ENVIRONMENTAL ASSESSMENT

for

BOBAR LANDSCAPE PROJECT

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

EA No. OR-110-02-27

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

Public notice of the availability of this EA was provided through 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: Bobar Landscape Project

LOCATION: T.39S.,R.2W., Sections 6,7,19,29-32
T.39S., R3W Sections 1,2,10-15,22-28, 33-36
T.40S.,R.2W., Sections 6,7,19,29-32
Willamette Meridian

EA NUMBER: OR-110-02-27

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CHAPTER I
PURPOSE AND NEED

INTRODUCTION

The purpose of this environmental assessment (EA) is to document the site-specific analysis of environmental effects of implementing the proposed action and/or alternatives. This EA will also assist in determining if an environmental impact statement (EIS) needs to be prepared or if a finding of no significant impact (FONSI) is appropriate.

This document complies with the Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA; 40 CFR Parts 1500-1508) and the Department of the Interior's manual guidance on the National Environmental Policy Act of 1969 (516 DM 1-7).

This EA tiers to and incorporates by reference the following documents:

(1) the Final EIS and Record of Decision dated June 1995 for the Medford District Resource Management Plan dated October 1994 (RMP-ROD);

(2) the Final Supplemental EIS on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl dated February 1994; and

(3) 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 its attachment A entitled 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 dated April 13, 1994 (NFP-ROD); the "Northwest Forest Plan".

In addition to the documents cited and tiered to above, the planning of the Bobar Landscape Project drew from the ideas, information and recommendations of the following documents which are also incorporated by reference:

(1) Applegate Adaptive Management Area: Ecosystem Health Assessment (USDI/USDA 1994);

(2) Applegate Adaptive Management Area Guide (USDI/USDA 1998);

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

(4) Little Applegate River watershed analysis (USDI/USDA 1995)

(5) Applegate-Star/Boaz watershed analysis (USDI/USDA 1995)

(6) Beaver Palmer watershed analysis. (USDA 1994)

(5) USFWS Biological Opinion (1-7-01-F-032, October 2001);

(6) Applegate Fire Plan (Coordinated by the Applegate Partnership) August, 2002

BACKGROUND

Thousands of acres of Southern Oregon forest and shrub land are in poor ecological health and at high risk to loss from catastrophic wildfire, insect and disease outbreak. The policy of suppression of wildfires over the last eighty years has had profound environmental consequences. Many Southern Oregon forests, conifer and hardwood, are very dense and are declining in health and vigor. They have slow growth rates, severe competition for water and nutrients, and increased susceptibility to insects, drought and catastrophic wildfire. These conditions are exacerbated by the drought conditions that have been impacting much of the West in recent years. The 2002 wildfire season has been one of the most damaging on record.

The Ashland Resource Area has utilized an ecosystem and landscape based approach in identifying the site specific treatments proposed for the Bobar Landscape Project. This process considered the current conditions of the various sub-watersheds within portions of the Little Applegate River and Applegate River-McKee Bridge watersheds in terms of need for vegetation management, need for restoration and road management, and implementing land management policy direction, including the potential to provide commodities in the form of forest products.

All BLM administered lands within the planning area were reviewed in the assessment to develop the Bobar Project. Stands selected for treatment are those that could best benefit from silvicultural intervention to encourage more stable and resilient forest vegetation conditions. Areas were excluded from treatment as a result of numerous surveys to determine presence or absence of habitat for special status species. The project design includes efforts to reduce fuel loadings to minimize the effects of wildfires adjacent to private lands in and near the planning area. There are over 500 human-made structures on private lands within one mile of the planning area boundary. Outreach and discussions with neighbors concerning fuels reduction treatments on BLM administered lands adjacent to private lands had direct influence on the project design.

The Bobar Landscape project planning area encompasses approximately 12,795 total acres of which BLM administers approximately 9,275 acres. Approximately 168 acres within the planning area are administered by the U.S. Forest Service with the remaining acres, approximately 3,352, held by numerous private landowners. Jackson County land use planning data within the project planning area shows 87% of the land is zoned forest resource, 12% farm use and 1% rural residential.

The Northwest Forest Plan land allocations on BLM administered lands within the planning area are; Adaptive Management Area – 7,273 acres, Riparian Reserve – 1,760 acres and great gray/northern spotted owl late seral reserve - approximately 245 acres. Management activities are proposed for approximately 4,864 acres, or 52 percent of the BLM administered lands within the project area. The two 100-acre northern spotted owl “core” areas designated as late seral reserve are to be managed long term for late seral forest habitat qualities and were not considered for any type of management under the proposed project. No commercial treatment is proposed in Riparian Reserves. Portions of some Riparian Reserves in oak woodland, shrubland and grassland are proposed for non–commercial treatments.

The proposed Bobar project is one of several landscape projects designed to meet the forest health and fuel management objectives in the Little Applegate River and Applegate River-McKee Bridge Watersheds. Other landscape projects that are proposed for out-year planning in the Little Applegate and Upper Applegate watersheds include Bald Lick, Prince Castor, Bald Lime, and Deadman’s Palm. The Rogue River National Forest also has the Wagner Gap, Little Applegate Stewardship, and miscellaneous small fuel reduction projects planned in the Little

Applegate and Applegate River-McKee Bridge Watersheds. Each of these projects is expected to address the need to improve the ecological health of lands that have become overly dense as a result of fire exclusion and other past management activities, restore aquatic ecosystems and assist in providing a sustainable supply of forest products.

PURPOSE AND NEED

The ***purpose*** of the Proposed Action is to implement management direction from the Medford District Resource Management Plan (RMP) and the Northwest Forest Plan. These planning documents respond to dual needs: the ***need*** for forest habitat and forest products.

The ***need*** for forest habitat is the need for a healthy forest ecosystem with habitat that will support populations of native species and includes protection for riparian areas and water bodies. The ***need*** for forest products from forest ecosystems is the need for 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.

Specifically for the Bobar Landscape Project, ***needs*** include the following forest health objectives:

- Management and improvement of overall forest health using silvicultural practices that encourage more stable and resilient forest vegetation conditions,
- Management and improvement of stand densities and species composition in overstocked natural and created forest stands,
- Facilitate the progression of late successional characteristics in forest stands by maintaining or improve existing structural and species diversity
- Reduce overall long-term sedimentation levels in the project area;
- Management and maintenance of fire hazard and fire risk,
- Contributing to a sustainable yield of commercial timber and other commodities, in concert with land management allocation and direction.

CONFORMANCE WITH EXISTING LAND USE PLANS

The proposed activities are in conformance with and tiered to the *Medford District Record of Decision and Resource Management Plan* (RMP) (USDI 1995b), as amended by 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 *Medford District Record of Decision and Resource Management Plan* (RMP) (USDI 1995b). The Medford District RMP incorporates 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 and the Medford BLM web site at <http://www.or.blm.gov/Medford/>.

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) and the Federal Land Policy and Management Act of 1976 (FLPMA), Clean Water Act, and the Endangered Species Act.

DECISIONS TO BE MADE ON THIS ANALYSIS

This environmental assessment (EA) is being prepared to determine if the proposed action and any of the alternatives would have a significant effect on the human environment beyond those previously addressed in tiered Environmental Impact Statements (see above). It is also being used to inform interested parties of the anticipated impacts and provide them with an opportunity to comment on the various alternatives.

- Whether or not the impacts of the proposed action are significant to the human environment beyond those impacts addressed in the previous NEPA documents listed under ***Conformance With Existing Land Use Plans***. If the impacts are not significant beyond those previously addressed, then a Finding of No Significant Impact (FONSI) can be issued and a decision can be implemented. If any impacts are determined to be significant to the human environment, an Environmental Impact Statement must be prepared before the manager makes a decision.

- Whether to implement the proposed action alternative and associated Project Design Features, or defer to the no action alternative.

RELEVANT ISSUES

Scoping is the name for the process used to determine the level of the environmental analysis to be conducted. It is used early in the NEPA process to identify (1) issues to be addressed, (2) the depth of the analysis required, (3) alternatives to be considered, and (4) potential environmental consequences associated with the alternatives considered in detail. Scoping is performed not to build consensus or get agreement on a project proposal, but rather to solicit relevant site specific comments that could aid in the analysis and final design of the proposal.

There was a deliberate public outreach process for identifying and addressing issues related to the action alternatives of this project. Invitation for participation of Federal, State, Local agencies, and interested parties was accomplished by letters, phone calls, field tours, and individual meetings. Issues and concerns were taken into consideration throughout the development of this project. See Chapter IV for detailed summary of scoping efforts.

The issues identified as pertinent to the project are listed below. Many of these issues were used in the design of the proposed project and alternatives. In some cases an issue raised was considered at the onset by the planning team and then eliminated from further consideration because it was not judged something that was within the scope of the project or proposed action(s). The primary issues identified for this project are:

Aquatic Systems: Hydrology, Water Quality and Fish

Applegate River, Little Applegate River and Yale Creek are in the project area and are listed as water quality limited as defined by the Oregon Department of Environmental Quality on the State 303(d) list. Non-point source pollution (sedimentation) from management activities could further degrade the aquatic ecosystem (e.g., reduce water quality).

Some soils in the project area are prone to landslides or slumping. Road construction or other activities on unstable soils could increase sedimentation to local streams.

The Little Applegate River and the main stem of the Applegate River are considered critical habitat for coho salmon (listed as threatened under the Endangered Species Act (ESA) of 1973). New road construction and other forest

management activities could potentially increase sedimentation and negatively impact critical habitat.

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

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

Access
Some of the project area is not currently accessible by existing roads. Increasing access through road construction and road improvements would greatly decrease the cost associated with meeting current long-term management objectives. Some long-term management objectives (i.e. fuels treatments) may not be possible without increased access. New and improved roads may also contribute to increases in other uses (e.g., off-highway vehicles, hunting, horse back riding) throughout the area.

Wildlife
Overall change in the number of snags and forest stand canopy closures over large landscapes would reduce habitat for some wildlife species and increase habitat for others. Reductions in canopy closure could affect late successional species' habitat, dispersal and thermal cover for deer winter range. Proposed road construction could increase human disturbance to wildlife. Management activities could result in localized, short-term noise disturbances affecting wildlife such as deer and nesting birds.

Special Status Animal Species
Several special status animal species occur in the proposed project area and would need to be protected from project-related activities through buffers and/or seasonal restrictions appropriate to the species in question.

Special Status Plant Species
Several special status plant species occur in the proposed project area and would need to be protected from project-related activities through buffers appropriate to the species in question.

Invasive, non-native plants
Starthistle and medusa head are present in the proposed project area. Some kinds of soil disturbance could facilitate the spread of this species.

Noise and Truck Traffic
The proposed action and associated helicopter logging may increase the amount of noise experienced by some local residents. The transport of logs over roads in the project area may impact residents due to increases in traffic.

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

CHAPTER II
Alternatives

INTRODUCTION

This chapter briefly describes the no action alternative and the action alternatives.

The BLM is proposing to implement a landscape level treatment project with activities including, in part, several commercial timber sales covering approximately 2,600 acres of harvest units. Approximately 2,300 acres of additional areas are proposed for non-commercial management and restoration activities such as thinning of young conifer, woodlands, and shrubland and burning of grassland. Fuels reduction is an integral part of all treatments and would be accomplished using hand, mechanical and prescribed fire methods. The treatments proposed, use a variety of silvicultural techniques based on the existing and potential vegetation at each site. The proposed action would treat an approximate total of 4,900 acres in the Little Applegate River and Applegate River-McKee Bridge watersheds within the Applegate River subbasin. Additionally 6 miles of new system road construction would facilitate access to the areas proposed for treatment; 7.2 miles of roads are proposed for decommissioning. Maintenance and renovation activities are proposed for 23.8 miles of existing roads. Proposed activities (silvicultural method, yarding systems, fuels mgt.) in commercial harvest units are listed in Appendix A. Proposed road construction and road renovation details are listed in Appendix D. Non-commercial activities are listed in Appendix H.

Alternative A (No Action)

Under the "no action" alternative, none of the management activities described in the action alternatives would occur in the Bobar project area.

Alternative B (Proposed Action)

Alternative B would use the following management tools to meet the purpose and need described in Chapter 1:

1. Variable prescription commercial thinning would occur on approximately 2,588 acres of forested stands. Pre-commercial thinning (thinning of young conifer stands) would occur on approximately 550 of the same acres being commercially harvested.
2. Non-commercial treatments (mechanical thinning, hand thinning, and prescribed fire) would occur in all commercial treated stands and on approximately 2,286 acres of young conifer stands, shrubland, hardwoods, and grasslands.
3. Approximately 6 miles of new road would be constructed in three separate areas.
4. Road decommissioning would take place on approximately 7.2 miles of existing roads (6.7 miles within the Bobar project area, 0.5 miles on the same ridge but outside of the project area boundary).
5. Approximately 24 miles of existing roads in the project area would be renovated to bring them up to current BLM standards.

Alternative C

Alternative C would use the same management tools as Alternative B but without any new road construction.

1. Variable prescription commercial thinning would occur on approximately 2,338 acres of forested stands. Pre-commercial thinning (thinning of young conifer stands) would occur on approximately 450 of the same acres being commercially harvested.

2. Non-commercial treatments (mechanical thinning, hand thinning, and prescribed fire) would occur in all commercial treated stands and on approximately 1,979 acres of young conifer stands, shrubland, hardwoods, and grasslands.
3. No new road construction would take place.
4. Road decommissioning would take place on approximately 5.9 miles of existing roads (5.4 miles within the Bobar project area, 0.5 miles on the same ridge but outside of the project area boundary).
5. Approximately 24 miles of existing roads in the project area would be renovated to bring them up to current BLM standards.

COMPARISON OF ALTERNATIVES

Listed below is a brief summary of the major differences between alternatives. The environmental consequences of each alternative are provided in Chapter 4.

TABLE 2-1. COMMERCIAL ACRES TREATED BY SILVICULTURE PRESCRIPTION

PRESCRIPTION	ACRES		
	ALT A	ALT B	ALT C
Wet Douglas Fir (WDF)	0	10	10
Dry, Douglas Fir (DDF)	0	1503	1254
Pine (P)	0	559	513
Douglas Fir Poles (DFP)	0	431	397
Regeneration (REG)	0	85	85
Total Acres	0	2588	2259

An explanation of each silviculture prescription is available in Appendix B.

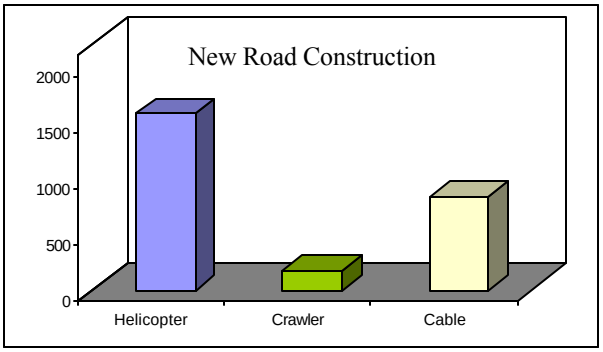
TABLE 2-2. CURRENT AND FUTURE ROAD MILAGE BY ROAD CATEGORY

ROAD SUMMARY	MILES		
	ALT A	ALT B	ALT C
Existing BLM Roads	23.8	23.8	23.8
Proposed New Road Construction	0	6.0	0
Proposed Decommissioning	0	7.2	5.9
Proposed maintenance/renovation on existing roads	0	23.8	23.8
Roads Currently Closed with Gates/Barricades	8.4	8.4	8.4
New Roads Closed with Gates/Barricades	0	6.0	0
Total BLM Roads after Project (Closed and Open)	23.8	22.6	17.9
BLM Roads Closed	8.4	14.4	8.4
BLM Roads Open	15.4	8.2	9.5

TABLE 2-3. NON-COMMERCIAL ACRES TREATED BY DOMINANT VEGETATION TYPE

PRESCRIPTION	ACRES		
	ALT A	ALT B	ALT C
Pre-Commercial Conifer	0	410	410
Oak Woodlands (OW)	0	1417	1227
Shrubland (S)	0	286	194
Grass (G)	0	173	158
Total Acres	0	2286	1989

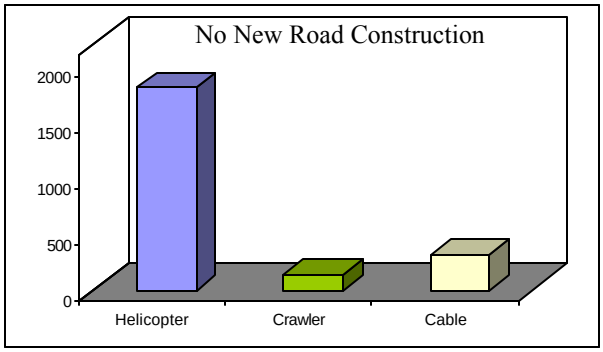
CHART 2-1. LOGGING SYSTEMS UTILIZED FOR COMMERCIAL TREATMENT



Alternative B

New Road Construction

Helicopter	1,572 Acres
Crawler/Tractor	175 Acres
Cable	841 Acres
Total Acres	2,588 Acres



Alternative C

No New Road Construction

Helicopter	1,804 Acres
Crawler/Tractor	135 Acres
Cable	320 Acres
Total Acres	2,259 Acres

PROJECT DESIGN FEATURES (PDFs)

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

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM ANALYSIS

The ID team also considered the following alternatives, but chose not to analyze them in detail. Below is a description of each alternative considered and the rationale for dismissal.

1. **Eliminate helicopter logging and rely on road construction for access to all project areas.** Constructing enough roads to manage the project area without helicopters would require constructing approximately 30-40 miles of new road construction and could increase impacts to waterways, aquatic wildlife, and terrestrial wildlife beyond acceptable limits. Increased road construction could also increase impacts to the local community. Potential impacts include increased noise from off-highway vehicles, potential wildfire ignition from off-highway vehicles, use of firearms behind and adjacent to residences, and the visual impacts of roads.

2. **Multiple routes of new road construction were considered but eliminated from the proposed action.** Several routes were considered to provide road access to the areas proposed for treatment but ultimately rejected from the final project proposal. The route chosen for the proposed action minimizes the resource impacts and the amount of new road construction required to treat the areas proposed.

3. **Maximize economic return by utilizing regeneration harvest for the dominant portion of the area.** While meeting the economic and wood supply goals of the project, aggressive regeneration harvest would not meet the balanced ecological approach sought after. Intensive harvest would limit the acres treated by concentrating harvest on fewer acres. It would not provide the opportunity to treat additional acres of the landscape to restore health, vigor and reduce fuel loading over a wide area.

4. **Limit harvest of commercial trees utilizing an upper diameter limit.** Comments have been received for this as well as other projects suggesting limiting the removal of trees above a certain diameter. Over time, various groups have proposed numbers ranging from 8 inches to 24 inches. The Ashland Resource Area Field Manager asked the ID team to consider if a size limit could be used to plan forest management activities and effectively meet the forest management guidelines outlined in the BLM Resource Management Plan and the Northwest Forest Plan. The ID team considered imposing a strict numerical diameter limit for treatments in the commercial conifer portion of the project. Imposing a strict numerical diameter limit does not provide enough latitude in treatment design to meet ecological goals for managing forest stands. Low thinning or thinning from below was chosen for the commercial conifer thinning approach in the proposed action. Low thinning always selects the smallest tree size classes first for harvest and then saves larger size class trees.

5. **Exclude commercial harvest and only treat non-commercial areas.** Comments have been received for this as well as other projects suggesting that no commercial products should be removed from federal lands. The ID team considered the idea of treating only oak woodlands, shrublands and grass and restricting the removal of conifer tress to those less than eight inches in diameter (non-commercial). This would effectively eliminate removing any material that could be sold for saw logs. Restricting the project to not remove any trees over eight inches DBH would not meet the purpose and need. It would not meet the need of providing wood products in the form of saw logs and it would not effectively meet the need of increasing forest health, reducing fuel loadings and improving tree vigor because it would not treat enough of the vegetation on the majority of sites.

CHAPTER III
Affected Environment

Only substantive site-specific environmental changes that would result from implementing the proposed action or alternatives are discussed in this chapter. If an ecological component is not discussed, it should be assumed that the resource specialists have considered affects to that component and found the proposed action or alternatives would have minimal or no effects. Similarly, unless addressed specifically, the following were found not to be affected by the proposed action or alternatives: air quality; areas of critical environmental concern (ACEC); cultural or historical resources; Native American religious concerns; prime or unique farmlands; flood plains; endangered, threatened or sensitive plant, animal or fish species; water quality (drinking/ground); wetlands/riparian zones; wild and scenic rivers; and wilderness. In addition, hazardous waste or materials are not directly involved in the proposed action or alternatives.

SILVICULTURE

The present day landscape pattern of the vegetation in the Bobar project area is a result of topography, fires from 1864 to1917, timber harvesting, and agricultural/residential land development. There is a natural diversity of vegetation condition classes within stands and between stands whose boundaries are generally dictated by slope, aspect and past disturbance. Aspect is an important determinant in vegetation changes. Ridges with westerly to southerly aspects and areas with shallow soils have severe growing conditions with shrubs and grasses dominating these sites. As a result, the majority of the timber stands are separated by grasslands, shrublands or oak woodlands. These influences create a coarse-grained pattern across the landscape with a mosaic pattern of different vegetation types and seral stages.

There is a total of 9,275 acres of federally-owned land in the Bobar project area. The Bobar project area is presently composed of the following vegetation types: grassland, 529 acres; shrubland, 711 acres; hardwood/woodland, 2,376 acres; seedlings/saplings (0 to 4.9 inches DBH), 358 acres; small conifer timber (5 to 11 inches DBH), 726 acres; and large conifer (11 to 21 inches DBH) and mature timber, 3441 acres.

Some of the stands within the Bobar project area have been previously harvested (4 percent of the project area is in an early seral stage). Natural mortality has also created openings in the canopy layer. Natural mortality is a result of bark beetles and windthrow. The understory of these stands consists of dense pockets of conifer regeneration and shrubs. The regeneration ranges from seedling to small pole size trees, with many of these trees being suppressed. These stands would benefit from pre-commercial thinning. .

In the project area, many of the commercial forest stands originated between 1864 and 1917 following small and large-scale fires. Most of the forest stands became established within 10 years after a fire, although the harsher sites may have taken 30 to 40 years to become forested. Because these fires were forest-replacing in nature, individual timber stands now tend to be uniform with little structural variation. This means that there are many trees of the same age class and almost equal in height, with few older trees scattered throughout. The majority of the trees in the project area are between 80 and 170 years old. However, there are 170 to 200 year old trees in fewer numbers. The oldest trees found were 352 and 372 years old. The age classes greater than 170 are the least frequently found. These older stands are in the understory reinitiation stage of forest development and diverse vertical stand structure.

There are some young, healthy forest stands (50 to 100 years of age) scattered among the older, overstocked stands. Most pole stands are suppressed and diameter growth is less than 1 inch per decade. These stands are still in the stem exclusion stage. These stands are characterized by a closed canopy and high stocking levels (sometimes more hardwoods than conifers) with many suppressed trees resulting in poor individual tree vigor. The canopy closure for the Bobar project area ranges from 56 to 99 percent. Some forest stands have been selectively logged, commercially thinned or have suffered mortality from natural disturbance. These stands tend to be more diverse in species composition and vertical structure as a result of disturbance.

There are three tree series in the Bobar project area: Douglas-fir, ponderosa pine, and white oak. The PSME (Douglas-fir)/RHDI (poison oak) and PSME/RHDI-BEPI (Piper's Oregongrape) plant associations are most prevalent at lower elevations and on dry ridges. As the elevation increases and rainfall is more abundant, or the aspect is more conducive to cooler temperatures, plant associations most often found include PSME-PIPO (ponderosa pine), and PSME/BENE (dwarf Oregongrape). Small areas of PIPO-QUKE (California black oak) are present. The PIPO-PSME association is slightly cooler and wetter than the PIPO-QUKE association. Poison oak is the only commonly occurring shrub (U.S.D.A., 1996). The white oak series (QUGA) occurs near the valley floor at low elevations. The series tends to be found in areas of shallow soils, and hot, dry microclimates. Three oak associations may be found; QUGA-PSME/RHDI, QUGA - CEMO (Birchleaf mountain mahogany), and QUGA/CYEC (hedgehog dogtail).

