterling Wolf TS | 99 |
| 39-2-17.1 | | | 0.5 | | Sterling Wolf TS | 99 |
| 39-2-8 | | 5.6 | | | Sterling Wolf TS | 98/99 |

| Road Number | Constructed | Drainage Imp. | Decommissioned | Obliterated | Project Name | Fiscal Year |
|---|---|---|---|---|---|---|
| 39-2-15 | | 1.1 | | | Sterling Wolf TS | 98 |
| 39-2-15.1 | | 0.3 | | | Sterling Wolf TS | 98 |
| 39-3-24 | | 0.4 | | | Sterling Wolf TS | 99 |
| 38-2-29.4 | | | 0.2 | | Sterling Wolf TS | 99 |
| 40-2-5 | | 1 | | | Drainage Improvement | 94 |
| 38-2-26 | | 6 | | | Grubby Sailor TS | 97 |
| 39-2-8 | | 3.1 | | | Grubby Sailor TS | 97 |
| 39-2-11 | | | 1 | | Grubby Sailor TS | 99 |
| 39-2-12.2 | | | 1 | | Grubby Sailor TS | 2 |
| 12.2 spur | | | 0.2 | | Grubby Sailor TS | 2 |
| 39-2-3 | | 0.8 | | | Grubby Sailor TS | 98 |
| 39-2-3.1 | | 1.3 | | | Grubby Sailor TS | 98 |
| 39-2-2 | | | 0.5 | | Grubby Sailor TS | 98 |
| 39-2-3.2 | | 2 | | | Grubby Sailor TS | 98 |
| 38-2-35.2 | | 0.5 | | | Grubby Sailor TS | 98 |
| 39-2-25.2 | | 3.5 | | | Rush Ck. Drainage Improvement | 1 |
| 39-1-17.2 | | | 0.5 | | Decommission Contract | 94 |
| 39-1-17.3 | | | 0.5 | | Decommission Contract | 94 |
| 39-2-30.1 | | | 0.5 | | Decommission Contract | 94 |
| 39-2-7.1 | 0.9 | 0.9 | | | Spencer Lomas TS | 1 |
| 39-3-24 | | 1.3 | | | Spencer Lomas TS | 1 |
| Totals | 6.4 | 38 | 15.1 | 1.4 | | |