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

Currently, the stocking levels of stands throughout the project area are high. This is primarily due to the lack of natural disturbance and fire exclusion. Merchantable trees (those over 7 inches DBH) per acre range from 185 to 630. The overall average for the Bobar project area is 348 merchantable trees per acre. Average radial growth for the past ten years is .4 inches. The average relative density for the area is .82 and indicates that physiologically the trees are at the point of suppression and mortality. Vegetation densities are also extremely high in the shrublands and woodlands and indicate an increased potential for fire. The average tree vigor index, as measured by leaf area index is 43. Trees with vigor indices below 30 will succumb to attack from bark beetles of relatively low intensity. Trees with vigor between 30-70 can withstand progressively higher attacks but are still in danger of mortality from the insect attacks. Trees with vigor between 70-100 can generally survive one or more years of relatively heavy attacks and trees with indices above 100 generally cannot be killed by bark beetles (Waring, 1980).

Bark beetle infestations are present in the project area. Western pine beetles *(Dendroctonus brevicomis*) are attacking the pines while flatheaded fir borers *(Melanophila drummondi*) and Douglas-fir beetles *(Dendroctonus pseudotsugae*) are killing Douglas-fir. Drought conditions and high tree stocking levels are severely stressing the

trees physiologically, enabling the beetles to enter and kill the trees.

Forest pathogens are also changing the forest stand structure and forest development pattern. *Phellinus pini* (red ring rot) is affecting Douglas-fir and ponderosa pine. It is apparent that the disease is most common in stressed trees. Some of the infected trees are beginning to die or are subject to stem breakage thus allowing light to reach the forest floor and the understory reinitiation stage to begin. *Phaelous schweinitzii* (brown cubical butt rot) is also present. Some Douglas-fir dwarf mistletoe is also present in small areas.

In the project area, the overall average amount of coarse woody material (CWM) is approximately 12.4 tons per acre. The coarse woody material stem diameters were concentrated in the 9 to 34 inch classes at the large end and averaged 17.4 feet in length. 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. Stand inventory data shows that there is a range of 13 to 91 damaged (includes physical defects or pathogens) trees/acre with an average DBH of 12.2 inches.

FIRE AND FUELS

Fire 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 vegetative successional processes. Large fires were a common occurrence in the area as determined by reviewing 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 to the frequency, severity and extent of fires occurring in an area (Agee 1991). The historic fire regime in the project area is considered to be one in which fire burned frequently with low severity. Large stand-replacing fires can occur under certain weather conditions, but are infrequent events.

In the early 1900s, uncontrolled fires were considered to be detrimental to forests. Suppression of all fires became a major goal of land management agencies. As a result of the exclusion of fire, there has been a build-up of fuel loadings and a change to vegetative conditions that are more prone to damaging fire events. The time between natural occurring fires to burn through a particular area of the landscape is known as the ***fire return interval***. The fire return interval for the project area is considered to be approximately 5 – 25 years.

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.

Many seedling and pole size forests of the 20th century have failed to grow into old-growth forests because of the lack of natural thinning once provided by frequent fire. Frequent low intensity fires can serve as a thinning mechanism, thereby, naturally regulating the density of the forests by killing weak and small trees. Trees growing at

lower densities, as in ponderosa pine stands, tend to be more fire-resistant and vigorous. Eventually they grow large and tall, enhancing the vertical and structural diversity of the forest.

Many forests developed high tree densities and produced slow growing trees rather than faster growing trees after abrupt fire suppression became policy in about 1900. Trees facing such intense competition often become weakened and are highly susceptible to insect epidemics and tree pathogens. Younger trees (mostly conifers) contribute to stress and mortality of mature conifers and hardwoods. High density forests burn with increased intensity because of the unnaturally high fuel levels. High intensity fires can damage soils and often completely destroy riparian vegetation. Historically, low intensity fires often spared riparian areas, which reduced soil erosion and provided wildlife habitats following the event.

The absence of fire has had negative effects on grasslands, shrublands, and woodlands. Research in the last few decades has shown that many southern Oregon shrub and herbaceous plant species are either directly or indirectly fire-dependent. Indirectly fire-dependent herbaceous species are crowded out by larger-statured and longer-lived woody species. This is particularly so for grasses and forbs within stands of wedgeleaf ceanothus and whiteleaf manzanita with a high canopy closure. High shrub canopy closure prevents herbaceous species from completing their life-cycle and producing viable seed. Many grass species may drop out of high canopy 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 to mixed 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.

Fire Risk

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

Information from the Oregon Department of Forestry database from 1967 to 1999 show a total of 59 fires occurred throughout the project area which burned a total of 327 acres. Lightning accounted for 51 percent of the total fires and human caused fires accounted for 49%.
The following table is a break down of the fires within the project area:

Total Number of Fires	Size Class
50	A (<.25ac)
6	B (.26-10ac)
2	C (10.1-100ac)
1	D (100.1-300ac)

0	E (300.1-1000ac)

The class D fire was 289 acres in size and was caused by lightning. The two class C fires were 12 and 14, acres in size. One of these fires was human caused and the other by lightning. A total of nine fires were caused by equipment. These nine fires burned less than 2 acres.

Fire Hazard

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

Fire Hazard Ratings for the Bobar Project Area	
Fire Hazard Rating	**Percentage of Acres in each Category**
Low hazard	5%
Moderate hazard	54%
High hazard	41%

Based on local knowledge of fire behavior of southwest Oregon the following factors were determined to be necessary in order to assign a fire hazard rating to an area: fuel model, presence of ladder fuels, slope, aspect, and elevation.

AIR QUALITY

Nonattainment Areas

In the past, the population centers of Grants Pass, Medford/Ashland (including Central Point and Eagle Point), and Klamath Falls were in violation of the national ambient air quality standards for particulate matter smaller than 10 micrometers (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, 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.

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.

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.

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

Vegetation, climatic, geologic and other processes related to hydrology/soils are discussed in depth in the *Little Applegate River* and *Applegate-Star/Boaz Watershed Analyses* (USDI and USDA 1995, USDI 1998).

The major soil series identified in proposed project area is Caris-Offenbacher complex (25G, 26G) with 1,178 acres, the Vannoy and Vannoy-Voorhies complex (195E, 195F, 196E, 197F) with 618 acres and the granitic soils Shefflein (164D, 165E, 166E) and Tallowbox (188E, 188G, 189E, 189G) with 81 and 649 acres respectively. For the location of these soils on the landscape see soils map on file at the Medford District Office.

Refer to Bobar Soil Concerns in the Appendix for erosion hazards, equipment limitation, seedling mortality, windthrow and plant competition concerns and potential productivity.

Soil Types Present

Caris-Offenbacher complex

The Caris and Offenbacher soils are intricately intermingled across the landscape. Most of the time these soils have surface textures of gravelly loam but in much of the proposed project area, stones overlay the soil surface forming talus. Not all of the talus is easily identified, as it is covered with a layer of needles, leaves, and twigs. For the purposes of this project, talus is defined as: rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or steep, rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding (Jackson County Soil Survey, SCS, August 1993).

The Caris and Offenbacher soils are moderately deep and well drained. The surface is typically covered with a layer of needles, leaves, and twigs about 1 inch thick. Permeability is moderate in both the Caris and Offenbacher soils, and runoff is rapid. Available water capacity is from 2 to 4 inches. The effective rooting depth is 20 to 40 inches. Also included in this unit are small areas of the McMullin soils (shallow) and rock outcrops on ridges and convex slopes and there may be small patches of Schefflein and Tallowbox series soils.

Vannoy silt loam

The Vannoy soil is moderately deep, well drained on hillslopes. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles, leaves, and twigs about 3/4 inches thick. 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. Weathered bedrock is at a depth of about 38 inches. Permeability of the Vannoy soil is moderately slow, and runoff is rapid. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is gravelly or very gravelly loam. Available water capacity is 5 inches, and the effective rooting depth is 20 to 40 inches.

Voorhies very gravelly loam
The Voorhies soil is moderately deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles and twigs about 1 inch thick. The surface layer is very dark grayish brown and dark brown very gravelly loam about 8 inches thick. The upper 10 inches of the subsoil is brown very gravelly clay loam. The lower 18 inches is brown very cobbly clay loam. Weathered bedrock is at a depth of about 36 inches. Permeability of the Voorhies soil is moderate. The depth to bedrock ranges from 20 to 40 inches. Available water capacity is 3 inches, and the effective rooting depth is 20 to 40 inches.

Shefflein loam
This deep, well-drained soil is on hillslopes. It formed in colluvium and residuum derived from granitic rock. Typically, the surface layer is dark brown loam about 4 inches thick. The next layer is reddish brown loam about 6 inches thick. The upper 30 inches of the subsoil is reddish brown clay loam, the lower 16 inches is reddish brown sandy clay loam. Weathered bedrock is at a depth of about 56 inches, with a range of 40 to 60 inches. Permeability of the Shefflein soil is moderately slow, with medium runoff. Available water capacity is 8 inches, and the effective rooting depth is 40 to 60 inches.

Tallowbox gravelly sandy loam
This moderately deep, somewhat excessively drained soil is on hillslopes and ridges. It formed in colluvium derived from granitic rock. Typically, the surface is covered with a layer of needles, leaves and twigs about 1 inch thick. The surface layer is dark brown gravelly sandy loam about 6 inches thick. The upper 6 inches of the subsoil is dark brown sandy loam, and lower 11 inches is brown gravelly sandy loam. Weathered bedrock is a depth of about 23 inches, with a range of 20 to 40 inches. Permeability of the Tallowbox soils is moderately rapid, with medium runoff. Available water capacity is 3 inches, and the effective rooting depth is 20 to 40 inches.

Manita loam
This deep, well drained soil is on alluvial fans. It formed in alluvium derived dominantly from metamorphic rock. Typically, the surface layer is dark brown loam about 8 inches thick. The upper 5 inches of the subsoil is dark reddish brown clay loam. The lower 45 inches is yellowish red clay loam. Weathered bedrock is at a depth of about 58 inches. The depth to bedrock ranges from 40 to 60 inches. Permeability of the Manita soil is slow. In some areas the surface layer is gravelly. The Manita soil has a significant clay content and is very susceptible to compaction. Only, approximately 18 acres of Manita soil are present in commercial units. Generally, Manita soils are located adjacent to perennial streams and creeks.

Erosion Hazard Potential

As with all soils, the runnoff rate and the erosion hazard due to water increases as the slope of the landscape increases and conversely as the presence of protective cover decreases:
– The Manita soil is considered to have a moderate erosion potential (erosion hazard)
– The Caris-Offenbacher, Vannoy-Voorhies complex and the granitic soils have a high hazard of water erosion (sic, Jackson County Soil Survey).

Erosion hazard relates to the ease of detachment and movement of soil and rock particles. It is not meant to imply that this material has entered the aquatic environment, but rather the colluvial environment where it could remain for years to millennia. Almost all soils on hillslopes form from colluvium.

Geomorphology and Slope Stability

The *Little Applegate River Watershed Analysis* (USDI and USDA 1994) (LARWA) developed a system describing the geomorphology of the watershed, titled Landscapes at a Glance (LAG). Within the boundary of the Bobar project there are essentially only two LAG units found. The Bobar planning area is represented by or can be extrapolated to be represented by Resistant Metamorphics and Low Elevation Granitics. These LAG units are considered stable, relative to slope stability concerns, and also have a low-to-moderate erosion potential (ARWC 2002).

LARWA defined three (3) types of granite influenced Landscapes in the Little Applegate River Watershed, they are Shallow Granitics, Glaciated Granitics and Low Elevation Granitics (the only granitic landscape in the Bobar planning area). Elsewhere in the Medford District, granite is a major concern because of its highly erosive nature when weathered (West Evans Creek), however this is not the case with the Low Elevation Granitic LAG Units which as mentioned previously are considered stable and have a low-to-moderate erosion potential. A reason for this increased apparent stability might be that the Low Elevation Granitics have been affected by the low-grade regional metamorphism characteristic of the Klamath Mountains (personal comm., Peter Jones, Engineering Geologist, USFS and co-author of LAG and the LAPWA).

A small landslide was found directly above the 39-3-27.2 road in section 27. This 50 foot by 60 foot slide might be better described as a road related cutslope failure. There is no catchment basin concentrating water into this feature. There is no indication that this feature is migrating upslope, it is located within 150 feet of the ridgetop. Similar, healed features can be seen along this same section of road.

Slope Stability and Riparian Reserves

Though both the Resistant Metamorphics and Low Elevation Granitics are considered stable, they, like all rocks, do erode and eroded material ultimately (decades to millennia) will accumulate in draws and near drainages. In Boaz Gulch, there is evidence (large boulders) of old debris torrents. However, there is no record of any debris torrents occurring in the Bobar Project area within recent recorded history.

Under natural conditions, in the headwaters of intermittent streams, erosion is continually moving sediment from hillsides into debris filled draws. As this material is piled deeper and deeper, it eventually becomes unstable. During a heavy rain this slug of material may move in any of the forms of a landslide (slump, rotational slump, etc.). As evidenced by the effects in Oregon's coast range of the January 1997 storm, the majority of debris flows occur during major storms. If conditions are right (i.e., excess water and slope) the material often undergoes a "phase change" of sorts, i.e., landslides become debris flows, which become wood-charged debris torrents. This is a repeating process; given time, channels heal, re-fill with debris and slide again. Virtually all steep-gradient mountain streams could be considered debris flow paths.

As this slug of debris starts moving, its speed and momentum increase rapidly. The disturbance cascades down the stream channel incorporating into itself all material in and adjacent to the channel, including full-grown trees and their roots. Debris flows can reach speeds of 100 km/h. Upon reaching a stream section of lower gradient, the velocity decreases and the larger sediment (boulders, cobbles and trees) will start to settle out of the flow. During high flow, water velocity is such that sediment small enough to fill the spaces between gravel is kept in suspension, allowing the finer sediment to pass out of the system without settling, and leaving clean gravels behind. The major source of large wood, boulders and large sediment in fish-bearing streams are debris flows that originate in narrow upland

intermittent streams.

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. 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. One definition of detrimental compaction is defined in Oregon and Washington in 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.

HYDROLOGY

Analysis Area

The proposed Bobar project area is located in the Applegate River-McKee Bridge (formerly known as Applegate-Star/Beaver/Palmer) and Little Applegate River Watersheds, upstream of the confluence of the Applegate and Little Applegate Rivers. The *Applegate-Star/Boaz Watershed Analysis* (USDI 1998) and the *Little Applegate River Watershed Analysis* (USDI and USDA 1995) provide a general description of geomorphology, hydrology, water quality, stream channels, and riparian vegetation for the project area.

For purposes of analyzing the affected environment within the proposed project, the project area is divided into ten drainage areas. In general terms, a watershed is defined as any bounding area within which water drains to a specified outlet. To better classify and analyze watersheds they are delineated to nest in a multi-level, hierarchical drainage system. The largest classification of this kind is termed a 1st level hydrologic unit (also called a Region). As part of the ranking system, a 1st level hydrologic unit is delineated into smaller 2nd levels (Subregions) which then can be subdivided into 3rd levels (Basins), then 4th levels (Subbasins), 5th levels (Watersheds), 6th levels (Subwatersheds), and 7th levels (Drainage Areas). The Bobar project area is split between the Little Applegate River and the Applegate River-McKee Bridge 5th level watersheds, within the Applegate River 4th level subbasin. The 7th level drainages (Table 3.1) in the project area include Waters Gulch and First Water Gulch (tributaries to Yale Creek), and Grouse Creek and Boaz Gulch (tributaries to the Applegate and Little Applegate Rivers).

Table 3.1. Drainage Area Description

Drainage Area Number	Hydrologic Unit Code (HUC)	Drainage Area Name	Drainage Area Description	Total Drainage Area (acres)	Drainage Area within Project Area (acres)	BLM Land within Project Area (acres)	Forest Service Land within Project Area (acres)	Private Land within Project Area (acres)
AU 0218	17100309020218	Applegate River, Flumet Gulch, China Gulch, and Boaz Gulch	All lands draining into the Applegate River below Beaver Creek and above Star Gulch	4018	1508	1346	8	154
AU 0360	17100309020360	Applegate River and unnamed tributaries	All lands draining into the Applegate River below Star Gulch and above Lime Gulch	2926	2297	1877	101	318
AU 0363	17100309020363	Applegate River and Lime Gulch	All lands draining into the Applegate River from (and including) Lime Gulch to above Little Applegate River confluence	2327	380	199	26	154
LA 0427	17100309030427	Waters Gulch	All lands draining into Waters Gulch	2350	854	408	0	446
LA 0430	17100309030430	Yale Creek and First Water Gulch	All lands draining into Yale Creek below Waters Gulch and above Little Applegate River Confluence	1672	1448	1094	0	354
LA 0503	17100309030503	Little Applegate River and unnamed tributaries	All lands draining into the Little Applegate River below Yale Creek and above Grouse Creek	1812	519	209	0	310
LA 0506	17100309030506	Grouse Creek	All lands draining into Grouse Creek	1879	1879	1844	0	36
LA 0509	17100309030509	Little Applegate River and unnamed tributaries	All lands draining into the Little Applegate River below Grouse Creek and above Sterling Creek	548	548	377	0	170
LA 0542	17100309030542	Little Applegate River and unnamed tributaries	All lands draining into the Little Applegate River below Sterling Creek and above drainage area LA 0545	1923	1923	1283	0	641
LA 0545	17100309030545	Little Applegate River and unnamed tributaries	All lands draining into the Little Applegate River below drainage area LA 0542 and above Applegate River confluence	1440	1440	638	33	770

In addition to BLM-administered lands (9,275 acres), a private timber company (480 acres), individual private land owners (2,872 acres), and the Forest Service (168 acres) also own or manage lands in the Bobar project area. The Oregon Forest Practices Act guides the management of private lands. Private lands in the lower elevations of the project area are primarily agricultural and shrub lands.

Precipitation Regime

Average annual precipitation in the Bobar project area ranges from approximately 25 to 29 inches based on PRISM model calculations (Taylor 1995). Elevations range from 1,480 feet at the confluence of the Applegate and Little Applegate Rivers to 3,880 feet at Cinnabar Mountain. Rain is the predominate form of precipitation in the Bobar project area, and falls primarily between the months of November and March. Summer months are typically very dry. Data on recent extremes of monthly precipitation are readily available on the Internet for the following NOAA stations:

- **Buncom** (adjacent to project area) at http://www.ocs.orst.edu/pub_ftp/climate_data/tpcp/tpcp1149.up
- **Ruch** (due north of the project area) at http://www.ocs.orst.edu/pub_ftp/climate_data/tpcp/tpcp7391.up
- **Applegate** (northwest of the project area) at http://www.ocs.orst.edu/pub_ftp/climate_data/tpcp/tpcp0217.up

A small portion of the project area occurs at elevations ranging from 3,500 feet to 3,880 feet, within the rain-on-snow zone, or transient snow zone. The snow pack level in this zone typically fluctuates throughout the winter in response to alternating warm and cold weather fronts. Heavy rain falling on an existing snowpack can result in flooding, although this effect is minimal in the project drainage areas due to the low percentage of land in the transient snow zone (2.6 percent of the Bobar project area and 3.2 percent of the associated 7th level drainage areas, based on Medford BLM GIS data).

Streamflow & Groundwater

Moderate to high streamflows usually occur between mid-November and mid-May on the Applegate and Little Applegate Rivers and their tributaries. The lowest streamflows generally occur from mid-July to mid-September. Streamflows in the Applegate River are partially regulated by Applegate Dam, as discussed in the *Applegate-Star/Boaz Watershed Analysis* (USDI 1998). The dam has moderated both high and low flows in the mainstem Applegate River, which now has fewer and smaller peak flows and fewer extreme low flow conditions. Water rights, mostly for irrigation uses, exceed the natural, unaltered flows that would occur at the mouth of the Little Applegate River in normal and drought years from July to October. Water withdrawals below Glade Creek have resulted in very low flows from the Yale Creek confluence to the mouth of the Little Applegate River and almost total dewatering below the Sterling Creek confluence. Low flows also occur in the lower several miles of Yale Creek that are exacerbated by irrigation water diversions (USDI and USDA 1995). Over-allocation and over-use of water through valid water rights and other water withdrawals likely place domestic wells and other groundwater resources at significant risk of going dry in late summer, especially in drought years.

Surface water in the proposed Bobar project area includes streams, springs, wetlands, reservoirs and ditches. Streams in the project area are classified as perennial, intermittent with seasonal flow, intermittent with ephemeral flow, and dry draws with ephemeral flow (Tables 3.2 and 3.3). Stream types on federal lands were identified through site visits. Private land stream types were estimated through a combination of existing information, aerial photo interpretation, and extrapolation from information on adjacent federal lands. Streams categorized as perennial or intermittent on federal lands are required to have Riparian Reserves as defined in the Medford District Resource Management Plan (RMP). Dry draws do not meet the Medford District RMP definition for streams needing Riparian Reserves, although dry draws with high slump potential would receive Riparian Reserve protection. Streams on private forest lands are managed according to the requirements of the Oregon Forest Practices Act.

Table 3.2. Stream Miles by Category and Ownership for HUC7 Drainage Areas within the Project Area Boundary

Drainage Area Number* (see Table 3.1)	Perennial Streams (miles)		Intermittent Streams with Seasonal Flow (miles)		Intermittent Streams with Ephemeral Flow (miles)		Dry Draws with Ephemeral Flow (miles)		Total Stream Miles	
	All Lands	BLM lands	All Lands	BLM lands	All Lands	BLM lands	All Lands	BLM lands	All Lands	BLM lands
AU 0218	3	1.7	3.5	3.2	0.8	0.6	10.2	10	17.5	15.5
AU 0360	4.0	0.6	6.6	5.8	4	3	18.2	17.4	32.8	26.8
AU 0363	0.9	0.3	1.7	0.8	0.4	0.1	2.4	2.2	5.4	3.4
LA 0427	1.1	0.4	1.1	0.1	1.6	0.2	8.3	4.7	12.1	5.4
LA 0430	2.1	0.9	2.4	1.9	4.1	2.9	13.4	10.7	22.0	16.4
LA 0503	2.1	0.1	0.1	0.1	0.6	0.3	2.6	1.5	5.4	2.0
LA 0506	4.3	3.9	2.1	2.1	1.6	1.6	18.6	18.5	26.6	26.1
LA 0509	0.8	0	1.5	1.2	0.3	0	3.7	3	6.3	4.2
LA 0542	2.2	0.8	6.3	2.9	5.2	3.2	12.9	10.6	26.6	17.5
LA 0545	1.7	0	3.7	1.3	6.7	2	7.7	4.7	19.8	8.0
TOTAL	**22.2**	**8.7**	**29.0**	**19.4**	**25.3**	**13.9**	**98.0**	**83.3**	**174.5**	**125.3**

* Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

Table 3.3. Stream Miles by Category by Entire HUC7 Drainage Area for BLM Managed Lands Only

Drainage Area Number* (see Table 3.1)	Perennial Streams (miles)	Intermittent Streams with Seasonal Flow (miles)	Intermittent Streams with Ephemeral Flow (miles)	Dry Draws with Ephemeral Flow (miles)	Total Stream Miles
AU 0218	1.8	4.6	0.6	14.9	22.0
AU 0360	0.6	6.0	3.4	20.1	30.0
AU 0363	1.3	2.1	2.3	7.7	13.4
LA 0427	3.1	3.2	3.8	9.7	19.8
LA 0430	0.9	1.9	3.2	12.4	18.4
LA 0503	0.9	0.8	0.8	8.7	11.3
LA 0506	3.9	2.1	1.6	18.5	26.1
LA 0509	0.0	1.2	0.0	3.0	4.2
LA 0542	0.8	2.9	3.2	10.6	17.5
LA 0545	0.0	1.3	2.0	4.7	8.0
TOTAL	**13.4**	**26.0**	**20.9**	**110.2**	**170.6**

* Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

Springs/seeps, wetlands, and reservoirs have been identified in the Bobar project area and are also required to receive Riparian Reserve protection (see Riparian Reserves section). There are 63 springs and seeps identified on BLM-administered land within the project area. Drainage areas AU 0360, AU 0218, and LA 506 have the highest numbers with 14, 13, and 11 springs and seeps respectively. Of the total number of springs and seeps, only three are located outside of existing Riparian Reserves of perennial and intermittent streams, and one has been developed with 90 percent of flow being diverted to a cattle watering trough. Four wetlands and three reservoirs have been identified on BLM-administered land within the project area, all of which are less than one acre in size and are located within Riparian Reserves of nearby streams. The four wetlands are located in the 7th level drainage areas LA 0430, LA 0542, LA 0545, and AU 0363. Two of the four wetlands range in size from 200 to 800 square feet, the other two lack descriptive data but have areas less than one acre. Two of the three reservoirs were used for historic mining purposes and are located in the 7th level drainage area LA 0545, one 9,600 square feet (~1/4 acre) and the other less than an acre in size. The third reservoir is located in the 7th level drainage area LA 0542 and is 1,000 square feet in size.

Upland Conditions Affecting Streamflow

Upland disturbances involving vegetation removal or soil compaction have the potential to affect the streamflow regime. Past road building, timber harvest, fire exclusion, and agricultural land clearing have the potential to alter hydrologic processes (infiltration, interception, and evapotranspiration) in the project area. Changes to hydrologic function can sometimes result in increased magnitude and frequency of peak flows, which in turn can cause accelerated streambank erosion, scouring and deposition of stream beds, and increased sediment transport.

Roads

Road effects are a major concern related to adverse hydrologic effects, especially because they do not mimic any process that would be expected to occur in the watershed under natural conditions. In order to meet Aquatic Conservation Strategy (ACS) objectives, it is important to incorporate efforts to improve degraded hydrologic conditions related to roads into proposed projects, rather than just maintaining the existing condition. Roads in the Bobar project area were identified using Medford BLM GIS coverages and aerial photos taken in July 2001. Roads identified using aerial photos were classified as major roads (roads with a moderate to high level of use) and minor roads (roads with little or no use). Minor roads that are no longer drivable may still alter watershed hydrologic processes by intercepting, concentrating, and rerouting storm runoff. Of the 111 miles of roads in GIS coverages within the project area and associated 7th field drainage areas (Table 3.4), 22.5 miles were identified as minor roads or jeep trails using aerial photos.

Professional judgment and field experience suggest that in the Applegate Subbasin, significant numbers of roads are present on the landscape but not readily detectable on commonly-used aerial photos. Using 1996 aerial photos, the Applegate River Watershed Council measured road densities exceeding 10 miles per square mile in a strip immediately adjacent to the Little Applegate River. Ground truthing suggested that the actual road density was likely underestimated in forested areas due to canopy cover (ARWC 2002). Because the percentage of undetected roads on private lands is higher (30% or greater) (David Squyres, personal communication) than on federal lands (5% to 10%) (John Samuelson, personal communciation), and due to the large percentage of federal lands within the project area (74%) and in the combined 7th level drainage areas (69%), a general increase of 15% was used in calculating road densities for this analysis.

Average road densities on federal and private lands (calculated using GIS data, aerial photo records, and increased by 15%) are high (4.9 mi/mi^2) within the project area and within the combined HUC 7 drainage areas (5.8 mi/mi^2) (Table 3.4). Using only GIS data (without a 15% increase), average road densities for each 7th level drainage area are higher on private lands than on federal lands, except for drainage areas AU 0363 and LA 0427 (Table 3.5).

Table 3.4. Bobar Project Area Road Densities

Drainage Area Number[1] (see Table 3.1)	Roads from GIS (miles)				Additional Roads (not in GIS) on BLM and non-BLM Lands from Aerial Photos (miles)				Road Density[2] (mi/mi^2)	
	Total Drainage Area		Bobar Project Area		Total Drainage Area		Bobar Project Area			
	BLM Land	Non-BLM Land	BLM Land	Non-BLM Land	Major Roads	Minor Roads	Major Roads	Minor Roads	Total Drainage Area	Bobar Project Area
AU 0218	8.0	18.2	7.1	1.6	5.1	4.6	1.1	0.2	6.6	4.9
AU 0360	4.9	6.6	4.9	3.4	2.0	3.0	0.3	1.1	4.1	3.1
AU 0363	6.2	6.2	0.0	2.6	0.3	7.8	0.2	0.9	6.5	7.1
LA 0427	9.1	9.4	3.6	2.1	1.1	11.5	0.4	8.4	9.7	12.4
LA 0430	3.2	2.7	3.1	2.0	0.9	1.0	0.5	0.3	3.5	3.0
LA 0503	2.9	6.6	0.4	0.9	2.4	1.2	0.7	0.2	5.3	2.9
LA 0506	9.0	0.9	9.0	0.9	0.1	0.0	0.1	0.0	3.9	3.9
LA 0509	0.3	1.7	0.3	1.7	0.3	0.5	0.3	0.5	3.8	3.8
LA 0542	1.6	6.3	1.6	6.3	0.7	5.1	0.7	5.1	5.2	5.2
LA 0545	0.6	6.3	0.6	6.3	1.3	5.6	1.3	5.6	7.1	7.1
TOTAL	**45.8**	**64.8**	**30.5**	**27.6**	**14.3**	**40.5**	**5.4**	**22.3**	**5.8**	**4.9**

[1] Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

[2] Road density estimates have been increased an additional 15 percent to account for roads not visible in aerial photos due to canopy cover.

Table 3.5. Road Densities by Land Ownership (from GIS coverages only)

Drainage Area Number* (see Table 3.1)	Bobar Project Area Road Densities (mi/mi^2)			Total HUC 7 Drainage Area Road Densities (mi/mi^2)		
	BLM Land	Forest Service Land	Private Land	BLM Land	Forest Service Land	Private Land
AU 0218	3.4	0.0	6.6	3.0	2.9	8.3
AU 0360	1.7	0.1	6.9	1.4	0.6	7.1
AU 0363	0.0	0.0	10.9	3.7	0.0	3.2
LA 0427	5.6	0.0	2.9	4.6	5.7	5.5
LA 0430	1.8	0.0	3.6	1.6	0.0	4.3
LA 0503	1.1	0.0	1.8	1.8	0.0	5.4
LA 0506	3.1	0.0	15.9	3.1	0.0	15.9
LA 0509	0.5	0.0	6.3	0.5	0.0	6.3
LA 0542	0.8	0.0	6.3	0.8	0.0	6.3
LA 0545	0.6	2.0	5.2	0.6	2.0	5.2
TOTAL	**2.1**	**0.4**	**5.3**	**2.3**	**2.7**	**5.6**

* Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

Road characteristics such as location, surfacing, level of use, and drainage design can influence watershed hydrologic processes. Roads in stable locations and/or located high on ridges are less likely to adversely impact streams than are roads that are located on unstable ground, or that cross or run parallel to streams. Frequently traveled, natural-surface roads without well-designed drainage have the greatest potential to channelize flow and transport large quantities of sediment away from the road, and therefore have the greatest chance of causing significant damage during a flood event. Within the 7th level drainage areas that are either partially or completely within the Bobar project area, 17.4 percent of the roads contained in Medford BLM GIS coverages are in an unimproved natural-surface category.

Rocking a road reduces road surface erosion, but does not substantially change the ability of the road to channelize flow or erode the toes of cutslopes unless the road is outsloped with no ditchlines. The negative hydrologic effects of roads can be greatly reduced (but not eliminated) by a combination of actions (and continued maintenance) such as frequent rocking of the road surface, installing waterbars or rolling water dips, and ensuring adequate ditch-relief culvert spacing. These kinds of improvements can dramatically reduce channelization of flow, delivery of sediment to streams, and failure of roads/stream crossings during major flood events.

Closing a road to vehicular use reduces the amount of sediment contributed to runoff, but does little to prevent channelization of flow or reduce potential road failure during flood events. The mechanisms by which roads intercept and reroute water are largely unaffected by road closure alone, as the road prism, road surface, and road drainage system remain intact. Often gated roads are more likely to experience drainage and erosion problems due to a lack of regular road maintenance. Also, road closures generally only prevent use by cars and trucks; smaller all-terrain vehicles can often still access and use closed roads.

Decommissioning a road by taking such actions as removing fills and culverts at stream crossings, outsloping the road, and waterbarring and replacing cross-drain culverts with water dips greatly reduces the ability of a road to channelize flow and deliver sediment to streams, and can greatly reduce negative impacts during flood events. The goal of road decommissioning is typically not full recovery of hillslope hydrologic processes, as decommissioning leaves the road prism intact and allows land managers the option to reopen the road in the future. Mechanical ripping and seeding of the road surface can also be used to decrease soil compaction and increase infiltration rates.

Obliterating a road by taking such actions as recontouring the road prism to match the original hillslope and restoring stream crossings by removing culverts and fill, reduces the risk of any negative effects to a low level; negative effects can be virtually eliminated as the vegetation recovers and reclaims the area. Often, the obliterated road area can be considered fully recovered and no longer having any effect on the hydrology within about 30 years as vegetation fully returns to the site; road-related sediment impacts would probably fall below a detectable level within 5 years or less following the work, and would immediately be much less than the pre-obliteration condition of the road.

Existing Watershed Risk from Roads and Past Timber Harvest

The Forest Service developed a process for assessing upland watershed condition and the relative risk of adverse cumulative effects from proposed management actions (USDA 1993). This process uses three indicators to assess the current watershed condition as it relates to hydrologic function: road density, watershed relief, and the percent of the drainage area that has forested stands less than 30 years old. Using existing conditions, a watershed risk rating was determined for each 7th level drainage area located either partially or entirely within the project area (Table 3.6). Road density was obtained using the process stated under *Roads*, above. Watershed relief was calculated for the major drainage within a 7th level drainage area using topographic maps. Watershed relief was averaged if multiple major drainages existed within a single 7th level drainage area. Stands less than 30 years old on BLM-administered land were identified from the BLM Forest Operations Inventory database and those on private land were identified from the 2001 aerial photos. Due to a combination of high road densities and high percentages of land with stands less than 30 years old, the watershed risk rating is high under existing conditions for all 7th level drainage areas except LA 0430, which has a moderate watershed risk rating (Table 3.6).

Table 3.6. Watershed Risk Rating

Drainage Area Number[1] (see Table 3.1)	Road Densities for HUC 7 Drainage Areas[2] (mi/mi^2)	Percent of HUC 7 Drainage Areas with Stands < 30 years old			% Watershed Relief	Watershed Risk Rating
		BLM Lands	Non-BLM Lands	All Lands		
AU 0218	6.6	4	17	11	21	High
AU 0360	4.1	4	14	6	25	High
AU 0363	6.5	18	24	21	20	High
LA 0427	9.7	10	41	25	16	High
LA 0430	3.5	0	20	5	16	Moderate
LA 0503	5.3	0	30	13	28	High
LA 0506	3.9	8	0	7	17	High
LA 0509	3.8	0	18	6	36	High
LA 0542	5.2	0	46	15	22	High
LA 0545	7.1	0	45	25	28	High

[1] Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

Existing Watershed Conditions from Past Fire Exclusion Policies

Changes in vegetation structure and density due to the combined effects of fire exclusion policies, logging, and residential and agricultural clearing contribute to ongoing watershed impacts in the project area. Many

years of fire exclusion in the area have increased levels of canopy closure, thus increasing evapotranspiration and reducing summer stream flows. Although increases in canopy closure may be offset by harvesting practices and agricultural and residential clearing of the past century, canopy closures are likely much higher today than in the early 1900s when the area experienced the combined effects of vegetation management utilizing fire by Native Americans, landscape burning and hydraulic mining impacts resulting from the quest for precious metals, and initial clearing of areas for agricultural development. Within the project area, ongoing changes in hydrology due to unnaturally high densities of small diameter trees and brushy vegetation would likely continue to occur unless significant changes in vegetation management are implemented across the landscape by agencies and private landowners.

Transient Snow Zone

Any large areas of vegetation removal in the transient snow zone are of particular concern due to possible alterations of the streamflow regime and resultant increased peak flow magnitudes. The *Oregon Watershed Assessment Manual* (Watershed Professionals Network 1999) provides a method for assessing the potential risk for peak flow enhancement from runoff originating in the transient snow zone. Drainage areas with less than 25% of the area in the transient snow zone are not considered to be at risk of increased peak flow magnitudes. Within the Bobar project area, the drainage area with the largest percentage in the transient snow zone (10.7%) is LA 506 (Grouse Creek). This is well below the percentage required for an area to be assessed for potential risk of increased peak flow magnitudes. For this reason, no additional transient snow zone analysis is included in this report.

Stream Morphology / Stream Channels

Perennial streams and rivers within the Bobar project area include portions of the Applegate and Little Applegate Rivers, portions of Yale Creek, Victor Gulch, and Felix Gulch, and the entirety of Grouse Creek, First Water Gulch, and Boaz Gulch. Although Waters Gulch does not flow through the project area, it has two perennial tributaries (Felix Gulch and Victor Gulch) that originate in the project area, and 36% of its drainage area (LA 0427) is within the project area. A majority of the Applegate and Little Applegate Rivers associated with the project area flow through private land, with small segments flowing through or near BLM-managed land. The remaining perennial streams typically have headwaters on BLM-administered land and reaches closer to the confluence with the Applegate and Little Applegate Rivers on private land. Victor Gulch is the exception, with the perennial portion of the stream almost entirely on private land within the project area.

The Applegate and Little Applegate Rivers are large, low gradient rivers that flow through terraces, flats, and floodplains across wide valley bottoms comprised of mostly agricultural and pasture lands. The Applegate River flows adjacent to the west side of the Bobar project area through valley floor that ranges from 600 to 2,000 feet across. The narrowest point is at the Star Gulch confluence where constricting ridges confine the valley bottom. The river is entrenched and disassociated from the adjacent floodplain due to regulated flow from the Applegate dam and to confinement on both sides by roads. The Little Applegate River is constrained by a road on the northwest bank throughout the project area. Hydraulic mining has occurred historically on Sterling Creek (a tributary to the Little Applegate River) and in the six miles of the Little Applegate River below Yale Creek, resulting in extensive alteration of channel structure. Conversion of oak and pine sites to agricultural use and associated channelization and wood removal has also altered channel morphology on both the Applegate and Little Applegate Rivers.

Tributaries of the Applegate and Little Applegate Rivers are predominately characterized by steep slopes,

incised channels, and short stream lengths. Rosgen's stream classification system (1994) is used to categorize channel morphology characteristics. Stream categories are based on stream gradients, sinuosities, valley form, entrenchment, and confinement (Rosgen 1994). Most of the streams in the project area are Rosgen A and B type streams (USDI and USDA 1995; USDI 1998). Most streams on federal lands are located in the mid to upper reaches of watersheds and are classified as type A streams. Type A streams are high gradient, entrenched, step/pool streams and highly stable. Type B streams are moderately entrenched and riffle dominated with infrequently spaced pools. They have stable stream banks and landforms that are narrow, gently sloping valleys.

The perennial portions of Grouse Creek and its tributaries have mean bankfull (1-2 year return interval flow event) widths that range from 1.8 to 8.7 feet and mean bankfull depths of 0.2 to 0.7 feet. Floodprone area widths (the width in common return interval floods, i.e. 20-30 year events) range from 3.0 to 13.3 feet. Intermittent streams in the Grouse Creek drainage area have mean bankfull widths that range from 1.1 to 3.8 feet, mean bankfull depths from 0.1 to 0.3 feet, and floodprone area widths from 2.0 to 6.3 feet. Channel gradients range from 2 to 7 percent in the main stem of Grouse Creek and from 7 to 18 percent in perennial tributaries to Grouse Creek. Intermittent streams in the Grouse Creek drainage area have channel gradients that range from 7 to 42 percent. The entire length of Grouse creek is constrained by V- and U-shaped hillslopes in the mid to upper reaches, and by terraces in the lower portion. Stream banks are mostly stable with little bank erosion, medium to low slump potential, and no active slumps. Channelization and road encroachment are present in the lower reaches of the mainstem of Grouse Creek.

On BLM-administered lands within the project area, the mainstem of First Water Gulch and other perennial streams located in the LA 0430 drainage area have mean bankfull widths of 2.0 to 3.7 feet and mean bankfull depths of 0.2 to 0.3 feet. Floodprone area widths are 2.7 to 5.0 feet. Intermittent streams within drainage area LA 0430 have bankfull widths that range from 0.9 to 3.5 feet, bankfull depths of 0.1 to 0.3 feet, and floodprone area widths of 2.1 to 7.1 feet. Channel gradients range from 7 to 23 percent on perennial streams and from 7 to 36 percent on intermittent streams. Streams within the drainage areas LA 0430 (First Water Gulch) and LA 0427 (Waters Gulch, Sulfur Gulch, Felix Gulch, and Victor Gulch) are located in the Low Elevation Granitics geomorphic unit and have high levels of streambank erosion and high slump potential (see Soils, Chapter 3). Portions of Victor Gulch and Felix Gulch are located within the project area and flow into Waters Gulch. Waters Gulch and Sulfur Gulch are not located within the project area, but there may be a downstream impact on the lower portion of Yale Creek and the Little Applegate River, into which they flow.

The perennial portion of Boaz Gulch has bankfull widths that range from 2.7 to 5.6 feet and bankfull depths of 0.3 to 0.4 feet. Floodprone area widths range from 5.1 to 6.9 feet and channel gradients range from 3 to 23 percent. The entire stream is constrained by V- and U-shaped valleys in the mid and upper reaches, and by terraces in the lower reach. The middle reach of Boaz Gulch is paralleled and crossed multiple times by an abandoned road. Streamflow has been diverted down the roadside ditch at multiple locations, resulting in downcutting of the road ditch and roadbed as well as dewatering of the natural streambed.

The relatively steep locations of many of the headwater streams in the project area increase the likelihood that flood events and debris torrents would 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 much of the transported 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 key pieces of wood, probably due to a combination of historic removal of large wood from streams, harvest of adjacent large trees that were likely to eventually fall into streams, and suppressed growth of future large trees due to high stand density.

Water quality

Beneficial water uses in the project area, as designated by the Department of Environmental Quality (DEQ), include domestic water supply, irrigation, livestock watering, cold water fish, other aquatic life, wildlife, recreation, and aesthetics (ODEQ 1992). State standards are designed to protect the most sensitive beneficial use within a waterbody. The key water quality criteria established to protect the most sensitive of these designated beneficial uses are: flow modifications, temperature, dissolved oxygen, pH, bacteria/pathogens, turbidity, sedimentation, and habitat modifications.

The Applegate and Little Applegate Rivers, and Yale Creek are on the DEQ 1998 list of water quality limited streams, also known as the 303(d) list from Section 303(d) of the 1972 Federal Clean Water Act. Within the Bobar project area, the Applegate River is listed from the mouth to Applegate Reservoir for summer stream temperature and flow modification. The Little Applegate River is listed from the mouth to headwaters, and Yale Creek is listed from the mouth to Waters Gulch, for summer stream temperature. All 303(d) listings within the project area are due to nonpoint source pollution. Sources of water quality concerns in the project area and recommendations for correcting them are addressed in the *Little Applegate Watershed Analysis* (USDI and USDA 1995) and the *Applegate-Star/Boaz Watershed Analysis* (USDI 1998).

Although streams in the project area are not listed by the DEQ for turbidity and sediment loading, there is evidence from recent stream surveys of high levels of erosion and sediment deposition in selected stream reaches. Road erosion and road failures at stream crossings and ditch relief culverts are the most notable sources of observed sediment inputs. In particular, Boaz Gulch and Grouse Creek are two perennial streams that have significant lengths of road within their Riparian Reserves and that are especially impacted by road and culvert erosion and failure. A road along Boaz Gulch has experienced severe erosion due to plugged stream crossing culverts and inadequate road drainage. Streamflow has been diverted from the natural channel to the road and ditch, resulting in four-foot deep ruts and erosion to bedrock for portions of the road. Sediment inputs to Grouse Creek are mainly due to road surface erosion and erosion below drainage culverts.

Riparian areas

The riparian areas of streams, draws, springs and other hydrologic features within the project area were surveyed from 1998 to 2000. The widest riparian areas on BLM-administered lands occur along the perennial streams, with riparian widths ranging from 5 to 200' (width from one side of the riparian area to the other, including the stream), with an average width of 37 feet. Long-duration intermittent streams (seasonal streams) on BLM-administered lands have riparian area widths ranging from 0 to 80 feet, with an average width of 16 feet. Short-duration intermittent streams (ephemeral streams) on BLM-administered lands have riparian area widths ranging from 0 to 60 feet, with an average width of 6 feet. Dry draws on BLM-administered lands have no riparian vegetation except where springs are present;

otherwise, streamside vegetation is essentially indistinguishable from the surrounding uplands.

Riparian conditions have probably been affected by fire exclusion policies and past timber management activities that did not mimic natural processes. Given the natural fire frequency in this area, many low-severity fire events have been suppressed over the past century, leading to riparian vegetation densities greater than would be expected under the natural fire regime for this area (see *Fire and Fuels* discussion in Chapter 3).

Hardwoods present in most riparian areas include species with roots that often survive wildfire. Crowns and trunks can be destroyed by fire, but these hardwoods quickly resprout from the roots, helping maintain long-term slope stability. Conifers with branches and trunks killed by fire do not resprout; as the roots rot away, slopes can sometimes become unstable until the next generation of trees develop large roots. Conifer roots often are very shallow, whereas hardwood roots tend to be somewhat deeper, an added stabilizing factor in fire-prone landscapes. Riparian areas, and contributing uplands where hardwood stands are gradually being replaced by conifer species due to fire exclusion, are at greater risk of soil instability and associated downstream sediment impacts following high-intensity wildfire than under the natural, less intense fire regime. Once trees fall into stream channels, wood from conifers takes much longer to rot away than wood from hardwoods. In a fire-adapted landscape, since hardwoods are important for slope and soil stability and large conifer wood provides long-term instream structure and associated sediment storage, long-term proper functioning of riparian areas is critically dependent on the presence and stand structure of both hardwoods and conifers.

FISHERIES

Riparian Reserves

Northwest Forest Plan Riparian Reserves are located on federal lands throughout the project area. Streams, springs, wetlands, and areas of unstable/potentially unstable ground have been identified in the proposed project area and are required to receive Riparian Reserve protection. The locations of Riparian Reserves were determined from on-the-ground surveys of every stream and draw on Federal lands within the project area. Riparian Reserve widths were determined site-specifically using the guidelines on page C-30 and 31 of the Northwest Forest Plan Standards and Guidelines. Fish streams within the project area have Riparian Reserves ranging from 320-360 feet on each side of the stream. Other perennial streams have Riparian Reserves between 160 and 180 feet on each side. Riparian Reserves on each side of intermittent streams range between 100 and 180 feet. On unstable and potentially unstable ground, Riparian Reserves cover the extent of the unstable ground. For springs, seeps and other non-stream channel wetlands less than one acre in size, the Northwest Forest Plan required Riparian Reserves to only extend to the edge of the wetland and associated vegetation. For the Bobar project, any springs, seeps, and any other wetland areas less than one acre in size have been assigned a designated Riparian Reserve of 100 feet slope distance from the edge of the wetland and associated vegetation. Stream types within the Bobar project area were inventoried in the1998 Riparian surveys (Table 3-7).

Table 3-7. Miles of different stream types within the Bobar Project Area.