## THE FIVE SNAG CLASSES AND THEIR RELATIONSHIP TO LOG CLASSES



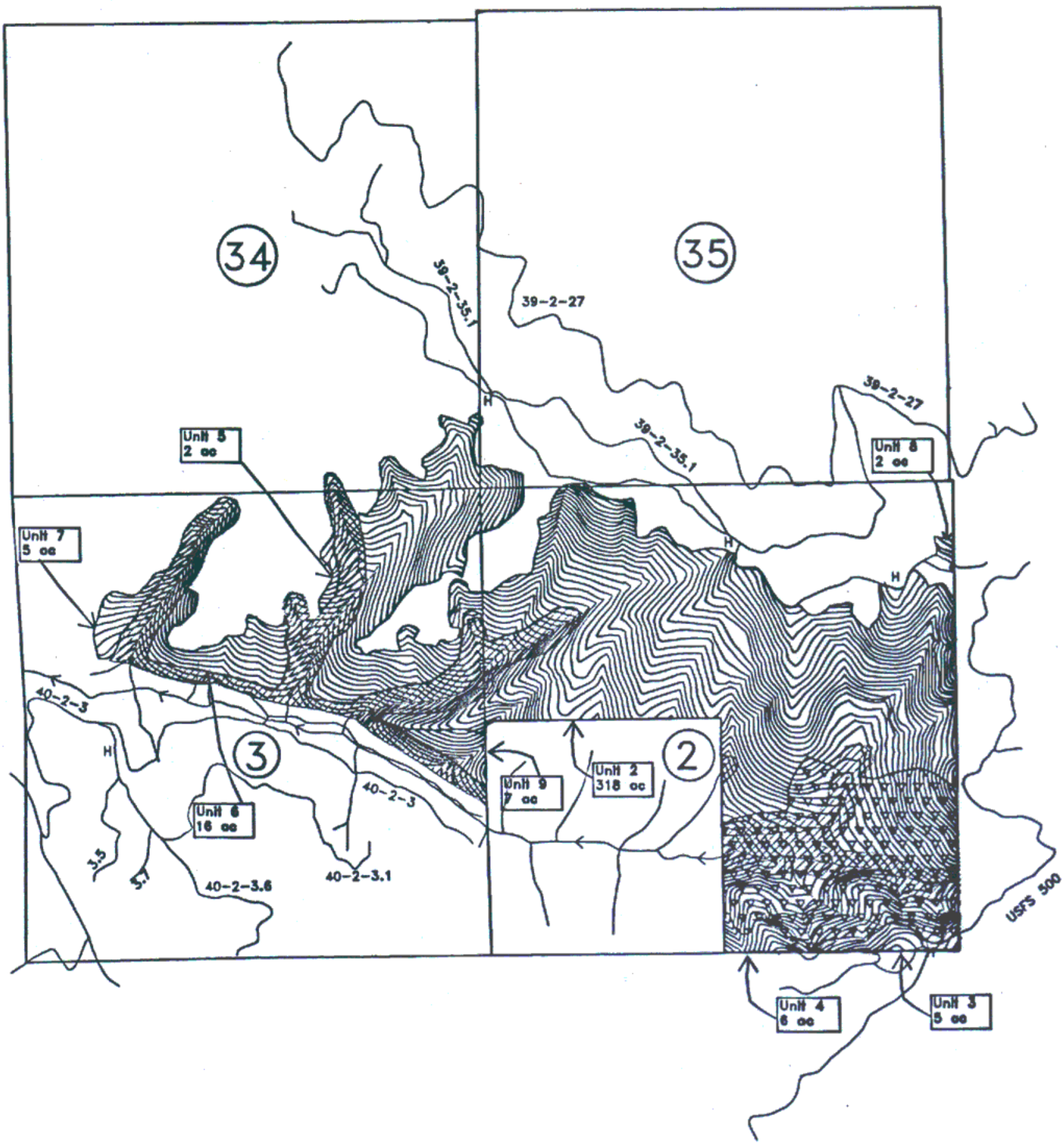

Source: Brown, E. R., tech. ed. 1985. Management of wildlife and fish habitats in forests in western Oregon and Washington, Part 1 - Chapter Narratives. Publ. R6-F and WL-192-1985. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region: 172.

| A FIVE-CLASS SYSTEM OF LOG DECOMPOSITION BASED ON FALLEN DOUGLAS-FIR TREES | | | | | | |
|---|---|---|---|---|---|---|
| Log Decomposition Class | Bark | Twigs < 3 cm (1.18 in) | Texture | Shape | Color of wood | Portion of log on ground |
| Log decomposition class 1  | intact | present | intact | round | original color | log elevated on support points |
| Log decomposition class 2  | intact | absent | intact to partly soft | round | original color | log elevated on support points but sagging slightly |
| Log decomposition class 3  | trace | absent | hard, large pieces | round | original color to faded | log is sagging near ground |
| Log decomposition class 4  | absent | absent | small, soft, blocky pieces | round to oval | light brown to reddish brown | all of log on ground |
| Log decomposition class 5  | absent | absent | soft and powdery | oval | red brown to dark brown | all of log on ground |

Source: Brown, E. R., tech. ed. 1985. Management of wildlife and fish habitats in forests in western Oregon and Washington, Part 1 - Chapter Narratives. Publ. R6-F and WL-192-1985. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region: 172.

# QUARTZ FIRE SALVAGE E.A. MAP
# T39S, R2W, SEC. 34, & 35
# T40S, R2W, SEC. 2, & 3





# QUARTZ FIRE SALVAGE E.A. MAP
# T39S, R2W, SEC. 36