Area	Fish-bearing	Non-fish bearing			TOTAL
		Perennial	Intermittent	Dry draw	
Bobar project area (BLM only)	1.2	7.5	33.3	83.3	125.3
Bobar project area (BLM, USFS, and private)	10.5	11.9	54.5	98.0	174.9

The widest riparian areas are along the perennial streams, with total widths ranging from 5-45 feet (width from one side of the riparian area to the other, including the stream) with a majority in the 10-30 range. Long duration intermittent streams (seasonal streams) have riparian area widths ranging from 0-50 feet, and the majority in the 0-20 foot wide range. Short duration intermittent streams (ephemeral streams) have riparian area widths ranging from 0-60 feet, with the majority 10 feet and under. Dry draws have no riparian vegetation except where springs are present; otherwise, vegetation is essentially indistinguishable from the surrounding uplands.

Over 29 miles of riparian areas on BLM-managed lands within the project area were assessed on-site for Proper Functioning Condition (PFC), which is a qualitative method for assessing the condition of riparian-wetland areas (USDI and USDA 1998). The PFC assessment considers hydrology, vegetation, and erosion/deposition attributes and processes to assess the riparian condition. The assessment places riparian areas into one of four categories: proper functioning, functional-at risk, nonfunctional, and unknown. The functional-at risk category is further defined by a trend: upward, downward, or not apparent.

The majority of riparian areas surveyed on BLM-managed lands within the project area are rated as being in proper functioning condition or functional-at risk with an upward trend. Drainage areas with high numbers of functioning condition problems included Boaz Gulch, Texter Gulch, Waters Gulch, and 1st Waters Gulch (Table 3-8). Primary conditions leading to the negative ratings included: lack of instream large wood, lack of large wood recruitment trees near streams, old roads in the riparian area, hydraulic mining impacts, and severe downcutting/channel incisement, probably related to the lack of large wood.

Table 3-8. Stream functioning condition on federal land within Bobar Project Area.

Stream name	Miles of stream in each condition category			% of surveyed streams in "Functional-at-risk" and "Non-functional" categories combined in each drainage
	Proper Functioning Condition	Functional-at-risk[1]	Non-functional	
Boaz Gulch	1.14	0.33	0.43	40%
Felix Gulch	3.08	1.89	0.0	38
Waters Gulch	0.76	1.14	0.0	60
1st Waters Gulch	0.57	1.52	0.0	73
Total miles	5.55	4.88	0.43	10.86

1/ Includes both "functional-at-risk with an upward trend" and "functional-at-risk with a downward trend."

Riparian Reserves throughout this area are dominated by a big leaf maple, Douglas fir, mock orange, and ocean spray understory with a Douglas fir and alder overstory. Riparian ground cover is comprised of grasses, mosses, snowberry, poison oak, and blackberry.

Within the project area, Boaz Gulch and other tributaries to the Applegate River flow in a westerly direction, their slopes are either north or south-facing. As a result, the riparian areas are not symmetrical, extending upslope farther on the north-facing side than on the south-facing side. Riparian-dependent plants and trees are present in these drainages, but in a narrower band than is found in wetter, cooler streams (Applegate-Star/Boaz Watershed Analysis 1998).

Roads in Riparian Reserves

Roads and road stream crossings located within Riparian Reserves can impact water quality, channel morphology, and riparian function. Roads and road stream crossings remove riparian vegetation important for aquatic needs and replace it with a compacted area that generates surface flow and has a high potential to contribute sediment to streams. Roads with unimproved natural-surfaces have an even greater potential to contribute sediment to streams than roads with rocked surfaces. Roads within Riparian Reserves may also isolate streams from the adjacent floodplain and channelize flow. Road stream crossings also confine and channelize flow and are at risk of failure during high flow events. The existing length of road and numbers of road stream crossings located within Riparian Reserves are shown in Tables 3.9 and 3.10. Road data was obtained from Medford BLM GIS coverages and is reported only within the project area boundaries.

Table 3-9. Roads within Riparian Reserves

Drainage Area Number	All Roads Located in Riparian Reserves (miles)		Roads in Riparian Reserves with Natural Unimproved Surface (miles)	
	All Lands	BLM Lands	All Lands	BLM Lands
AU 0218	3.0	2.1	0.9	0.9
AU 0360	4.6	1.7	0.2	0.2
AU 0363	1.8	0.0	0.0	0.0
LA 0427	1.6	0.9	0.2	0.1
LA 0430	1.8	0.5	0.5	0.5
LA 0503	0.8	0.0	0.0	0.0
LA 0506	3.3	2.6	0.1	0.1
LA 0509	1.1	0.0	0.0	0.0
LA 0542	5.1	0.2	0.0	0.0
LA 0545	4.1	0.3	0.0	0.0
TOTAL	**27.3**	**8.3**	**1.9**	**1.8**

Table 3-10. Number and density of road stream crossings by stream type and drainage area, on BLM and all lands, within the Bobar project area.

Drainage Area Number	Number of crossings								Number of crossings per square mile			
	Road Crossings on Perennial Streams		Road Crossings on Intermittent Streams with Seasonal Flow		Road Crossings on Intermittent Streams with Ephemeral Flow		Road Crossings on Dry Draws with Ephemeral Flow		Road Stream Crossing Density (perennial and intermittent streams only)		Road Stream Crossing Density (including dry draws)	
	All lands	BLM lands	All lands	BLM lands	All lands	BLM lands	All lands	BLM lands	All lands	BLM lands	All lands	BLM lands
AU 0218	4	3	7	7	2	1	24	21	5.5	5.2	15.7	15.2
AU 0360	7	1	6	4	13	10	14	14	7.2	5.1	11.2	9.9
AU 0363	1	0	7	0	3	0	1	0	18.6	0.0	20.2	0.0
LA 0427	3	3	3	1	2	0	23	16	6.0	6.3	23.2	31.4
LA 0430	3	0	2	0	7	0	15	10	5.3	0.0	11.9	5.9
LA 0503	1	0	0	0	0	0	2	0	1.2	0.0	3.7	0.0
LA 0506	8	7	3	3	1	1	25	24	4.1	3.8	12.6	12.2
LA 0509	2	0	0	0	2	0	3	0	4.7	0.0	8.2	0.0
LA 0542	2	0	12	0	11	1	15	8	8.3	0.5	13.3	4.5
LA 0545	1	0	10	0	18	2	6	0	12.9	2.0	15.6	2.0

Fisheries

Streams in the Bobar project area flow into either the Applegate or Little Applegate Rivers. Several at-risk anadromous fish species occur in the Applegate and Little Applegate Rivers. 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, NOAA Fisheries (formerly the National Marine Fisheries Service) ruled that the listing was not warranted. The status of coastal cutthroat trout (*O. clarkii*) is under review by the U.S. Fish and Wildlife Service.

Coho numbers in the Little Applegate watershed are very low. An estimated 25 adults return to spawn in the lower 1.4 miles of the Little Applegate (Bessey 1995) and recent smolt trap monitoring shows corresponding low fry production (ODFW et al. unpublished data).

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 population numbers and distribution of sculpin, suckers, and lamprey in this drainage is incomplete.

On the Little Applegate River, a falls located at river mile 1.4 is a potential barrier to the migration of coho and chinook salmon. Steelhead negotiate this barrier in high flows, to spawn in the upper sections of the Little Applegate and Yale Creek (ARWC/BLM, unpublished data). It is unlikely that coho negotiate these falls, and none have been observed above the falls since one unconfirmed observation in 1951 (personal communication, Chuck Fustish, ODFW Fish Biologist).

On the mainstem Applegate River, there are no fish barriers until the Applegate Dam. Within the Bobar project area, the tributaries to the Applegate River are fishless.

Grouse Creek and Waters Gulch are the only two streams within the project area that support salmonid populations (Table 3-11). Steelhead and rainbow trout have been confirmed in the lower 1 mile of Grouse Creek and cutthrout trout have been confirmed in Waters Gulch to the south edge of section 5, approximately 1.5 miles.

Table 3-11. Tributaries to Little Applegate River and Applegate River within Bobar project area with confirmed fish presence.

Stream name	Survey date	Species	Fish use ends (rivermile)	Barrier observed
Grouse Creek	1985	Steelhead	0.5	Culvert
	2000	no fish	-	-
Waters Gulch	2000	Cutthroat	1.5	No
Eagle Canyon	2000	mosquito fish	Near mouth	Culvert

Fish Habitat

Human impacts on Riparian Reserves can be seen throughout the Applegate and Little Applegate drainages. Mining, irrigation withdrawals, diversion dams, floodplain development, timber harvest, road building, removing large wood from riparian areas, and grazing have greatly affected riparian areas and fish habitat within the project area. Virtually all of the land along the lower Little Applegate River has been logged, mined, burned or cleared for homesites and pastureland over the last 140 years. The channel is isolated from its floodplain in most locations and has a low degree of channel sinuosity and low habitat diversity (LAWA, USDA & USDI, 1995). Within the project area, the Applegate River is deeply incised and confined by roads that parallel the river on either side (Applegate-Star/Boaz Watershed Analysis, USDI 1998).

Mining has occurred throughout the Applegate and Little Applegate River basins and portions of the Little Applegate River are bordered by mining tailings. Historic mining has disturbed many of the riparian areas by confining channels, encouraging channel downcutting, destroying riparian areas, and removing trees, which increased sedimentation and contributed to habitat degradation.

Agriculture and associated irrigation needs reduce the amount of water in the Little Applegate and Applegate Rivers and their tributaries during the summer. Diversion ditches are located within the project area however, much of the water withdrawal occurs in the downstream stretches of tributaries originating in the project area. Water withdrawals are a serious issue in watersheds with limited summer flows and high summer temperatures. The Applegate River is listed by the Department of Environmental Quality (DEQ) (1994) as water quality limited for flow modification. Low water creates higher summer water temperatures, which cause physiological stress for cold-water adapted species. Unscreened ditches irrigation ditches are hazardous for fish and associated diversion dams limit migration.

Diversion dams on the Little Applegate River are barriers to fish migration. Besides creating barriers to migration, ditches associated with diversion dams remove large volumes of water from the stream.

Floodplain development limits the rivers ability to access its floodplain. This loss of connectivity may increase water conveyance, increasing velocity and erosion (ARWC 2002). Reduced water storage function can lower local groundwater tables and consequently decrease summer base flows. Reduced access to the floodplain will increase channelization and consequently decreases the structural diversity of streams.

Past timber harvest activities have impacted streams by reducing shade, removing large wood, and increasing sediment delivery. Clearcuts down into riparian areas have removed the large wood component along the stream and its tributaries in several areas throughout the drainage. Less than one percent of riparian acreage along the mainstem Little Applegate and Grouse Creek is dominated by late successional vegetation and contributes very little large wood to fish habitat (Little Applegate Watershed Analysis 1995).

Road density in the project area is high with an average of 5.6 mi/mi2 within the Bobar project area, 27.3 miles within the Riparian Reserves and 141 stream crossings on perennial and intermittent streams within the project area. Roads and associated culverts can cause erosion and sedimentation if not properly maintained or installed. The Boaz Gulch road is located in the valley bottom and greatly influences Boaz Gulch for approximately one mile, crossing the channel twice. Improperly installed culverts are also

migration barriers for fish and other aquatic organisms.

Large wood has been identified as a limiting factor in both systems.[1] The effects of large wood on stream form and function are positive, creating pools, trapping sediment, providing cover for fish and other aquatic species, and stabilizing banks during high flow events. Beaver have historically contributed wood in the form of beaver dams, to these systems. In addition, removing wood from riparian areas for commercial use, firewood, or to clean the stream of obstructions also occurred in the past.

Boaz Gulch is part of a grazing allotment that has not been permitted since 1999. There is some suspected llama trespass; however, the BLM has not recently documented any serious grazing impacts in the project area. Riparian surveys conducted in the Bobar project area (1998) did not identify significant impacts to streams or associated riparian areas from cattle grazing. Changes to the current grazing regime are not considered under the Bobar Project.

As a result of previous impacts, limiting factors in the Little Applegate River include sedimentation, lack of large wood, diversion dams and associated water withdrawals, and high summer temperatures. In the Applegate River, the limiting factors for long-term sustainability of native fish and other aquatic species are high summer water temperatures, lack of side channels and edgewater rearing habitat (especially for coho salmon), lack of winter habitat, and flood refugia.

The mainstem Applegate River and Little Applegate River are identified by the Department of Environmental Quality (DEQ) (1994) as water quality limited for temperature. The Little Applegate River is water quality limited due to temperature. Low water creates higher summer water temperatures, which cause physiological stress for cold-water adapted species.

Coho Critical Habitat and Essential Fish Habitat

On May 5, 1999, NMFS designated Critical Habitat for SONC coho [FR64(86):24049]. All of the streams in the project area are tributaries to Critical Habitat streams. Within the project area, occupied Critical Habitat is limited to the Applegate River and lower Little Applegate, below the falls at river mile 1.4. In addition, tributaries to the Applegate and Little Applegate Rivers within the project area are not considered occupied coho Critical Habitat due to low flows, inaccessibility, and unsuitable habitat.

Essential Fish Habitat (EFH) was designated for commercial and recreational salmonids under the Magnuson-Stevenson Act (1996); within the Bobar Project area, these salmonids are coho, steelhead, and chinook salmon. EFH includes "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH does not incorporate riparian or upland areas (FR 62(244): 66531-66559). In the Bobar project area, EFH includes the mainstem Little Applegate and Applegate Rivers as well as Grouse Creek; all of the other streams are tributaries to these streams.

Wildlife

SPECIAL STATUS SPECIES

Special Status Species (SSS) include those species that are listed as threatened or endangered, are proposed for listing as threatened or endangered, or are a candidate for listing as threatened or endangered by the U.S. Fish and Wildlife Service, under the auspices of the Endangered Species Act (ESA) of 1973, as amended. Also included are those species listed by the BLM as Sensitive and Assessment species.

For this project, those species identified in the *Record of Decision and Standards and Guidelines for amendments to the Survey and Manage, protection Buffer, and other Mitigation Measures Standards and Guidelines (Jan 2001 S&M ROD)* will also be addressed as SSS.

Special Status Species known to occur in the proposed project area are as follows:

Northern Spotted Owl *(Strix occidentalis caurina)*
The northern spotted owl is listed as a Threatened species under the auspices of the ESA.
This species uses the habitat in the proposed project. Within the proposed project area, 2,899 acres is classified as suitable for this species, which means that it is judged to be, at a minimum, suitable for spotted owl roosting and foraging. Of these suitable acres 1,195 are also suitable for spotted owl nesting. There are 2 known spotted owl sites within the boundaries of the project area. There are no other known sites within 1.3 miles of the project area. Portions of the project area which contain suitable habitat for this species have never been surveyed to protocol standards. Surveys for this species are not required. Additional, undetected, sites may exist in the project area. In addition to the suitable habitat acres mentioned above, there are 2,091 acres of habitat that is not considered suitable for nesting, roosting or foraging, but is considered to be suitable for spotted owls to disperse through as they travel across the landscape.

Great Gray Owl *(Strix nebulosa)*
The great gray owl is a Bureau-Sensitive species that also receives protection as a Survey and Manage species under the S&M ROD of 2001. Great gray owls in this part of their range nest in mature/late seral mixed conifer and white fir forests, and forage primarily in the meadows/grassland or early seral stand conditions of conifer forests. Two seasons of formal protocol surveys for this species have been conducted in the proposed project area. These formal surveys resulted in no great grey owl nest sites being located. A radio tagged female owl from the Hukill Hollow area (immediately adjacent to the NE corner of the Bobar project area) spends a considerable portion of the winter in the central-western portion of the Bobar project area on private lands south of Little Applegate county road .

The closest known nest site for this species is less than 1/4 mile from the proposed project area. The Great Gray Owl sites in Spencer Gulch and Hukill Hollow are near a road that accesses the northern portion of the proposed project area (north of the Little Applegate River). Use of this road, which is the main BLM access to a large piece of land, is likely to be seasonally restricted during the Great Gray Owl breeding season.

Northern *Goshawk* (*Accipiter gentilis*)
This Bureau sensitive species is known to occur in the Little Applegate and Applegate-

McKee/beaver/palmer watersheds. The goshawk is a late successional habitat associated species in this part of it's range. Nests are usually in the lower portion of the canopy in late successional stands. This species forages in a wide variety of habitats including open forest stands and openings. There are no known nest sites in or adjacent to the proposed project area. Pre-disturbance surveys are not required and none have been performed.

Golden Eagle (*Aquila chrysaetos*)
While the golden eagle is not listed under the ESA and is not a Bureau Sensitive species, it is protected under the auspices of the Bald and Golden Eagle Protection Act of 1940**.** There are no known nests in the proposed project area. This species uses late-successional forest habitat for nesting in this part of its range. Golden eagles build large nests in dominant overstory trees. Nest trees often have significant defects, such as a blown out top or unusually large branches, and are often among of the largest diameter trees in mature and old growth stands. Golden eagle nests in SW Oregon are usually on or near the tops of major ridges. There have been numerous incidental golden eagle sightings in the lower Little Applegate valley and the Boaz Gulch area over the last 10 years. It is possible that there is an undiscovered nest in or near the proposed project area. No surveys have been conducted for this species; none are required.

Fisher *(Martes pennanti*)
The fisher is a Bureau assessment species. This species may occur in the proposed project area. Preferred habitat is dense conifer forests in the mixed conifer and white fir zones. There are no specific protection measures prescribed for this species. There is a population of fishers documented in the Williams area approximately 10 miles to the west of the proposed project area, and the USFS has documented this species in the Ashland watershed approximately 15miles south east of the proposed project area. No surveys for this species have been conducted in the proposed project area, none are required.

Oregon Red Tree Vole (*Arborimus longicaudus*) The proposed project area is within the known and suspected range of the Red Tree Vole which is a Survey and Manage species. Formal, pre-disturbance surveys of all suitable habitat for this species were conducted according to applicable protocol in 1999. These surveys resulted in no detections of red tree voles or their nests.

Siskiyou Mountains Salamander (*Plethodon stormii*)

This species occurs in surface rock habitat scattered throughout the proposed project area.
This is a Survey and Manage category D species in this part of its range according to the results from the 2001 Annual Species Review of the status of this species. The BLM is required to manage (protect) high priority sites for this species. However, the interagency process for identifying which known sites are high priority for management (protection) has not been established to date. In the absence of that guidance the BLM is required to manage (protect) all known sites. Over 1000 acres within the proposed project area have been confirmed as occupied habitat and as such have been dropped from consideration for timber harvest or fuels reduction treatments at this time.

The 2001 Annual Species Review of the status of this species resulted in a change in its status with regard to the need to perform pre-disturbance surveys in this part of the species range. Surveys are no longer required in the proposed project area. Consequently approximately 250 acres of potential habitat were not surveyed. Some of these acres are included in the non-commercial treatment acres in the proposed action

alternatives.

Terrestrial mollusks
Surveys for terrestrial mollusks were completed in Fall 2000 in the proposed project area. No special status mollusks were found.

The following is a list of special status species that are **not** likely to occur in the proposed project area.

Western Pond Turtle (*Clemmys marmorata*)
White-headed Woodpecker (*Dendrocopos albolarvatus*).
Black-backed *Woodpecker* (*Picoides arcticus*)
Northern Three-toed Woodpecker (*Picoides tridactylus*)
Bald Eagle (*Haliaeetus leucocephalus*)
Peregrine Falcon (*Falco peregrinus*)
Lewis' Woodpecker (*Asyndesmus lewis*)

Roads:
Presently the proposed project area is characterized by relatively high open road density in the southern portion of the project area in the Boaz Mountain, Ned's Gulch, and Cinnabar Mountain areas, and a large area with essentially no roads in the north western portion of the project area. There is another area of low road density on the north side of the Little Applegate River. This northern area has several roads that either go onto or up to BLM lands from private lands along the Little Applegate county road. There is no public road access to this northern portion of the project area.

Deer winter range:
The portions of the project area with a low density of roads are currently good deer winter range because of their relative inaccessibility to the general public. However, the forage conditions have deteriorated over time due to the lack of fire or other disturbance. Brush species which provide forage are becoming decadent and less productive. Oak woodlands, patches of oaks and individual large oak trees all of which provide acorns are becoming less productive and in some cases, oaks are being out-competed by brush and invading conifers.

Botany

Vascular Plant Species

All of the proposed activity areas were surveyed for Bureau Special Status and Survey and Manage vascular plants as well as the federally listed Fritillaria gentneri. Surveys were conducted by qualified botany contractors over a time period extending from 1995 through 1999. Surveys documented 100 occurrences for 13 species.

Species	Status	Occurrences
Camissonia gracilliflora	BAO	1
Cirsium ciliolatum	BTO	8
Cypripedium fasciculatum	BSO & S&M (C)	10
Cypripedium montanum	BTO & S&M (C)	3
Fritillaria gentneri	FE	4
Isopyrum stipitatum	BAO	17
Lewisia cotyledon var howellii	BTO	24
Mimulus kelloggii	BTO	1
Sedum laxum ssp. heckneri	BAO	1
Sedum oblanceolatum	BSO	13
Sedum spathulifolium ssp. purdyi	BTO	16
Silene lemmonii	BTO	1
Smilax californica	BTO	1

Fritillaria gentneri: This species occurs in southwestern Oregon in white oak woodland, mixed evergreen forest, and mixed white oak / rosaceous chaparral. The four known occurrences within the following sections; T39S, R2W, SEC 7 (1 site) and T39S, R3W, SEC 2 (3 sites) will be buffered with a 150 ft radius buffer.

Camissonia gracilliflora: This species grows on shrubby hillsides and open oak woodlands in clay soils at elevations of less than 2500ft. The one known occurrence in T39S, R3W, SEC 2 will be buffered with a 150 ft radius buffer.

Cypripedium fasciculatum: This species occurs in a variety of habitats all of which seem to have a filtered light condition in common and most frequently occurs on steep slopes at mid elevations. It is most often associated with Douglas fir and is usually tucked under some type of hardwood tree or senescent shrub such as manzanita, in areas with relatively little competition from other understory plants. There are

10 known occurrences for this species within the following sections; T39S, R2W, SEC 30 (6 sites), T39S, R3W, SEC 25 (2 sites), T39S, R3W, SEC 33 (1 site), and T39S, R3W, SEC 34 (1 site). All of these sites will be buffered with a 150 ft. radius buffer.

Cypripedium montanum: This species occurs in moist woods below 5000 ft elevation in mixed evergreen and yellow pine forests. The 3 known occurrences within the following sections; T39S, R2W, SEC 30 (1 site), T39S, R3W, SEC 25 (1 site), and T40S, R2W, SEC 7 (1 site) will be buffered with 150 ft. radius buffer.

Isopyrum stipitatum: This species grows on shaded slopes in chaparral, mixed-evergreen forest, and oak woodland communities at elevations ranging from 1800- 4200 feet. The 17 known occurrences in the following sections;T39S, R2W, SEC 7 (1 site), T39S, R3W, SEC 1 (1 site), T39S, R3W, SEC 2 (4 sites), T39S, R3W, SEC 13 (2 sites), T39S, R3W, SEC 14 (2 sites), T39S, R3W, SEC 15 (5 sites), T39S, R3W, SEC 27 (1 site), and T39S, R3W, SEC 33 (1 site), will be buffered with a 150 ft. radius buffer.

Sedum laxum ssp. heckneri: This species occurs on steep serpentine or gabbro rock outcrops at elevations of 300 -5400 feet. The one known occurrence within the following section; T39S, R3W, SEC 33 (1 site) will be buffered with a 150 ft. radius buffer.

Sedum oblanceolatum: This species occurs on dry, dioritic slopes with good drainage. There are 13 known occurrences within the following sections; T39S, R3W, SEC 2 (1 site), T39S, R3W, SEC 15 (1 site), T39S, R3W, SEC 23 (9 sites), T39S, R3W, SEC 26 (1 site), and T39S, R3W, SEC 27 (1 site). All of these occurrences will be buffered with a 150 ft variable radius buffer.

Cirsium ciliolatum, Lewisia cotyledon var. howellii, Mimulus kelloggii, Sedum spathulifolium ssp. purdyi, Silene lemonii, and Smilax californica are Bureau "tracking" species and do not require mitigation.

Nonvascular plant species

All of the proposed activity areas were surveyed for the presence of Survey and Manage and Bureau Special Status fungi, lichens, and bryophytes in the spring and fall of 1998 and in the spring and fall of 2001 in accordance with established protocols. Surveys documented 169 occurrences for five species.

Species	Status	Occurrences
Bryoria tortuosa	D	78
Crumia latifolia	BAO	9
Dendriscocaulon intricatulum	E	76
Hedwigia stellata	BTO	3
Tortula subulata	BTO	3

Bryoria tortuosa: This species occurs on trees and shrubs in well-lit, open stands, most frequently on Ponderosa pine, white oak, and whiteleaf manzanita (*Arcotstaphyllos viscida*). There are 78 known

occurrences in the following Sections; T39S, R2W, SEC 7 (2 sites), T39S,R2W, SEC 19 (1 site), T39S, R2W, SEC 30 (4 sites), T39S, R2W, SEC 31 (9 sites), T39S, R3W, SEC 1 (3 sites), T39S, R3W, SEC 2 (3 sites), T39, 3W, SEC 11 (2 sites), T39S, R3W, SEC 12 (8 sites), T39, 3W, SEC 13 (3 sites), T39S, R3W, SEC 14 (10 sites), T39S, R3W, SEC 15 (5 sites), T39S, R3W, SEC 23 (5 sites), T39S, R3W, SEC 24 (1 site), T39S, R3W, SEC 26 (1 site), T39S, R3W, SEC 27 (12 sites), T39S, R3W, SEC 34 (1 site), T39S, R3W, SEC 35 (2 sites), T40S, R 2W, SEC 5 (1 site), and T40S, R2W, SEC 7 (6 sites).

Crumia latifolia: forms dense sods or cushions on wet calcareous rocks and cliff faces. It can be found in both perennial and intermittent stream beds. The nine occurrences in the following sections; T39S, R2W, SEC 7 (2 sites), T39S, R2W, SEC 11 (1 site), T39S, R2W, SEC 12 (6 sites)
will be buffered with 100 ft radius buffers in accordance with district protocol established by Medford BLM District Office Instruction Memorandum OR110-2000-8 dated 23, June, 2000.

Dendriscocaulon intricatulum: This species occurs in mixed conifer/ hardwood and oak- woodland communities. On the Medford BLM District it is most frequently observed on California Black Oak (*Quercus kelloggii*) stems less than 12" in diameter. The 40 occurrences in the following sections; T39S, R2W, SEC 19 (4 sites), T39S, R2W, SEC 30 (5 sites), T39S, R2W, SEC 31 (9 sites), T39S, R3W, SEC 22 (1 site), T39S, R3W, SEC 24 (1 site), T39S, R3W, SEC 25 (3 sites), T39S, R3W, SEC 26 (3 sites), T39S, R3W, SEC 27 (3 sites), T39S, R3W, SEC 35 (2 sites), T39S, R3W, SEC 36 (3 sites), T40S, R2W, SEC 5 (9 sites), T40S, R2W, SEC 6 (4 sites) and T40S, R2W, SEC 7 (1 site) will be buffered with 100 ft radius buffers in accordance with district protocol established by Medford BLM District Office Instruction Memorandum OR110-2000-8 dated 23, June, 2000.

Hedwigia stellata and *Tortula subulata* are Bureau "tracking" species and do not require mitigation.

Chapter IV
Environmental Consequences

Silviculture

Silviculture - Alternative A - No Action

Direct and Indirect Effects

No action would allow forest stands to remain overstocked and individual tree vigor and growth would remain poor. A 318 tree sample of dominant trees showed an average decadal radial growth of .4 inches or .80 inches diameter growth per decade in the Bobar project area.. Dominant tree 10-year radial growth ranged from .1 to 1.65 inches. When radial growth is less than .5 inches per decade, pine trees cannot pitch-out bark beetles and tree mortality results (Dolph, 1985). Tree mortality represents a reduction in stand volume production and a loss of revenue and poor forest health.

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

Cumulative Effects

With no forest stand density reduction, slow tree growth and vigor will result in individual tree and perhaps stand mortality. If severe stand mortality results, silvicultural options in the future will be reduced. It is possible that after bark beetle attack, there may be less than 16 trees per acre remaining in some forest stands. If this happens we would not be able to harvest live trees for approximately 30 to 50 years and spotted owl habitat 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 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 may approach 50 to 80 percent. Where large patches of trees die, canopy closure would be 0 to 40 percent.

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

Silviculture - Alternative B - Variable Prescriptions With Proposed Road Construction

Direct and Indirect Effects

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

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

With the group selection prescription, pine and cedar species will be favored to increase their prevalence in the forest stands.

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

In addition to the commercial treatment 960 acres would be precommercially thinned. If all road construction is completed, there are 72 Operations Inventory units (see Table), or portions of units, that are in need of precommercial thinning. The excess, small diameter trees less than 8 inches DBH will be cut from under the drip lines of old-growth trees to assure their survival. Elsewhere the excess tree stems will be thinned to a desired stocking level to improve the growth and vigor of the remaining trees. Achieving the desired species composition goals is of equal importance.

Cumulative Effects

By utilizing various landscape prescriptions, future silvicultural options will be greater. In the majority of forest stands that will be commercially thinned, these stands can be commercially thinned once again, or regeneration harvested in 10 to 40 years. Pole sized stands could be entered in 30 to 60 years. The prescriptions will also assume that drought resistant conifer species such as ponderosa pine and incense cedar will be present in future stands where appropriate in regard to site conditions. This is critical to forest health. Tree species will be favored on sites where they are best adapted.

There is a wide variety of silvicultural prescriptions because of the wide variety of 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 changes. There may be pine trees within a dry Douglas-fir forest that may need releasing according to the pine prescriptions. Within the pine series forest patches of Douglas-fir may be encountered that will be treated according to the dry, Douglas-fir prescription. Forest stands will vary and the tree plant associations will be treated by the respective prescriptions. There is within stand variation in canopy closure and this variation would remain across the landscape. On Douglas-fir sites, including pole stands, canopy closure would be 50 percent or greater. On pine and Douglas-fir regeneration harvest sites, canopy closure would be 20 to 40 percent. Pine species are shade intolerant so canopy closure must be lower.

Leaving numerous acres of commercial forest land untreated could increase the occurrence of bark beetle attack even in the treated stands. Mortality of untreated stands could cause epidemic levels of bark beetle species that could infect adjacent thinned forest stands. Leaving acres untreated would also decrease the effectiveness of fuels hazard reduction in adjacent treated stands.

If proposed road construction is completed, precommercial thinning will be performed on 1,596 acres to achieve species composition goals and to improve the growth and vigor of the younger trees. Precommercial thinning would also help to reduce the fire hazard by reducing ladder fuels.

If surrounding private lands are clearcut, our forest stands would be the only patches of forest left to provide late-successional habitat. Continuous forest stands would remain connecting the Little Applegate River Watershed to the Applegate River-McKee/Boaz Watershed. Forest fragmentation would not result. Surrounding BLM lands would be managed with similar prescriptions to assure forest health.

Silviculture - Alternative C - Variable Prescriptions With No New Roads

Direct and Indirect Effects

This alternative would eliminate commercial vegetation management on an additional 300 acres of forest land. The effects on this acreage would be the same as the No Action alternative. Forest health would remain poor as well as individual tree vigor. Pre-commercial vegetation management would result on all 960 acres if access can be gained across private lands.

Cumulative Effects

A 13 % reduction in commercial vegetation management would result across the landscape. This could reduce the effects of our vegetation treatments elsewhere in the project area in regard to forest health and fire fuels hazard reduction. Bark beetles may kill the untreated stands and spread to some adjacent harvested stands causing some scattered tree mortality. Cumulative effects in the no treatment areas would be the same as in the No Action alternative.

Fire and Fuels

Fire and Fuels – Alternative A - No Action Alternative

The current trend of increasing stand density which results in increased mortality to the timbered stands would continue. The transition from ponderosa pine stands to excessively dense true fir stands would also continue at the lower elevations within the project area. Trees growing under these conditions often

become weakened and are highly susceptible to insect epidemics and tree pathogens. Younger trees (mostly conifers) contribute to stress and mortality of mature conifers and hardwoods.

Ladder and surface fuels would also increase within these stands. Increasing stand densities and fuel loadings would increase the chance of more acres that would burn in high intensity fires within the project area. Fire fighter safety would continue to be an issue as well as the potential of resource damage.

The objectives of improving grasslands would not be achieved. Also, the restoration of shrublands and Oak woodlands would not be achieved.

Air quality would be impacted in the event of a large wildfire. Emissions from wildfires are significantly higher than from prescribed burning. The wildfires which occurred in southern Oregon in 1987 emitted as much particulate matter as all the burning that occurred within the state that year.

Fire and Fuels - Alternative B - Variable Prescriptions With New Roads

Thinning to Reduce Fire Effects

Thinning from below, fuel bed treatment, canopy spacing treatments, and periodic low intensity prescribed fire activities are supported by most scientists and researchers who study and research fire-adapted ecosystems as a means to reduce the risk and intensity of wildfire. Treatments that result in forests with a lower density and larger trees show lower potential for crown fire initiation and propagation and for less severe fire effects (Pollet and Omi 2002).

The overwhelming body of science agrees that thinning is an effective tool to reduce fire risk and the effects are well understood, and do not involve highly unknown effects or risks, and logging (thinning) is necessary in many cases prior to utilizing prescribed fire (Omi and Martinson 2002; Pollet and Omi 2002; Wilson and Baker 1997; Agee and others 1999; Ottmar 1997; Omi and Kalabokidis 1991; Covington and others 1997; Johnson and others 1998; Fielder 1996; Oliver and others 1994; Graham and others 1999).

Observations on the 2002 Squires Peak Fire adjacent to the Bobar project showed thinning generally reduces the risk of tree mortality in a wildfire (BLM and ODF undated). The Oregon Department of Forestry reported that fire behavior in the Logtown Fire in previously treated areas *"became a low intensity surface fire, underburning the area and leaving the overstory intact"* (BLM and ODF 2002). Analysis of the Hayman Fire, Colorado's largest wildfire in recorded history, indicated thinning and prescribed burn activities prior to the fire were instrumental in stopping the fire's spread (pers. comm. The Nature Conservancy). The assessment of the largest recorded wildfire in Arizona's history, the Rodeo-Chediski fire, indicates that "*even under the most severe draught conditions on record, and given an event with extreme fire behavior, positive benefits can be attributed to forest management activities that reduce crown densities, raise canopy heights and diminish surface fuel loadings (*USDA 2002)."

The proposed commercial thinning would reduce the overall density of the treated stands. These treatments would reduce some of the aerial fuels present in the stands. Some of the smaller diameter commercial trees that are proposed for harvest also act as ladder fuels. The combination of removing some of the aerial component as well as the ladder fuels would reduce the chance of sustaining a crown

fire in these stands (Omi and Martinson 2002). Over time, the commercial thinning would also increase diameter growth of the residual stand. Larger diameter trees are more tolerant to surface fires so there would be less mortality to the stand in the event of a surface fire. The commercial thinning would also favor more fire tolerant species such as pine.

Logging (Thinning) and Fire Effects

Studies have shown that logging (thinning) can increase fire behavior (UC Davis 1996). Logging exacerbates fire prone stand structures primarily when activities harvest large, fire resistant trees while retaining smaller, more flammable trees; when activities leave logging debris (slash) untreated so it adds additional fuels to the ground; and when activities change the microclimate of the forest floor (opening canopies for drier and windier conditions at the forest floor) (Weatherspoon and Skinner 1995; UC Davis 1996).

In Alternative B, large trees are being retained. Targeting thinning towards trees less than 16 inches diameter addresses the core of fuels problems according to testimony before Congress subcommittees (professors Morgan, Neuenschwander, and Swetnam, before Subcommittee on Forests, 2000). Based on the last eight years of timber harvest for the areas near and adjacent to the Bobar area, the emphasis on tree harvest has been on diameters less than 16 inches. Over 80% of the trees cut were less than 16 inches, as well as numerous trees less than 8 inches in diameter.

Slash in Alternative B will be treated. Treatments designed to reduce canopy fuels through density management, increase and decrease fire hazard simultaneously. After thinning and prior to slash treatment, there is a period of increased fire hazard as untreated thinning debris makes additional fuel available to a wildfire. The Squires Peak fire burned very hot where freshly logged areas of slash had not yet been piled or burned. The fresh slash provided fuel sources for many spot fires, and burned as a stand replacement event.

Slash generated from the commercial thinning of timber stands, if not treated, would create surface fuels that would be greater than current levels. The existing surface fire behavior fuel model in the majority of stands proposed for commercial thinning are represented by a Timber Group fire behavior fuel model. Fuel amounts are measured in tons per acre for different size material. Material up to 3 inches in diameter has the greatest influence on the rate of spread and flame length of a fire, which has direct impacts on fire suppression efforts. It is anticipated that fuel loadings after logging would be increased by approximately 3-15 tons to the acre. This would change the existing fuel model of most of the timbered stands to a Logging Slash Group which in turn would create higher rates of spread and greater flame lengths in the event of a wildfire. However, despite the temporary increase in ground fuels, recent research indicates that a reduction in crown fuels outweighs any increase in surface fire hazard (Omi and Martinson 2002).

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

acres burned in the event of a wildfire.

The reduction in stand density would make it possible to use prescribed fire as a tool to further reduce fire hazard in these stands. Slash generated from commercial and noncommercial treatments would be treated on the majority of units proposed for harvest within two years after a unit is harvested. Treatments would take place where slash three inches in size and less exceeds 5 to 6 tons per acre. Treatments should ensure that under most climate conditions, flame lengths would be less than three feet allowing for direct attack of a wildfire.

The objectives of improving grasslands and the restoration of shrublands and oak woodlands would be achieved under these Alternatives. The high fire hazard which exist in these areas would also be greatly reduced.

Alternative B will generally open forest canopy. Studies have noted that when forests are opened up, forest floors tend to dry more and winds increase. These factors are not significant in vegetation types that have a frequent, but low intensity fire regime, simply because open forest floors and drier conditions are natural. Recent studies have demonstrated the effectiveness of management activities designed to reduce fuel hazard and minimize the impacts of wildfire in areas with fire regimes historically characterized by low severity fire (Omin and Martinson 2002; Pollet and Omi 2002). Fires in such stands are carried by grasses, forbs and shrubs which produce substantially less fuel than the woody debris on the forest floors of thick forests. Historically, the majority of the stands in Bobar had a frequent, low intensity fire regime. Therefore, the effects of opening forest canopy, in conjunction with treating slash, has a positive effect in reducing fire intensity.

Some stands in Bobar are more moist and have a less frequent fire regime, historically. In stands where the drying effect is important, thinning is generally in the understory and not expected to affect the forest floor significantly. Computer simulations along with anecdotal evidence provide strong support that the negative effects on microclimate of opening up the forest canopy are outweighed by the reduction in live and dead fuel loading and continuity (Van Wagtendonkt 1996).

Prescribed Fire In Absence of or Prior to Thinning

Attempts to use fire alone to thin dense stands frequently resulted in high levels of mortality in the residual stands (Swezy and Agee 1991, Sackett and others 1996, Covington and Sackett 1984, Ryan and Losensky 1988). Due to long time buildups of forest fuels around the base of trees, old growth trees are susceptible to mortality from prescribed fire. Post-fire mortality among old growth trees was 23% higher in burned plots than in unburned controls over a 20 year period (Sackett and others 1996).

Prescribed fire is not a very selective thinning tool, because a number of fires are required to reduce fuels, change the understory, and overcome the effects caused by fire exclusion (Harrington and Sackett 1990). Gaines and others (1958), Woolridge and Weaver (1965), and Lindemuth (1960) all reported that fire was a rather imperfect tool for thinning.

In an extensive report to Congress, the Sierra Nevada Ecosystem Project (SNEP) authors concluded that an extensive modification of forest structure by thinning and burning is needed to minimize severe fires in the future (UC Davis 1996). In an extensive scientific evaluation (involving over 100 scientists) of the

effects of Forest Service management practices on the sustainability of eastern Oregon and Washington ecosystems, Huff and others (1994) found a need to utilize thinning as one of several actions to restore wildfire to more natural behavior. In a report of the National Commission on Wildfire Disasters, Sampson (1994) states many forest situations will require mechanical removal of excess trees via thinning before a fire can safely be reintroduced.

Substantial research has demonstrated the effectiveness of thinning as one component in a forest restoration program (Swezy and Agee 1991, Fiedler 1996, Fenney and others 1996, Weatherspoon 1996, Edminster and Olsen 1996, Covington and others 1997, Scott 1998, Harrington and Sackett 1990).

The escaped prescribed fire at Bandalier NP (Los Alamos, New Mexico in 2000) which attempted to use fire as thinning agent without effective mechanical thinning first shows the high degree of risk and trauma that may result. Over 300 homes and over 50,000 acres were burned. At one point during the fire, the entire town of Los Alamos was evacuated.

Fuels Reduction in Urban Interface

Cohen (1999) looked at the likelihood of a structure being ignited by radiation from an approaching fire or from an ember igniting burnable surfaces such as shake shingles. He found that a distance of about 200 feet was needed free of flammable materials and vegetation to prevent combustion to a piece of home siding. While a solution to protecting homes, this practice does not consider the ecological, spiritual and social values of forestland surrounding the urban interface. In absence of a 200-foot clearing, Cohen suggests that wildland vegetation management would have to occur potentially up to several kilometers (1.3 miles) away from homes.

In the Squires Peak fire, the local fire chief credited homeowners, who provided defensible space through various thinning and cleaning activities, with giving firefighters the ability to save their homes.

In his response to an appeal of Coconino National Forest's Fort Valley Project, Cohen writes: *This* [my research] *should not be interpreted to mean that wildland fuel management (e.g. thinning) has no impact on fire behavior. In fact, quite the opposite…The reduction of available fuels due to vegetation removal or vegetative type changes can significantly change the fire behavior over relatively small distances* (USDA 1999).

Cumulative Effects

At the landscape level, Alternative B fuels reduction activities are contributing to a reduced fire effects. Based on the last eight years of timber harvest for the areas near and adjacent to the Bobar area, the emphasis on tree harvest has been on diameters less than 16 inches. The emphasis in Alternative B is on trees less than 16 inches, thus contributing to the landscape level reduction of potential fire effect.

Since 1997 fuel hazard reduction work has occurred in the Little Applegate River Watershed. To date one landscape project within this watershed has been implemented. This project is the Buncom project. To date approximately 3,000 acres of fuels treatment has occurred within this project area. Approximately 900 additional acres will be treated in the next 2 to 3 years.

Future landscape projects are planned over the next five years in the Little Applegate River Watershed. In addition to those treatments proposed with the Bobar Project, four other landscape analysis projects in the Little Applegate River and Applegate River-McKee Watersheds are planned. Bald Lick, Prince Castor, Bald Lime, and Deadman's Palm are scheduled to be analyzed and implemented over the next five years.

Roads are sources of fire starts because humans use roads. Within the Applegate AMA, humans cause the majority of wildfires, and they generally remain small. The same road that was used as a starting point for a fire is also an access route for fire equipment and crews. Lightning is the primary cause of large wildfires in the last 20 years in the Applegate, primarily due to poor access (no or lack of roads) and/or lack of fire fighting resources (examples are Quartz, Squires, and numerous fires in 1987). Topography, weather and forest fuels, past management, and available fire resources all combine to create fire behavior that may or may not be influenced by the presence of roads.

Proposed road construction for Bobar allows access to stands for treatment with thinning prior to prescribed (broadcast burns). While the risk of a human fire start is increased, access allowed by that same road for wildfire suppression, combined with fuels reduction treatments, will lessen the risk that a fire will become large.

Thinning in conifer stands (including retention of large trees and treatment of slash), thinning in non-conifer woodlands and brush, in combination with homeowner defensible space treatments, and developing additional access for treatment areas and wildfire suppression, all contribute to reduced effects of potential wildfire.

Impacts of Spring versus Fall Burning

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

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

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

Prescriptions are developed for spring burning to consume the smaller fuels (1/4" - 3") and retain the majority of large down woody debris due to the higher dead fuel moistures. Soil moisture is also higher in

the spring so duff consumption is also minimal. Burning under these conditions keep fire intensity low so impacts to residual vegetation are minimal and the chance of escape is also minimized. Visual observations of areas that have been underburned in the spring in the Applegate over the past six years have not shown any negative impacts to the site.

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

Fire and Fuels - Alternative C - Variable Prescriptions With No New Roads

Impacts are the same as Proposed Action with the following discussion:
Access to approximately 338 acres of commercial thinning units would be limited. Also, access to approximately 275 acres of noncommercial treatments would be limited. The majority of these acres would be more than one mile from the nearest road.

Access to an area plays a critical role in determining if fuels treatments can occur. The risk of escape is a major factor when conducting burning operations especially underburning and broadcast burning. Without access there is an increase risk of escape due to the lack of availability and mobility of people, equipment and water. Limited or no access would preclude the use of prescribed burning.

The construction of the road would decrease response time of suppression forces to this area in the event of a wildfire. Quick response time is a major factor in insuring wildfires are kept small in size.

Impacts - Air Quality- Alternatives B & C
The proposed action and no road alternative both propose to use prescribed fire so consequently there would be some smoke related impacts.

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

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

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

during prescribed burning operations.

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

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

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

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.

Soils

Soils - Alternative A- No Action

Direct, Indirect, and Cumulative Effects

The effect of the no action alternative on the soil resource would be the continuance of existing erosion and sediment rates coming from the existing roads throughout the watershed. Roads would not be maintained and road drainage would not be improved. Road densities would remain at the current level

and all currently opened roads would be open to traffic. This would result in no reduction of sediment production and may increase the potential for sediment delivery over time as roads deteriorate. Erosion rates would not increase as a result of timber harvest activities and prescribed fuel reduction treatments.

No density management or fuel reduction would occur. This would increase the potential for wildfire to occur in the project area. The increased fuel levels could result in a much more severe wildfire. Wildfire, even a severe fire, is a natural part of the landscape. However, severe fires have higher potential to devastate watersheds. The risk of severe fire in the watershed would continue to increase. A severe fire of any appreciable size would increase erosion and sedimentation rates dramatically. Such a fire could destroy riparian vegetation, increase sediment delivery and erosion potential, and destabilize stream channels. Negative soil impacts from a large, high intensity wildfire would be much greater and effect much more of the watershed than the proposed action.

There would be no increase in erosion rates short-term (unless a severe fire occurred) but no decrease in erosion and sedimentation rates long-term as a result of the no action alternative.

Soils - Alternative B - Variable Prescriptions With New Roads

Direct and Indirect Effects

Soils and Timber Harvest

Soils in the project area are generally stable and the landslide hazard is considered low. No areas of high landslide potential are being treated. Soil disturbance would be limited to these localized areas with only a fraction of soils within each harvest unit disturbed. There would be no widespread areas of continuous soil disturbance. Approximately 278 acres would be tractor logged using designated skid trails. Approximately 754, would be skyline-cable logged using partial suspension, the remaining 1,520 acres would be helicopter yarded.

Cable and helicopter yarding would result in less soil disturbance than tractor yarding. Cable yarding subjects up to seven (7) percent of the unit to severe disturbance (Smith 1979). Helicopter yarding would subject about one (1) percent of the unit to severe disturbance (Klock 1975).

Erosion rates would be higher in the tractor units where the soil is disturbed and lower in the cable units. Although erosion rates would increase, most soil particles would remain on-site and very few soil particles are likely to reach any waterways because of the project design. See Hydrology section for more information on sedimentation.

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.

Most of the slash created by the logging will be removed from the site or treated to reduce the total fuel loading on-site. All tractor yarding would be accomplished using designated skid trails resulting in the compaction of no greater than 12 percent of the unit, this is equivalent to compacting a maximum of approximately 33 acres. If the findings of Amaranthus and Steinfeld are true on this site, compaction

where it does occur might not necessarily be detrimental compaction.

Two units proposed for tractor yarding are on Manita Soils. Manita soil has a significant clay content and are very susceptible to compaction. These units are upper portion of Unit 9 and lower portion of Unit 42. Use of designated skid roads will compact no more that 12 percent of the units

Cable yarding would result in less soil disturbance than tractor yarding. Cable yarding can subject up to seven (7) percent of the unit to severe disturbance (Smith 1979). Because of the size of the proposed project the effects of soil compaction are negligible within the watershed It is unlikely that there would be any noticeable effect from this small amount of disturbance.

Soils and Roads

Erosion Hazard relates to the ease of detachment and movement of soil and rock particles**B** it is not meant to imply that this material has entered the aquatic environment, but rather the colluvial environment where it could remain for years to millennia. Almost all soils on hillslopes in the planning area form in colluvium.

New roads would have an impact on the soil resource. Approximately four (4) acres of land is disturbed and taken out of vegetation production for every one mile of road proposed. The 6 miles of new construction would take out of production approximately 24 acres. Conversely the decommissioning of 7.2 miles of existing unsurfaced roads would bring back into production approximately 29 acres.

Regarding the road from the crest towards East Side Road; 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).

New road construction (one mile) is proposed on granitic soils in the south edge of Section 31. This new construction is an extension of a previously built road also on granitic soils. Based on the condition of the existing road after over twenty years and the inherent stability of Low Elevation Granitics, there is little concern for excessive erosion or slope failures from this proposed ridge-top road.

Ridge top roads would increase the existing erosion rates in the localized area of construction. Most of the eroded particles would re-settle on the hillslope. 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.

Soils and Fuel Reduction

The proposed action is to reduce fuels on all of the acres proposed for treatment. An array of tools would be used to reduce fuel loads, these include: broadcast burn, underburn, mechanical and manual treatment.

Broadcast and underburns associated with the fuel treatments would have a moderate effect on the soil. Burning increases the amount of mineral soil exposed by a varying amount, depending on the depth and consumption of the forest floor. Burning can expose up to forty percent of the burned area. A low-

intensity burn would have little direct effect on soil properties. A light surface fire would generally char the litter, leaving most of the mineral soil partially covered.

The desired result is a mosaic of burn intensities, where unburned or lightly burned areas may lie adjacent to more severely burned strips. The retention of duff is desired, where duff already exists. The goal is to burn a majority of litter with a retention of as much duff as possible. It is acknowledged that there might be pockets where a majority of duff is consumed. This is acceptable as long as a mosaic of severity is present, allowing migration of soil organisms from adjacent areas to recolonize impacted sites

Most soil movement occurs during the first season after the slash is burned and quickly diminishes as vegetation cover re-establishes. Soil productivity would experience a slight negative decrease short-term but long-term positive effects would be realized from the proposed actions as the risk of severe fire is diminished.

Piled slash burns hotter than broadcast burning, increasing consumption of organic matter and nutrient losses. High soil temperatures generated under burning piles (typically, about 3-5% of the harvested area) negatively affect soil properties by physically changing soil texture, structure and reducing nutrient content. Additionally, the intense teat resulting from burning of hand piles would negatively impact soil organisms for the short-term. Migration of soil organisms from adjacent areas would recolonize these sites.

A reduction in vegetation density as planned for in this project would mitigate compaction and help to attain the development of late-successional species and structure.

Site productivity would be enhanced by reducing the potential for severe wildfires. An uncontrolled burn could be of such intensity so as to severely increase erosion and sedimentation, and also severely set back the community of microorganisms. For this reason, proposed fuel treatments are considered to have a net positive influence on soil resources.

A short-term increase in available nutrients released by burning would benefit newly released vegetation, both tree and browse species.

There would be a short-term increase in available mineral nutrients such as calcium and magnesium, conversely, there would be a temporary decrease in total site nitrogen, yet available nitrogen would be increased.

Cumulative Effects

The cumulative effects to the soil resource in the affected landscape area would be a moderate short-term increase in erosion rates which would last about three to five years. A slight long-term decrease in erosion rates would occur as the affected harvest units re-establish ground cover and the risk of severe wildfire is reduced. By way of contrast, the impacts of cable yarding is far less severe on the soil resource than a high intensity wildfire which can remove all organic material from the site and create hydrophobic soil conditions, i.e., water repellent soils. A reduction in vegetation density, as planned for in this project, which promotes the development of late-successional species and structure could help to

decrease bulk densities and increase soil organic matter (Amaranthus and Steinfeld, 1997). Site productivity would also be enhanced by reducing the potential for severe wildfires.

Almost a century of fire exclusion has occurred in this area, consequently "natural" conditions no longer exist. Fuel loading is greater and duff/litter layers are often greater than would naturally occur. Given the natural fire frequency in this area, many low-severity fire events have likely been suppressed over the past century. Long periods of protection from fire are associated with fuel buildup (Agee, 1993), which leads to litter depths greater than would be expected under a more natural fire regime. Consequently, an uncontrolled natural burn could be of such intensity as to severely increase erosion and sedimentation, and severely set back the community of microorganisms. For this reason, proposed treatments are considered to have a net positive influence on soil resources.

A 1997 study, (Amaranthus and Steinfeld), that took place in an the south portion of this watershed (Yale Creek), 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 and Caris-Offenbacher soils constitute 55 percent of the soils on the BLM administered portion of the Bobar Planning Area.

Additionally, thinning prescriptions like these that promote the development of late-successional species and structure could help to decrease bulk densities and increase soil organic matter over time. Also, site productivity can be enhanced by reducing the potential for hot, uncontrolled wildfires through: fuel reduction treatments, encouraging the building of soil organic matter, promoting hardwood species, maintaining an adequate duff and litter layer, and encouraging development of large woody debris (Amaranthus and Steinfeld 1997).

The cumulative effects to the soil resource in the affected landscape area would be a moderate short-term increase in erosion rates which would last about three to five years. A slight long-term decrease in erosion rates would occur as the affected harvest units re-establishes ground cover, land that was once occupied by roads are put back into producing vegetation (ground cover), and the risk of severe wildfire is reduced. The watersheds would continue to experience high erosion rates long-term as a result of the high road density per square miles.

Soils - Alternative C - Variable Prescriptions With No New Roads

Direct and Indirect Effects to Soils

The effects on the soil resource would be similar to those of Alternative B.

Differences would be:

There would be no increase in erosion and sedimentation as a result of building new roads: however decommissioning roads would still create localized soil disturbance and erosion.
Overall, the erosion rates would remain high long-term as a result of high road densities and moderate-to-slight erosion rates as a result of harvesting timber and prescribed burning.

HYDROLOGY (Water Quality, Channel Morphology, Streamflow)

Water Quality- Common to all Alternatives

The BLM in cooperation with the Forest Service, ODEQ, and the Environmental Protection Agency (EPA) is implementing the *Forest Service and Bureau of Land Management Protocol for Addressing Clean Water Act Section 303(d) Listed Waters* (USDA and USDI 1999). The Water Quality section in Chapter 3 of this E.A. identifies 303(d) listed waters in the project area. Under the Protocol, the BLM will protect and maintain water quality where standards are met or surpassed, and restore water quality limited waterbodies within their jurisdiction to conditions that meet or surpass standards for designated beneficial uses. The BLM will also adhere to the State Antidegradation Policy (ODEQ 1992; 340-041-0026) under all alternatives. The BLM will continue supporting ODEQ's efforts to work with land managers and designated management agencies in total maximum daily load (TMDL) development (scheduled for 2003) and implementation plans (e.g., water quality management plans (WQMPs)). The Protocol serves as a framework for developing water quality restoration plans, specific to BLM-administered lands, which are used to guide and can be incorporated by reference into ODEQ's WQMPs. In areas where BLM management actions have either short- or long-term effects on BLM-administered lands and adjacent waters, the BLM will work toward water quality improvement. Under all alternatives, necessary federal and state permits would be obtained for any instream work. Restoration aimed at improving water quality is described under Alternatives B and C. Best Management Practices (BMPs) and effectiveness monitoring as described in the Medford District RMP would ensure that TMDLs are being met on BLM-administered lands.

Private forest lands in the project area would be managed according to the Oregon Forest Practices Act. These lands as well as private agricultural lands would be addressed in the Applegate River Water Quality Management Plan to be prepared by ODEQ.

Alternative A

Direct Effects

Water Quality

Alternative A would have no direct effect on designated beneficial uses or the 303(d) listed parameters.

Channel Morphology

Alternative A would have no direct effect on channel morphology in the project area.

Streamflow

Alternative A would have no direct effect on the streamflow regime in the project area.

Indirect Effects

Water Quality

Under Alternative A, there would be no indirect effect on flow modification (303(d) listed parameter for the Applegate River) and on stream temperature (303(d) listed parameter for the Applegate and Little Applegate Rivers and Yale Creek). Stream shade on BLM-administered lands in the project area would be maintained in the short-term and increased in the long-term as riparian vegetation continues to grow. Management actions on private lands may still prevent stream temperatures from meeting the State

water quality criteria. Beneficial uses sensitive to stream temperatures, such as cold water fish and other aquatic life, would not be expected to thrive under temperatures that exceed the State criteria. Sediment input from roads and streambanks would be expected to continue at approximately the existing rate in the short term. Boaz Gulch and Grouse Creek would continue to receive high levels of sediment input due to road erosion. Improvements to reduce erosion would be made on the Boaz Gulch and Grouse Creek roads when funding becomes available for road improvements. In the long term, continued fire suppression and lack of treatments designed to reduce fire hazard would increase the likelihood of larger and more intense wildfires within the project area. A severe intensity fire would result in levels of soil erosion and sedimentation that are higher than those existing. A high intensity fire also would likely reduce or eliminate stream shade, resulting in increased water temperatures.

Channel Morphology

Short-term indirect effects to channel morphology would include the continuation of existing levels of sedimentation and lack of large wood. Long-term indirect effects of high sedimentation levels would include increased sediment deposition, resulting in the evolution of wider and shallower channels that could lead to higher water temperatures (ODEQ 1999). Channels would continue to experience headcutting below roads with undersized culverts or inadequate energy dissipaters. Channel structure would improve in the long-term as large wood becomes more available. Large wood recruitment would increasingly occur, although at a slower rate than if dense young conifer stands were treated to enhance late-successional riparian conditions. A high intensity fire would reduce potential future large wood recruitment and extend the time for trees to contribute down large wood in stream channels.

Streamflow

In the short and long terms, drainage basins in the project area with high road densities would continue to experience altered peak flow magnitudes and frequencies. The risk of peak flow enhancement would be reduced in the long term as forest stands continue to grow and crown closure increases. However, a large high intensity fire or continued timber harvesting on private lands could maintain or increase the risk of peak flow enhancement for all drainage areas in the project area.

Alternative B

Direct Effects

Water Quality

Alternative B would have no direct effect on summer stream temperature (303(d) listed parameter for the Applegate and Little Applegate Rivers and Yale Creek) or on flow modification (303(d) listed parameter for the Applegate River). Shade on perennial streams would be maintained with all vegetation treatments in both commercial and non-commercial areas and proposed road work.

Under Alternative B, direct effects on sedimentation would only occur in perennial streams where existing culverts are proposed for replacement or removal. Culvert replacements in perennial streams would take place as part of the proposed road renovation and are proposed for Grouse Creek and possibly up to seven additional sites. Culvert removals from perennial streams would be done with the road decommissioning and are proposed for Boaz and Felix Gulches. Adverse sediment impacts in these streams would be minimized through Best Management Practices including the following: all in-channel work would be done

during the summer low-flow period; flowing streams would be diverted around work areas; movement of sediment downstream from the worksites would be minimized through the use of settling ponds and filtering materials such as straw bales or coconut fiber logs/bales; fill material at the location of stream crossing structures would be stabilized as soon as possible following construction; and exposed soils would be seeded and mulched.

The purpose of the proposed culvert replacements is to increase the culvert size to allow passage of a 100-year flood and reduce erosion at the culvert outlets. The proposed Grouse Creek culvert is located approximately 0.9 mile from the confluence with the Little Applegate River. Locations of the other possible culvert replacements would be determined after the road renovation inventory is completed. A maximum of seven additional culverts could be replaced on perennial streams in the project area: one on Grouse Creek (approximately 1.9 miles upstream of the Little Applegate River), four on Grouse Creek tributaries, one on Victor Gulch, and one on Felix Gulch. Culvert replacements at these sites would result in localized, short-term (limited duration) turbidity/sediment increases.

The proposed road decommissioning under Alternative B would include removal of four stream crossing structures from perennial streams (three from Boaz Gulch and one from Felix Gulch). This in-channel work would also result in localized, short-term (limited duration) turbidity/sediment increases.

Any turbidity and sediment increases resulting from road renovation and decommissioning work under Alternative B would be within the scope of the increases analyzed in the Medford District PRMP/EIS (USDI 1994, p. 4-18, 4-19).

The proposed culvert replacements and removals under Alternative B are restoration priorities for improving water quality in the Little Applegate River and Applegate River-McKee Bridge Watersheds.

Channel Morphology

Under Alternative B, direct effects on channel morphology would occur where existing road stream crossings are removed and new road stream crossings are installed. Removal of existing road stream crossings would occur at four perennial stream sites (three on Boaz Gulch, one on Felix Gulch), one long-duration intermittent stream (a tributary to Boaz Gulch), and four short-duration intermittent streams (two tributaries to the Applegate River, and two tributaries to the Little Applegate River). Stream channels at these locations would be reconnected to the floodplain and the channel bottoms would change from metal pipes to natural material substrates. Installation of a culvert would have a direct impact on an unnamed tributary to the Applegate River located in drainage area AU0363 (see Table 3.1 for drainage area description). A culvert existed at this site previously but was pulled. The stream channel at this location would change from natural substrate to metal pipe. The unnamed tributary in AU0363 is classed as a long-duration intermittent stream at and below the proposed road crossing and as a perennial interrupted stream upstream of the proposed crossing. The perennial interrupted classification means that there is no surface flow on portions of the stream. There is perennial flow from small seeps upstream of the proposed crossing, but flow goes subsurface above the crossing. The intermittent channel loses any evidence of scour as it enters a high terrace of the Applegate River. Beyond this point, for the last 0.8 miles before the stream flows into the Applegate River, the stream is ephemeral, and evidence of scour or deposition is undetectable. Because of the extremely low gradient of the terrace, distance to the mainstem river, lack of a defined channel, and lack of surface flow, there

is virtually no chance that there would be any other changes to channel morphology other than at the immediate crossing location.

Streamflow

Alternative B would have no direct effects on the streamflow regime in the project area.

Indirect Effects

Water Quality

Alternative B would have no indirect effect on summer stream temperature (303(d) listed parameter for the Applegate and Little Applegate Rivers and Yale Creek) or on flow modification (303(d) listed parameter for the Applegate River). Shade on perennial streams would be maintained with all vegetation treatments in both commercial and non-commercial areas and proposed road work areas.

Management activities proposed under Alternative B that could have an indirect effect on sedimentation to streams and rivers in the Bobar project area include commercial harvest, pre-commercial thinning, fuel reduction treatments, helipad construction, road work, and log hauling. The potential for sediment from commercial harvest units to reach stream channels is very low due to Best Management Practices (BMPs) such as no harvest or yarding in Riparian Reserves and minimizing and waterbarring skid trails. Manual pre-commercial thinning would not involve any ground disturbance and therefore would not have any effect on erosion rates or sedimentation in the project area. BMPs for pre-commercial thinning would exclude mechanical treatments from the Riparian Reserves of fish-bearing and perennial streams, springs/seeps/wetlands, and unstable areas and from 25 to 50 foot intermittent stream buffers (see Appendix C, Table 1). This protection would result in a low potential for sediment to reach stream channels.

Sedimentation resulting from proposed mechanical fuel reduction treatments within Riparian Reserves would be very low due to the same BMPs as for mechanical pre-commercial thinning. Affects on sedimentation as a result of proposed underburning would depend on the season burning occurred. Spring underburning would result in a low intensity burn with minimal duff consumption. Sediment increases from spring underburning would be very slight given the low intensity burn and BMPs that stipulate no ignition or fire lines in Riparian Reserves. Fall underburning would result in a moderate to high intensity burn with a higher consumption of down large woody debris. Fall underburning BMPs would be the same as for spring, however, the higher intensity burn could expose mineral soil that would be subject to erosion. This is especially a concern in the fall since the burned area would not revegetate until the following spring; intense fall and winter rains immediately following the burn could move soil and ash to stream channels. Any turbidity and sediment increases resulting from underburning would be within the scope of the increases analyzed in the Medford District PRMP/EIS (USDI 1994, p. 4-19). Pile burning would be excluded from within 50 feet of fish-bearing, and perennial streams, springs/seeps/wetlands, and unstable areas, and from within 25 feet of long-duration intermittent streams (see Appendix C, Table 1). No piles would be allowed in the channel of short-duration intermittent streams. These BMPs would minimize the entry of sediment or ash into stream channels. Any increases in sediment or ash to waterbodies in the project area resulting from pile burning would be very slight.

Proposed helipad construction would occur on stable ridges outside of Riparian Reserves. BMPs for the construction of helicopter landings would include: dry season construction, rock or seeding of running surface, and seeding of fill slopes. The locations and BMPs applied to the proposed helipad construction would greatly limit the amount sediment moving off-site to stream channels.

Road construction, renovation, and decommissioning proposed under Alternative B would have the greatest likelihood of having indirect effects on sedimentation to waterbodies in the Bobar project area. The primary sediment source would be on-site soil disturbance caused by the removal or installation of road stream crossings and the secondary source would be from surface erosion off cut and fill slopes and the road surface. The following BMPs (see Project Design Features in Appendix C) are designed to minimize soil disturbance, sediment entry into stream channels, and downstream sediment movement. All road work would be done during weather conditions that will minimize sediment delivery to streams. In-channel work would be done during the summer low-flow period on the perennial streams, and when streams are dry on the intermittent streams; flowing streams would be diverted around work areas. Movement of sediment downstream from the worksites would be minimized through the use of settling ponds and filtering materials such as straw bales or coconut fiber logs/bales. Fill material at the location of stream crossing structures would be stabilized as soon as possible following construction; and exposed soils would be seeded and mulched. Timing of road work operations would reduce the initial amount of sediment entering streams; new road construction and renovation would occur during the first year of the contract while road decommissioning would occur during the final dry season of the contract. Proper spacing and sizing of drainage structures would be ensured on all BLM roads in the project area. Road surfaces would be graded to provide for proper runoff of water. Road surfaces would be hardened by placing surface rock and thereby stabilizing roads. Armored splash pads would be placed at the outfall of culverts and water dips. Managed road closure devices (gates and barricades) would be used to limit wet weather use. On new road construction, fill slopes would be seeded and mulched and slash winrowed along the toe of the fill to filter sediment. On road grades less than 8-10%, roads would be outsloped, and on grades greater than 8-10%, roads would be insloped with ditchlines. All of these BMPs would minimize the likelihood of displaced sediment reaching stream channels.

The proposed road construction would occur in stable locations, with the majority on or near ridges, thus minimizing the risk of sediment reaching streams. Road construction would include the reinstallation of a previously pulled culvert on a small intermittent stream (a tributary to the Applegate River located in drainage area AU0363 (see Table 3.1 for drainage area description)) and 11 new drainage crossings on dry draws (draws with no defined channel or no evidence of annual scour and deposition). Drainage structures placed in these drainageways would disturb the soil, however, the potential for sediment moving downstream is low because they normally have no surface flow even in major flood events. The crossing on the intermittent stream would be located over 0.8 miles above the confluence with the Applegate River. There is a small volume of subsurface perennial flow from small seeps upstream of the proposed crossing, but evidence of year-around moisture disappears just above the crossing. The intermittent channel loses any evidence of scour as it enters a high terrace of the Applegate River. Beyond this point, for the last 0.8 miles before the stream flows into the Applegate River, the stream is ephemeral, and evidence of scour or deposition is undetectable. Because of the extremely low gradient of the terrace, distance to the mainstem river, lack of a defined channel, and lack of surface flow, there is virtually no chance that there would be any changes to water quality resulting from this crossing installation. Bankfull width at the stream crossing is 2.7 feet, maximum bankfull depth is 0.5 feet, and the stream channel gradient below the crossing is low (< 1%).

Road renovation would bring existing roads up to current BLM design standards. Improving road drainage and resistance to wear and erosion is a restoration priority for the Applegate River-McKee Bridge and Little Applegate River Watersheds. Renovation work would consist of improving road surface condition, road surface hardness, and drainage structure spacing and sizing. Armored splash pads would be placed at the outfall of culverts and water dips. Replacing undersized culverts would be undertaken as part of the road renovation work. The Grouse Creek Culvert at Grouse Creek Road MP 0.91 (0.91 mile above the confluence with the Little Applegate River) needs to be replaced with a larger culvert. The new culvert would be sized to at least a 100-year flood event and would provide for fish passage. Additional culverts/drainage structures on smaller stream crossings would be replaced as needed as part of the Bobar project. Indirect effects would result if soil material entered streams and the sediment moved downstream from the culvert replacement sites. A local sediment pulse would most likely occur during storm events the first fall/winter following renovation work. The timing of this sediment pulse would coincide with normal high turbidity levels and the sediment from the proposed project would not be discernible above background levels. It is highly unlikely that any sediment resulting from the culvert replacements would reach either the Applegate or Little Applegate Rivers. Culvert replacements would provide a net benefit to the water quality of the stream systems affected as they would reduce erosion and reduce the chance of high water damage.

Proposed road decommissioning would include the removal of 21 (4 on perennial streams, 6 on intermittent streams, 9 on dry draws, and 2 on ditches) existing road crossings. Fourteen of the crossings are in drainages that flow into the Applegate River, and the remaining 7 crossings are in drainages that flow into the Little Applegate River. The primary sediment delivery mechanism resulting from culvert removal at stream crossings would be streambank erosion during bankfull flows following completion of instream work. Removing fill material to the extent of the bankfull width, pulling back side slopes to the natural slope, and mulching and seeding the streambanks are project BMPs that would minimize the potential for streambank erosion. Streambank erosion resulting from culvert removals would continue to occur during successive bankfull events until vegetation becomes sufficiently established to protect the banks. It could take up to two winters for streambanks to stabilize after culvert removals.

Proposed road decommissioning within Riparian Reserves (Boaz Gulch and unnamed Grouse Creek tributary) and road stream crossing removal on perennial streams (Boaz and Felix Gulches) would have the highest risk of having indirect effects on sedimentation.

On Boaz Gulch (a tributary to the Applegate River), more than 0.6 miles of road within the Riparian Reserve and very near to the stream channel would be decommissioned. Within that same 0.6 miles of road, three road stream crossings would also be decommissioned. Where road stream crossings would be removed, maximum bankfull depths range from 0.5 to 0.6 feet and bankfull widths range from 2.9 to 5.4 feet. The closest road stream crossing is over 0.8 miles away from the confluence of Boaz Gulch with the Applegate River. High levels of erosion and sedimentation have already occurred on Boaz Gulch, as the stream has bypassed blocked road crossing culverts and streamflow has occurred along the road surface and ditch for hundreds of feet. Increases in sedimentation due to soil disturbance from proposed road and road stream crossing decommissioning would be small compared to existing levels on Boaz Gulch. Returning streamflow to the natural stream channel and off of the road surface would result in an immediate reduction in sediment delivery to the stream. The need for this restoration work is identified in the *Applegate-Star/Boaz Watershed Analysis* (USDI 1998, p. 64).

Decommissioning of a single road stream crossing on Felix Gulch (a perennial stream and tributary to Waters Gulch) would result in short-term sedimentation due to soil disturbance from instream work. Where the road stream crossing would be removed, maximum bankfull depths range from 0.2 to 0.4 feet and bankfull widths range from 1.9 to 2.1 feet. The crossing is approximately 0.6 miles away from the confluence with Waters Gulch (a perennial fish-bearing stream). It is therefore unlikely that sediment delivered to Felix Gulch due to soil disturbance resulting from road crossing removal would reach Waters Gulch. If any sediment did reach Waters Gulch, the amount would likely be negligible compared to background levels.

Approximately 0.5 miles of road and a single road stream crossing would be decommissioned within the Riparian Reserve of an intermittent stream that is a tributary to Grouse Creek (a perennial fish-bearing stream). The road stream crossing would be removed at the lower end of a short-term intermittent stream, located about 0.4 miles away from Grouse Creek. The stream channel at the point of the road stream crossing has a maximum bankfull depth is 0.4 feet and a bankfull width of 2.8 feet. Soil disturbance due to instream work at the road stream crossing and to 0.5 miles of road decommissioning within the stream riparian area would result in short-term sedimentation to the intermittent stream and potential short-term sedimentation to Grouse Creek.

Short-term sedimentation as a result of log truck travel on roads in the project area would be minimal due to seasonal hauling restrictions (BMPs) and proposed road surfacing.

Proposed road work in and near streams would increase sedimentation rates in the short term. Over the long term, road drainage improvements to existing roads, upper slope locations (near ridgelines) of most new roads (except the beginning of road 39-3-15.1), and decommissioning of problem roads and road stream crossings would result in a net reduction in sediment delivered to streams. Road renovation proposed for approximately 24 miles of road would have a positive long-term effect on stream sedimentation problems in the project area.

Channel Morphology

Under Alternative B, proposed Riparian Reserve treatments would have beneficial long-term indirect effects on channel morphology. Thinning and fuels treatments within Riparian Reserves would promote the growth of larger trees that will be the source of large woody debris (LWD) to stream channels. LWD adds to the complexity of stream channels in that it provides cover, produces and maintains pool habitat, retains gravels and sediments, and increases stream sinuosity (USDI 1998).

Proposed road decommissioning at stream crossings would remove culverts and allow stream channels to return to their natural form. Road decommissioning within Riparian Reserves would allow the reestablishment of riparian vegetation that would eventually be a source of LWD. Road drainage improvements would reduce the amount of channel downcutting and streambank erosion that is occurring at culvert outlets.

Streamflow

Alternative B would indirectly effect streamflows in the project area as a result of changes in road drainage, road density, and vegetative cover. Road renovation under Alternative B is proposed for

approximately 26 miles of road in the project area. Improvements to road drainage would further disperse road runoff, decreasing the rapid, concentrated routing of water to streams during storm events. This would help to minimize the impact of roads on the timing and magnitude of peak streamflows.

Of the 7.2 road miles proposed to be decommissioned under Alternatives B and C, 0.5 miles cross the ridgeline into drainages outside of the project area. Road decommissioning would disconnect the remaining 6.7 road miles within the Bobar project area from the hydrologic network. Subsurface flows would no longer be intercepted and routed down ditchlines, thus reducing the magnitude of peak flows.

Under Alternative B, soil compaction from yarding would be minimized. Project design features such as no yarding in Riparian Reserves, waterbarring tractor skid trails, and avoiding tractor skid trails on slopes over 35 percent, would prevent surface flow from traveling very far down skid trails or reaching stream channels. The risk of increased magnitude or frequency of peak flows as a result of soil compaction from proposed tractor skid trails would be very low.

Road density in the project area would decrease by 0.8 percent, from 4.94 mi/mi^2 to 4.90 mi/mi^2, after decommissioning 6.7 road miles (plus an additional 0.5 miles on the same ridge but outside the project area boundary) and constructing 6.0 miles of new roads (Table 4.1). The greatest percent decreases in road density would occur in the 7^{th} level drainage areas AU 0218 (15%), LA 0506 (12%), LA 0509 (11%), and AU 0360 (10%). These drainage areas would be most likely to experience a reduction in frequency and/or magnitude of peak flows due to road decommissioning. The greatest percent increases in road density would occur in the 7^{th} level drainage areas LA 0430 (29%), LA 0503 (15%), and AU 0363 (14%). Impacts on streamflow regime due to road density increases in these drainage areas would most likely be offset by proposed improvements to road drainage that would reduce channelization of runoff, placement of new roads in stable locations generally high on ridges, and decommissioning of problem roads and road stream crossings. The net impact on hydrology in these drainage areas would be no effect or a slight decrease in the frequency and/or magnitude of peak flows due to road construction and decommissioning.

Drainage Area Number* (see Table 3.1)	Road Density in Bobar Project Area (mi/mi^2)			Road Density in Total HUC 7 Drainage Area (mi/mi^2)		
	Existing	Alternative B	Percent Change	Existing	Alternative B	Percent Change
AU 0218	4.9	4.2	-15.0	6.6	6.3	-4.2
AU 0360	3.1	2.8	-10.3	4.1	3.9	-6.1
AU 0363	7.1	8.1	13.6	6.5	6.7	2.4
LA 0427	12.4	13.1	5.6	9.7	10.0	2.6
LA 0430	3.0	3.8	29.1	3.5	4.2	21.5
LA 0503	2.9	3.3	14.7	5.3	5.4	2.3
LA 0506	3.9	3.4	-12.0	3.9	3.4	-12.0
LA 0509	3.8	3.4	-10.6	3.8	3.4	-10.6
LA 0542	5.2	5.1	-1.5	5.2	5.1	-1.5
LA 0545	7.1	7.2	1.4	7.1	7.2	1.4
Total	**4.9**	**4.9**	**-0.8**	**5.8**	**5.8**	**-0.4**

Table 4.1. Project Effects on Road Density - Alternative B

*Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

The Forest Service method (Chapter 3) is used to assess the watershed risk rating for each 7th level drainage area that is located entirely or partially within the project area. The watershed risk rating is determined using three factors; drainage area road densities, the percent of timber stands less than 30 years in age, and the average watershed relief. These factors influence the hydrologic functions associated with streamflow regimes and the watershed risk rating can be viewed as an indicator of watershed sensitivity to additional disturbance. Under Alternative B, road densities for the entire project area and for the combined 7th level drainage areas would change very little (Table 4.1). Road densities for individual drainage areas would increase by as much as 22 percent (LA 0430) or decrease by as much as 12 percent (LA 0506), but they would still remain moderate to high for all drainage areas (Table 4.1). The silvicultural treatments that would have a potential impact on the percent of stands less than 30 years old are the Douglas-fir regeneration and pine site treatments (Scott Haupt, personal communication). Site specific conditions such as stand structure and health determine the percent of stands under Douglas-fir regeneration and pine site prescriptions that would be reduced in age to less than 30 years. Assuming 50 percent of stands under Douglas-fir regeneration and pine site prescriptions would be lowered in age to less than 30 years, the percent of stands less 30 years old would increase under Alternative B in all drainage areas except LA 0509 and LA 0545 (Table 4.2). Due to the combination of road density and stand age, the watershed risk rating for each drainage area would remain the same as under existing conditions (Chapter 3), except drainage area LA 0430 would change from moderate risk to high risk (Table 4.2).

Table 4.2. Watershed Risk Rating – Alternative B

Drainage Area Number* (see Table 3.1)	Road Density (mi/mi^2)		Percent of Drainage Area with Stands < 30 years old		% Watershed Relief	Watershed Risk Rating
	Existing	Alternative B	Existing	Alternative B		
AU 0218	6.6	6.3	11	13	21	High
AU 0360	4.1	3.9	6	8	25	High
AU 0363	6.5	6.7	21	22	20	High
LA 0427	9.7	10.0	25	26	16	High
LA 0430	3.5	4.2	5	9	16	High
LA 0503	5.3	5.4	13	13	28	High
LA 0506	3.9	3.4	7	10	17	High
LA 0509	3.8	3.4	6	6	36	High
LA 0542	5.2	5.2	15	19	22	High
LA 0545	7.1	7.2	25	25	28	High

* Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

The high watershed risk rating for each drainage area indicates that it is extremely important that the proposed project result in reduced risk of degradation to the watershed rather than increasing that risk. The numbers in Table 4.2 must be looked at in relation to conditions on-the-ground. An increase in road density that includes major road drainage improvements on existing roads and proper road design and location with implementation of BMPs for new road construction would actually be improving watershed condition. For the percent of drainage area with stands less than 30 years old, the harvest method also needs to be examined, as a unit logged by helicopter would have less adverse effects on hydrologic conditions than indiscriminant tractor logging. In assessing the level of risk in the proposed project, current conditions must be weighed against proposed and possible future changes, both human-caused and natural. The risk of watershed degradation resulting from the proposed project must be compared to the risk of degradation expected under the natural fire regime of the area with the current dense vegetation conditions.

Alternative C

Direct Effects

Water Quality

Alternative C would have the same direct effects on water quality as Alternative B except there would be no short-term sediment increases to an unnamed stream located in drainage area AU 0363 (see Table 3.1 for drainage area description) due to a new road stream crossing installation.

Channel Morphology

Alternative C would have the same direct effects as Alternative B on channel morphology in the project area, except for a drainage crossing on a small intermittent stream (a tributary to the Applegate River located in drainage area AU0363 (see Table 3.1 for drainage area description)). A new road stream crossing would not be installed at that location, and the stream channel at that location would maintain a natural substrate and connection with the surrounding floodplain.

Streamflow

Alternative C would have no direct effects on the streamflow regime in the project area.

Indirect Effects

Water Quality

Alternative C would have essentially the same indirect effects on water quality as Alternative B, except the absence of new road construction would reduce the potential for additional sedimentation to streams in the project area. While approximately 1.3 miles less road would be decommissioned under this alternative, that same 1.3 miles of road would have drainage improvements that would substantially reduce the potential for additional sediment delivery to streams from those roads.

Channel Morphology

Alternative C would have the same indirect effects on channel morphology as Alternative B.

Streamflow

Road density in the project area would decrease from 4.94 to 4.63 mi/mi^2 (6.3%) after decommissioning 5.4 road miles (plus an additional 0.5 miles on the same ridge but outside the project area boundary). The greatest percent decreases in road density within the project area would occur in the 7th level drainage areas AU 0360 (-16.1%), AU 0218 (-15%), and LA 0506 (-9.5%)(Table 4.3). These drainage areas would be most likely to experience a reduction in frequency and/or magnitude of peak flows due to road decommissioning. None of the drainage areas would have an increased road density.

Table 4.3. Project Effects on Road Density - Alternative C

Drainage Area Number* (see Table 3.1)	Road Density in Bobar Project Area (mi/mi^2)			Road Density in Total HUC7 Drainage Area (mi/mi^2)		
	Existing	Alternative C	Percent Change	Existing	Alternative C	Percent Change
AU0218	4.89	4.16	-15.0	6.58	6.31	-4.2
AU0360	3.11	2.61	-16.1	4.15	3.76	-9.4
AU0363	7.13	7.13	0.0	6.51	6.51	0.0
LA0427	12.37	12.20	-1.4	9.73	9.66	-0.6
LA0430	2.97	2.96	-0.3	3.49	3.48	-0.3
LA0503	2.89	2.89	0.0	5.31	5.31	0.0
LA0506	3.91	3.54	-9.5	3.91	3.54	-9.5
LA0509	3.80	3.75	-1.3	3.80	3.75	-1.3
LA0542	5.23	4.99	-4.6	5.23	4.99	-4.6
LA0545	7.08	6.77	-4.3	7.08	6.77	-4.3
Total	**4.94**	**4.63**	**-6.3**	**5.82**	**5.63**	**-3.3**

* Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

The Forest Service method (Chapter 3) is used to assess the watershed risk rating for each 7th level drainage area that is located entirely or partially within the project area. The watershed risk rating is determined using road density, stand age, and watershed relief. The percent of forested stands less than 30 years old would be the same as under Alternative B (Table 4.4). Although the road density would be reduced in all but two drainage areas, the watershed risk rating for each drainage area would remain the same as under Alternative B.

Table 4.4. Watershed Risk Rating – Alternative C

Drainage Area Number* (see Table 3.1)	Road Density (mi/mi^2)		Percent of Drainage Area with Stands < 30 years old		% Watershed Relief	Watershed Risk Rating
	Existing	Alternative C	Existing	Alternative C		
AU 0218	6.6	6.3	11	13	21	High
AU 0360	4.1	3.7	6	8	25	High
AU 0363	6.5	6.5	21	22	20	High
LA 0427	9.7	9.7	25	26	16	High
LA 0430	3.5	3.4	5	9	16	High
LA 0503	5.3	5.3	13	13	28	High
LA 0506	3.9	3.4	7	10	17	High
LA 0509	3.8	3.4	6	6	36	High
LA 0542	5.2	5.0	15	19	22	High

LA 0545	7.1	6.8	25	25	28	High

* Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

Table 4.5. Water Quality, Channel Morphology, and Streamflow Short and Long-Term Effects: Summary by Alternative

Resource	Alternative A		Alternative B		Alternative C	
	Short Term	Long Term[1]	Short Term	Long Term	Short Term	Long Term
Water Quality for 303(d) Listed Streams						
Flow modification	NE	NE	NE	NE	NE	NE
Stream temperature	NE	BE/MAE	NE	BE	NE	BE
Sedimentation	NE	MAE/HAE	LAE	BE	LAE	BE
Channel Morphology						
Width-to-depth ratio	NE	MAE	LAE	BE	LAE	BE
Channel structure (large wood)	NE	BE/MAE	NE	BE	NE	BE
Streamflow	NE	BE/MAE	NE	BE	NE	BE

Key: NE = no effect (i.e. no change from existing conditions); BE = beneficial effect; LAE = low adverse effect; MAE = moderate adverse effect; HAE = high adverse effect

[1] Potential long-term effects under Alternative A include a high risk for a catastrophic fire. Long-term effects are shown for no major fire followed by a '/' and then for effects resulting from a major fire.

Watershed Cumulative Effects

For the watershed cumulative effects analysis, the direct and indirect effects that result from the alternatives are considered with past, present, and reasonably foreseeable future forest management actions in the project area and at the larger scale. Past management actions are incorporated into the existing condition analysis. Chapter 3 of this E.A. describes the existing watershed conditions for the project area, and the 1998 *Applegate-Star/Boaz Watershed Analysis*, the 1994 *Beaver Palmer Watershed Analysis*, and the 1995 *Little Applegate River Watershed Analysis* describe the existing watershed conditions for the Applegate River-McKee Bridge and Little Applegate River 5th level watersheds. Present *federal* actions include BLM and USFS actions that have occurred since completion of the watershed analyses, and reasonably foreseeable future *federal* actions are known upcoming BLM and USFS projects. For present and reasonably foreseeable future management actions on non-federal timber lands, it is assumed that all merchantable timber stands would be clearcut. Because the existing road density on non-federal lands is fairly high, it is assumed that no new roads would be built on these non-federal lands in the reasonably foreseeable future.

Cumulative Effects in the Project Area and Associated 7th Level Drainage Areas

Present federal actions include the Slashbuster 3 and Manual Treatments project that was completed on

BLM-administered lands within drainage area LA0427 during 2002. Mechanical treatments (slashbuster) covered 634 acres and manual treatments affected 202 acres for a total of 836 treated acres; 35.6% of drainage area LA0427. The environmental assessment for this project (USDI 2001) did not identify any adverse affects to water quality, channel morphology, or streamflow.

On Forest Service lands within the project area and associated 7th level drainage areas, the only reasonably foreseeable future action would be the non-commercial thinning of 50 to 100 acres of shrub and conifer in the China Gulch drainage (within drainage area AU0218 on the west side of the Applegate River). Reasonably foreseeable future actions on BLM-administered lands within the project area and associated 7th level drainage areas would include proposed actions for the Bobar project (Alternative B or C), and the commercial thinning of approximately 50 acres of conifer stands under the Boaz Forest Health and Small Diameter Utilization project. The Boaz project would reduce stand densities from 500 to 130 trees/acre with no new roads. Reasonably foreseeable future actions on private lands within the project area and associated 7th level drainage are difficult to predict since industrial forest land management is generally market-driven. The assumption used for this analysis is that all merchantable timber stands on private forest lands would be clearcut. Private land harvest projections are based on analysis of the 2001 aerial photos.

Alternative A

Water Quality

Water temperatures in the project area would likely be maintained or improve slightly under the cumulative effects of Alternative A added to past and future federal and private actions. Stream shade on federal lands in the project area would increase as riparian vegetation continues to recover from past harvest. Under Alternative A, the cumulative effect of no fuel reduction treatments on federal lands would increase the likelihood of larger and more intense wildfires within the project area. A high intensity fire would likely set-back the shade recovery and lead to increased water temperatures. The risk of high intensity wildfires on private lands in the project area would be reduced over time with implementation of the Applegate Fire Plan.

The Total Maximum Daily Loads (TMDLs) for water temperature in the Applegate River Subbasin are scheduled to be set in 2003 along with the implementation of the Water Quality Management Plan (WQMP) to be issued by the Oregon Department of Environmental Quality. The Water Quality Management Plan will identify management necessary to meet water quality standards for agricultural lands, private or state forest lands, rural areas, and federal lands in the Applegate River Subbasin. Agricultural lands would be managed according to the management plan developed under Senate Bill 1010. Private industrial timber lands would continue to be harvested according to the Oregon Forest Practices Act. Improvements to water temperatures in the project area would likely be more noticeable in the smaller tributary streams than in the mainstem rivers and major tributaries. Decreases in summer water temperature for the 303(d) listed streams in the project area (Applegate and Little Applegate Rivers and Yale Creek) would require major changes in management of riparian areas, irrigation withdrawals, and channel morphology on private lands and would take many years to detect. The Farmer's Ditch project directed by the Applegate River Watershed Council will increase streamflows by approximately 10 cubic feet per second (cfs) in the portion of the Little Applegate River within the project area. This project is ongoing and expected to be completed in 2 to 3 years. Irrigation withdrawals from the Little Applegate River will be replaced by stored water from the Applegate

Reservoir. This project will likely result in reduced summer stream temperatures in the lower portion of the Little Applegate River.

Sediment input from roads and streambanks would likely continue at the existing rate until restoration work identified in the Applegate River WQMP is implemented on federal and private lands throughout the project area. Road improvements to reduce erosion from federal roads would occur when appropriated funds become available. Sediment from other management activities on private lands would likely continue at the same level or increase until the WQMP is implemented. A severe intensity fire in the project area would result in levels of soil erosion and sedimentation that are higher than those existing.

Channel Morphology

Cumulative effects to channel morphology would include the continuation of existing sediment levels and lack of large wood until restoration projects reduce sediment input and riparian areas start contributing large wood to the channels. Based on the Riparian Reserve widths for federal lands, future large wood contributions would likely be higher on federal lands than private lands. Impacts to channel morphology could include wider and shallower channels. A high intensity fire would reduce potential future large wood recruitment and extend the time for trees to contribute down large wood in stream channels.

Streamflow

Under Alternative A, the cumulative watershed risk rating (based on road densities, watershed relief, and the percent of the drainage area with forested stands less than 30 years old) would be high for all drainage areas (Table 4.6). Projected road densities would remain the same as under existing conditions in Chapter 3 (Table 3.6). Based on projections assumed for harvest on BLM, Forest Service, and private lands, the percent of the drainage area with stands less than 30 years old would increase in all drainage areas (Table 4.6). Hydrologic functions affecting peak streamflows would remain in an altered state under Alternative A.

Table 4.6. Cumulative Watershed Risk Rating for Alternative A and Projected Future Management Actions on All Lands.

Drainage Area Number* (see Table 3.1)	Road Density (mi/mi^2)		Percent of Drainage Area with Stands < 30 years old		% Watershed Relief	Watershed Risk Rating
	Existing	Alternative A	Existing	Alternative A		
AU 0218	6.6	6.6	11	13	21	High
AU 0360	4.1	4.1	6	7	25	High
AU 0363	6.5	6.5	21	29	20	High
LA 0427	9.7	9.7	25	41	16	High
LA 0430	3.5	3.5	5	12	16	High
LA 0503	5.3	5.3	13	18	28	High
LA 0506	3.9	3.9	7	9	17	High
LA 0509	3.8	3.8	6	10	36	High
LA 0542	5.2	5.2	15	17	22	High
LA 0545	7.1	7.1	25	28	28	High

* Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

Alternative B

Water Quality

Water temperatures in the project area would likely be maintained or improve slightly. Protection of Riparian Reserves on federal lands would allow riparian vegetation to continue to recover from past harvest and increase stream shade. Private industrial timber lands would continue to be harvested according to the Oregon Forest Practices Act. Implementation of the Total Maximum Daily Loads (TMDLs) for water temperature and the Water Quality Management Plan for agricultural lands, private or state forest lands, rural areas, and federal lands in the Applegate River Subbasin would be the same as under Alternative A.

Water quality degradation caused by sediment input from roads and streambanks on federal lands would improve considerably due to road renovation and decommissioning proposed under Alternative B. Any sediment increases resulting from the proposed road construction under Alternative B would be minor relative to existing sediment levels and would be offset by the substantial sediment decreases resulting from road renovation and decommissioning. Sediment input from private lands would likely continue at the existing rate or increase if additional soil disturbance occurs until restoration work and management strategies identified in the Applegate River WQMP are implemented.

Channel Morphology

Cumulative effects to channel morphology would include an overall reduction of existing sediment levels due to road restoration work proposed for federal lands. The lack of large wood would continue until riparian areas across the project area start contributing large wood to the channels. Based on the Riparian Reserve widths for federal lands, future large wood contributions would likely be higher on federal lands than private lands. Proposed thinning and fuel reduction treatments within Riparian Reserves on federal lands would promote the growth of larger trees that will eventually fall into adjacent streams and become large woody debris. Over time, channel structure would improve on the smaller tributary streams and lead to narrower and deeper channels. Channel morphology is not likely to change noticeably on the mainstem rivers and major tributaries in the project area.

The one new road stream crossing on an intermittent stream proposed under Alternative B is not expected to result in any cumulative effects on channel morphology. Road decommissioning at stream crossings on federal lands in the project area would remove culverts and allow stream channels to return to their natural form. Road drainage improvements on federal lands would reduce the amount of channel downcutting and streambank erosion that is occuring at culvert outlets. This improvement could be offset by additional road construction involving stream crossings on private lands.

Streamflow

Under Alternative B, the cumulative watershed risk rating (based on road densities, watershed relief, and the percent of the drainage area with forested stands less than 30 years old) would be high for all drainage areas (Table 4.7). Projected road densities would be the same as the Streamflow indirect effects under Alternative B (Table 4.2). Based on proposed harvest under Alternative B and projections assumed for harvest on BLM, Forest Service, and private lands, the percent of drainage area with stands less than 30 years old would increase in all drainage areas (Table 4.7). Improvements to road drainage and decommissioning of problem roads and road stream crossings under Alternative B would have a positive effect on decreasing the frequency and/or magnitude of peak flows. The overall cumulative effects of Alternative B and past and future management actions on private and federal lands would retain the hydrologic functions affecting peak streamflows in an altered state.

Table 4.7. Cumulative Watershed Risk Rating for Alternative B and Projected Future Management Actions on All Lands.

Drainage Area Number* (see Table 3.1)	Road Density (mi/mi^2)		Percent of Drainage Area with Stands < 30 years old		% Watershed Relief	Watershed Risk Rating
	Existing	Alternative B	Existing	Alternative B		
AU 0218	6.6	6.3	11	14	21	High
AU 0360	4.1	3.9	6	8	25	High
AU 0363	6.5	6.7	21	29	20	High
LA 0427	9.7	10.0	25	43	16	High
LA 0430	3.5	4.2	5	17	16	High
LA 0503	5.3	5.4	13	18	28	High
LA 0506	3.9	3.4	7	12	17	High
LA 0509	3.8	3.4	6	10	36	High
LA 0542	5.2	5.1	15	21	22	High

LA 0545	7.1	7.2	25	28	28	High

* Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

Alternative C

Water Quality

Cumulatve effects of Alternative C on water temperatures in the project area would be the same as under Alternative B. Cumulative effects of Alternative C on sedimentation in the project area would be the same as under Alternative B except there would not be any sediment increases due to road construction.

Channel Morphology

Cumulative effects to channel morphology under Alternative C would be the same as under Alternative B.

Streamflow

Under Alternative C, the cumulative watershed risk rating (based on road densities, watershed relief, and the percent of the drainage area with forested stands less than 30 years old) would remain high for all drainage areas (Table 4.8). Projected road densities would be the same as the Streamflow indirect effects under Alternative C (Table 4.4) and the cumulative percent of drainage area with stands less than 30 years old would be the same as under Alternative B (Table 4.7). Reductions in road density and improvements to road drainage under Alternative C would have a positive effect on decreasing the frequency and/or magnitude of peak flows. The overall cumulative effects of Alternative C and past and future management actions on private and federal lands would retain the hydrologic functions affecting peak streamflows in an altered state.

Table 4.8. Cumulative Watershed Risk Rating for Alternative C and Projected Future Management Actions on All Lands.

Drainage Area Number* (see Table 3.1)	Road Density (mi/mi^2)		Percent of Drainage Area with Stands < 30 years old		% Watershed Relief	Watershed Risk Rating
	Existing	Alternative C	Existing	Alternative C		
AU 0218	6.6	6.3	11	14	21	High
AU 0360	4.1	3.7	6	8	25	High
AU 0363	6.5	6.5	21	29	20	High
LA 0427	9.7	9.7	25	43	16	High
LA 0430	3.5	3.4	5	17	16	High
LA 0503	5.3	5.3	13	18	28	High
LA 0506	3.9	3.4	7	12	17	High
LA 0509	3.8	3.4	6	10	36	High

LA 0542	5.2	5.0	15	21	22	High
LA 0545	7.1	6.8	25	28	28	High

* Drainage Areas: **AU 0218**-Applegate River below Beaver Creek, above Star Gulch; **AU 0360**-Applegate River below Star Gulch, above Lime Gulch; **AU 0363**-Applegate River below (and including) Lime Gulch, above Little Applegate River; **LA 0427**-Waters Gulch; **LA 0430**-Yale Creek below Waters Gulch, above Little Applegate River; **LA 0503**-Little Applegate River below Yale Creek, above Grouse Creek; **LA 0506**-Grouse Creek; **LA 0509**-Little Applegate River below Grouse Creek, above Sterling Creek; **LA 0542**-Little Applegate River below Sterling Creek, above drainage area LA 0545; **LA 0545**-Little Applegate River below drainage area LA 0542, above Applegate River. See Table 3.1 for details.

Cumulative Effects Outside the Project Area

Outside of the project area, the Little Applegate River and Applegate River-McKee Bridge Watersheds (5^{th} level hydrologic units) were analyzed for watershed cumulative effects. For the Bobar project, only Alternative B is analyzed for cumulative watershed effects outside the project area since project level effects become diluted at the larger scale and effects of Alternative A and C would be less than Alternative B. Vegetation information for private forest lands was derived from the 1993 Western Oregon Digital Image Processing (WODIP) satellite imagery data. For analysis purposes, it is assumed that the total acres of merchantable timber obtained from the WODIP data have either been harvested since 1993 or will be harvested in the foreseeable future.

Little Applegate River Watershed

In August 2001, the Quartz Fire burned 954 acres of BLM, 3,466 acres of Forest Service, 71 acres of Oregon State, and 1,669 acres of private lands in the Yale and Glade Creek subwatersheds. In July 2002, the Squires Peak Fire burned 1,981 acres of BLM and 819 acres of private lands in the Lower Little Applegate Subwatershed. Combined, these two fires burned a total of 12% of the Little Applegate River Watershed. Burn intensities varied from low to high across the landscapes affected by these wildfires. According to the Oregon Department of Forestry, 32 miles of dozer firelines and 11 miles of hand firelines were constructed for suppression of the Quartz Fire. These firelines were waterbarred, seeded, and mulched after the fires were controlled. For this cumulative effects analysis, no salvage activities are anticipated on BLM and Forest Service lands in these fire areas, and the forested lands on non-federal burned areas are already included in the estimated harvest acreages for private lands listed below.

The Slashbuster 3 and Manual Treatments project was completed on BLM-administered lands during 2002. Mechanical treatments (slashbuster) covered 634 acres and manual treatments affected 202 acres within the Little Applegate River Watershed for a total of 836 treated acres (1% of the Watershed).

Reasonably foreseeable future harvest on federal lands in the Little Applegate River Watershed would cover approximately 15.4 percent of the area (Table 4.9). Best Management Practices, Riparian Reserves, and harvest prescriptions would minimize adverse affects on hydrologic processes in the analysis area.

Table 4.9. Reasonably Foreseeable Future Harvest Actions on Federal Lands in the Little Applegate River 5th Level Watershed

Project Name	Administrative Unit	Acres of Commercial Harvest	Acres of Non-Commercial Harvest	Estimated Sale Date
Bobar (Alt. B)	BLM	1888	1637	2003
Bald Lick	BLM	4398	-	2004
Prince Castor	BLM	2385	-	2005
Wagner Gap	USFS	447	-	--
Neighborhood Fuels	USFS	-	7	2003
Stewardship Pilot	USFS	290	101	2003
Total		9408	1745	**15.4% of Little Applegate River Watershed**

The estimated present and foreseeable future harvest from private lands would be 10.9 percent of the Little Applegate River Watershed. Present and foreseeable future federal land harvest combined with projected private land harvest would total 26.3 percent of the Little Applegate River Watershed.

Other than the road work proposed under the Bobar project, reasonably foreseeable future road construction and decommissioning on BLM-administered lands in the Little Applegate River Watershed are not known at this time, however, it is likely that road rennovation and decommissioning would be included in other future projects.

Water Quality

The cumulative effects of past, present, and reasonably foreseeable future management actions in the Little Applegate River Watershed would likely result in a trend of decreasing summer water temperatures in small perennial tributaries due to implementation of Riparian Reserves on federal lands and the Water Quality Management Plan (see discussion under Cumulative Effects within the Project Area, Alternative B, Water Quality) on private lands. High stream temperatures are likely to persist on the 303(d) listed reaches of the mainstem of Yale Creek primarily due to low summer flows and lack of riparian cover. The Applegate River Watershed Council is currently working on the Farmer's Ditch project that will increase summer flows in the lower portion of the Little Applegate River by approximately 10 cfs. Irrigation water diverted from the Little Applegate River will be replaced by stored water from the Applegate Reservoir. Increased summer flows in the mainstem Little Applegate River should lead to reduced summer water temperatures. Cooler summer stream temperatures in the tributaries would not likely affect the temperature in the mainstem Little Applegate River based on infrared imagery data collected in 1998 and 1999 (ARWC 2001).

Roads have been identified as the primary sediment source in the Little Applegate River Watershed (USDI and USDA 1995, ARWC 2001). Overall sediment production originating from federal lands in the Little Applegate River Watershed would likely decrease over time under the Northwest Forest Plan, especially with implementation of the Aquatic Conservation Strategy that includes Riparian Reserves and watershed restoration, and Best Management Practices. Watershed restoration projects such as the road renovation and decommissioning proposed for the Bobar project are essential components of sediment reduction efforts in the Little Applegate River Watershed. Sediments originating from private lands would

likely not change; this assumes continuation of current practices, particularly relating to roading and yarding activities (USDI and USDA 1995). The Water Quality Management Plan (WQMP) for the Applegate River Subbasin should identify restoration opportunities for sediment reduction on private and federal lands. Implementation of the WQMP proposed restoration efforts is critical for improving water quality in the Little Applegate River Watershed.

Channel Morphology

The cumulative effects of past, present, and reasonably foreseeable future management actions in the Little Applegate River Watershed would likely maintain or slightly improve channel conditions. As pointed out in the *Little Applegate River Watershed Analysis* (USDI and USDA 1995), historic hydraulic mining had the most dramatic impact on channel morphology in the watershed and the effects are still present. Road renovation and decommissioning proposed in future federal management actions will contribute to local channel improvements, however, at the 5th level watershed scale, these improvements would not be apparent.

Channel structure for small tributaries on federal lands would likely improve in the long term, as future proposed thinning and fuel reduction treatments within Riparian Reserves promote the growth of larger trees that would eventually become large woody debris in the stream channels. Large tree removal within riparian areas on private lands would continue to have a negative impact on the amount of large woody debris in streams within the Little Applegate River Watershed.

Negative effects on channel morphology resulting from excess sediment loads produced off federal lands would be reduced over time with implementation of the Northwest Forest Plan (see sediment discussion under Water Quality). Reductions in sediment sources from private lands would depend on the level of restoration effort applied to these lands.

Streamflow

The adverse effects of roads on the timing and magnitude of peak streamflows would be slightly diminished as a result of future proposed road renovation and decommissioning on federal lands in the Little Applegate River Watershed. This would be a gradual change over time as restoration projects are implemented on federal lands. Road density is assumed to continue at the same level on private land with minimum renovation work thus maintaining the current streamflow regime resulting from roads on private lands in the watershed. Additional road construction would tend to offset road density reductions resulting from road decommissioning.

Effects on the timing and magnitude of peak flows resulting from vegetation removal, especially in the transient snow zone, would likely be reduced due to future management actions on federal lands and maintained due to future management actions on private lands. Future timber harvest proposed for federal lands in the Little Applegate River Watershed would likely be predominately density management treatments that maintain at least 30 percent canopy closure. These vegetation treatments would have a low potential of adversely affecting peak flows. Timber harvest and agricultural land clearing on private lands in the watershed would likely continue at the same level and could result in local increases to the frequency and magnitude of peak flows. For the watershed as a whole, the cumulative effects of past, present, and reasonably foreseeable future management actions would not likely result in a noticable change in the frequency and magnitude of peak flows in the Little Applegate River Watershed.

Applegate River-McKee Bridge Watershed

The Slashbuster 3 and Manual Treatments project was completed on BLM-administered lands during 2002. Mechanical treatments (slashbuster) covered 734 acres and manual treatments affected 27 acres within the Applegate River-McKee Bridge Watershed for a total of 761 treated acres (1.5 % of the watershed).

Reasonably foreseeable future timber harvest on federal lands in the Applegate River-McKee Bridge Watershed would cover approximately 17.5 percent of the area (Table 4.10). Best Management Practices, Riparian Reserves, and harvest prescriptions would minimize adverse affects on hydrologic processes in the analysis area.

Table 4.10. Reasonably Foreseeable Future Harvest Actions on Federal Lands in the Applegate River-McKee Bridge 5th Level Watershed

Project Name	Administrative Unit	Acres of Commercial Harvest	Acres of Non-Commercial Harvest	Estimated Sale Date
Boaz	BLM	-	50	2003
Bobar (Alt. B)	BLM	705	648	2003
Bald Lime	BLM	660	-	2004
Deadman's Palm	BLM	5724	-	2004
Prince Castor	BLM	1267	-	2005
China Gulch	USFS	-	100	2003-2004
Total		**8356**	**798**	**17.5% of Applegate River-McKee Bridge Watershed**

The estimated present and foreseeable future harvest from private lands would be 3.8 percent of the Applegate River-McKee Bridge Watershed. Foreseeable future federal land harvest combined with projected private land harvest would total 21.3 percent of the Applegate River-McKee Bridge Watershed.

Other than the road work proposed under the Bobar project, reasonably foreseeable future road construction and decommissioning on BLM-administered lands in the Applegate River-McKee Bridge Watershed are not known at this time, however, it is likely that road rennovation and decommissioning would be included in other future projects..

Water Quality

The cumulative effects of past, present, and reasonably foreseeable future management actions in the Applegate River-McKee Bridge Watershed would likely result in a trend of decreasing summer water temperatures in small perennial tributaries due to implementation of Riparian Reserves on federal lands and the Water Quality Management Plan (see discussion under Cumulative Effects within the Project Area, Alternative B, Water Quality) on private lands. High stream temperatures are likely to persist on the 303(d) listed reaches of the mainstem of the Applegate River primarily due to withdrawals, high channel width-to-depth ratio, and lack of riparian cover. Cooler summer stream temperatures in the tributaries would not likely affect the temperature in the mainstem Applegate River due to the large differences in discharge between the tributaries and the mainstem.

Old clearcuts in granitics (Beaver Creek) and roads have been identified as the primary sediment sources

from lands in the Applegate River-McKee Bridge Watershed (USDA 1994 and USDI 1998). Along the Applegate River corridor, increased sedimentation is attributed to grazing in riparian zones and residential clearing (USDI 1998). Overall sediment production originating from federal lands in the Applegate River-McKee Bridge Watershed would likely decrease over time under the Northwest Forest Plan, especially with implementation of the Aquatic Conservation Strategy that includes Riparian Reserves and watershed restoration, and Best Management Practices. Watershed restoration projects such as the road renovation and decommissioning proposed for the Bobar project are essential components of sediment reduction efforts in the Applegate River-McKee Bridge Watershed. Sediments originating from private lands would likely not change; this assumes continuation of current practices, particularly relating to roading and yarding activities. The Water Quality Management Plan (WQMP) for the Applegate River Subbasin should identify restoration opportunities for sediment reduction on private and federal lands. Implementation of the WQMP proposed restoration efforts is critical for improving water quality in the Applegate River-McKee Bridge Watershed.

Channel Morphology

The cumulative effects of past, present, and reasonably foreseeable future management actions in the Applegate River-McKee Bridge Watershed would likely maintain or slightly improve channel conditions for tributaries to the Applegate River. Road renovation and decommissioning proposed in future federal management actions will contribute to local channel improvements, however, at the 5th level watershed scale, these improvements would not be apparent.

Channel structure for small tributaries on federal lands would likely improve in the long term, as future proposed thinning and fuel reduction treatments within Riparian Reserves promote the growth of larger trees that would eventually become large woody debris in the stream channels. Large tree removal within riparian areas on private lands would continue to have a negative impact on the amount of large woody debris in streams within the Applegate River-McKee Bridge Watershed.

Negative effects on channel morphology resulting from excess sediment loads produced off federal lands would be reduced over time with implementation of the Northwest Forest Plan (see sediment discussion under Water Quality). Reductions in sediment sources from private lands would depend on the level of restoration effort applied to these lands.

Streamflow

The adverse effects of roads on the timing and magnitude of peak streamflows would be slightly diminished as a result of future proposed road renovation and decommissioning on federal lands in the Applegate River-McKee Bridge Watershed. This would be a gradual change over time as restoration projects are implemented on federal lands. Road density is assumed to continue at the same level on private land with minimum renovation work thus maintaining the current streamflow regime resulting from roads on private lands in the watershed. Additional road construction would tend to offset road density reductions resulting from road decommissioning.

Effects on the timing and magnitude of peak flows resulting from vegetation removal, especially in the transient snow zone, would likely be reduced due to future management actions on federal lands and be maintained due to future management actions on private lands. Future timber harvest proposed for federal lands in the Applegate River-McKee Bridge Watershed would likely be predominately density management treatments that maintain at least 30 percent canopy closure. These vegetation treatments

would have a low potential of adversely affecting peak flows. Timber harvest and agricultural land clearing on private lands in the watershed would likely continue at the same level and could result in local increases to the frequency and magnitude of peak flows. For the watershed as a whole, the cumulative effects of past, present, and reasonably foreseeable future management actions would not likely result in a noticable change in the frequency and magnitude of peak flows in the Applegate River-McKee Bridge Watershed.

FISHERIES

Summary

The Aquatic Conservation Strategy (ACS) was developed to restore and maintain ecological health of watersheds and aquatic ecosystems on public lands. The strategy would protect aquatic habitat on federal lands managed by the Forest Service and Bureau of Land Management within the range of Pacific Ocean anadromous species. All Action Alternatives proposed would meet the requirements of the Aquatic Conservation Strategy. The ACS consistency is displayed in Appendix F.

Table -4-11. Summary of the effect of each Alternative on indicators important to fish populations and fish habitat. Details of these potential impacts and the cumulative effects are described in the text by alternative.

Issue	Alternative A (No Action)	Alternative B (With new roads)	Alternative C (No new roads)
Effect on SONC coho and Essential Fish Habitat	No change	Not Likely to Adversely Affect	Not Likely to Adversely Affect[1]
Fine sediments: short-term change	No change (problems remain)	Insignificant short-term increase; more risky than Alternative C	Insignificant short-term increase; less risky than Alternative B
Instream fine sediments: long-term change	Remains at current high levels	Input reduced	Input reduced
Peak flows	No change	No change	No change
Riparian Reserves	No change	Small improvements only at site scale; no change at larger spatial scales	Small improvements only at site scale; no change at larger spatial scales

1/ Note, however, that only the preferred alternative is submitted to NOAA Fisheries for consultation. Reinitiation of Section 7 consultation would only be needed if the decision in the FONSI would have more effects on listed species and their habitat than was previously analyzed.

Threatened and Endangered Aquatic Species and Essential Fish Habitat

This project is determined to be a "May Affect, Not Likely Adversely Affect (NLAA)" for listed coho salmon, their Critical Habitat, and Essential Fish Habitat. According to a simple USFS watershed condition model, past activities (federal, state, and private) in the watershed that have compromised aquatic habitat, the watershed is at increased risk for water quality problems. However, the project is NLAA because project design features, Riparian Reserve stipulations, buffers, and site conditions (e.g. stable soils) would ensure that there is a less than negligible chance of negatively affecting Critical Habitat for listed SONC coho or Essential Fish Habitat for coho, steelhead, and chinook. It is not a No Effect project because the project will improve peak flows and fine sediment loading at the project (HUC 6) scale, which will benefit listed coho and other aquatic species. This project has been reviewed by the SW Oregon Level 1 Team. It will be submitted to the NOAA Fisheries (formerly NMFS) with the expectation of receiving a Letter of Concurrence.

Fisheries - Alternative A - No Action

Direct and Indirect Effects

Alternative A would have no direct effect on fish or fish habitat. Under Alternative A, special funding for restoration work would be required and no BLM-funded road renovation would occur on private lands. Until funding for road restoration became available, fine sediment input into Boaz Gulch and Grouse Creek would continue to be a problem. In Grouse Creek, fine sediments would continue to settle in fish habitat, reducing the permeability of spawning gravels, filling in pools, and eliminating habitat for aquatic insects.

Riparian vegetation would continue to grow more slowly due to overly dense stands. Once the riparian vegetation reached late successional characteristics, it would provide some large wood recruitment that is currently in short supply. Increased large wood would benefit fish by creating pools, providing cover for fish and other aquatic species, trapping sediment, and stabilizing banks during high flow events.

Cumulative Effects

There would be a threat of a severe intensity, stand-replacement fire from the continued fire exclusion and lack of silvicultural treatments in the project area. Such a fire could lead to levels of soil erosion and sedimentation even higher than those existing, further damaging fish habitat. It could also eliminate stream shade and large wood recruitment.

Fisheries - Alternative B - Variable Prescriptions With Proposed Road Construction

Direct Effects

Under Alternative B, the only potential direct effects to fish would be related to a culvert replacement on Grouse Creek. This culvert, at approximately stream mile 1.0, is above the upper observed limit of steelhead at stream mile 0.5. However, since the culvert at stream mile 0.5 was replaced after the 1997 flood, steelhead may have recolonized the stream up to mile 1.0. If so, the two direct effects to fish would be 1) temporary disturbance, and 2) improved habitat.

The fish may be temporarily disturbed by the noise and activity of replacing the culvert, and move downstream to calmer pools. Anadromous fishes move all the time, up and downstream, from day-to-day, week-to-week, or seasonally, so it is very unlikely that moving to a different area would cause any physiological hardship for the steelhead. The movement would be within the natural parameters of their

normal activity, and would have no negative effect on the fish.

Replacing this culvert would have direct positive effects because as the habitat available for steelhead would be expanded. The fish would be able to access the habitat upstream of the culvert.

Other than this culvert replacement, there would be no direct effects to fish in Alternative B. No other types of instream work are proposed for the Bobar Project.

Indirect Effects

Sediment/Channel Condition

Of all the activities planned in Bobar, proposed road and helipad construction, renovation, and decommissioning have the greatest risk of adversely affecting aquatic habitat. These activities have the potential of adding to instream fine sediment loads. Excess fine sediment in fish-bearing streams can eliminate aquatic insect habitat (food supplies), reduce the permeability of spawning gravels, fill pools and winter refugia, and block the interchange of subsurface and surface waters.

However, there are several important factors that should all but eliminate the risk of sediment input to downstream aquatic habitat, and reduce the possibility of adverse effects to downstream coho Critical Habitat and EFH to "less than negligible."

(1) Location - All helipads are on ridges or knolls outside of Riparian Reserves and well away from intermittent or perennial headwater streams. The proposed new roads are very well placed; they stay almost totally on the ridge (with one exception, discussed below). Therefore, there is no route for fine sediments produced from road or helipad construction to even reach Riparian Reserves or streams. Without a route to water, this sediment cannot reach downstream fish habitat. Slide areas and slumps have been identified and will be avoided. Roads are located away from slide areas and stringent PDFs and road design should prevent any road failures. Unstable and potentially unstable areas will be included in Riparian Reserves and buffered from timber harvest. Consequently, there would be no increase in landslide rates due to the proposed activities.

(2) Strict sediment control measures: Even with appropriate road/helipad placement, the Bobar Project includes strict Best Management Practices (BMPs) and Project Design Features (PDFs) to control fine sediment produced during any kind of road work. These BMPs and PDFs were designed to prevent accumulation and movement of fine sediments out of the road work area, especially in places where road renovation (e.g. culvert replacements) crosses intermittent or perennial streams. The culvert replacement PDFs were developed by BLM engineers and fish biologists and reviewed with by NOAA Fisheries in 2001.

(3) Geology: As described in the Soil section of Chapter 3, the soils in the project area not highly erosive. The "Low Elevation Granitics" have granitic parent material, but are rockier, and much less prone to slumping or surface erosion than the often problematic "decomposed granitics" in the upper part of the Little Applegate Watershed. (See soil report for detailed information). The soils in metamorphic-based parent material are very stable. As described in the Soil and Hydrology sections of Chapter 4, with the implementation of strict sediment-control measures during construction, design features (e.g. outsloping) meant to eliminate problems before they start, and well-designed locations that eliminate all stream crossings except one, ensure that the two new roads, if maintained, will not be a sediment source to streams feeding the Applegate or Little Applegate Rivers.

(4) Natural sediment regime: As described in detail in the Hydrology section, culvert work on renovated and decommissioned roads will have the potential to contribute fine sediments to Riparian Reserves or streams. With the strict PDFs, sediment production on decommissioned or renovated roads would be localized and small. As described in the Hydrology section (Chapter 4), small, localized sediment pulses would most likely occur during storm events that occur the first fall/winter following the road work. The timing of this sediment pulse would coincide with normal high turbidity levels and the sediment from the proposed project would be such a small amount (due to strict controls from PDFs) it would not be discernible above background levels. Also note that renovation and decommissioning would occur in different years, so as to ensure there are no negative cumulative effects.

Timber harvest can also potentially increase fine sediment loading in streams. However, the following factors will prevent harvest-related soil disturbance from adding to the sediment load in project area streams and adversely affecting aquatic habitat within the project area or within downstream SONC coho Critical Habitat and EFH.

(1) As explained in the Soil section, although soil surface erosion rates would increase in disturbed areas, this disturbed soil would remain on site, trapped in duff and fallen logs, or part of the colluvium for hundreds of years. Riparian Reserves will serve as an additional sediment trap or buffer for any small rivulets of surface run-off or fine sediments, in the rare occurrence of a severe rain event after soils are saturated but before soils have stabilized.

(2) The PDFs for all upland harvest units are designed to stop surface erosion where it is occurring, rather than rely on the Riparian Reserves to protect streams. Not only would this maintain soil productivity, but it prevents concentration of fine sediments in the uplands, so that they do not reach the outer edges of Riparian Reserves. Extra attention will be paid to yarding corridors and skid roads.

As explained in the Hydrology section of Chapter 4, pre-commercial thinning (PCT) with hand crews would have no effect on erosion rates or sedimentation in the project area. Hand crews will be hiking into units and using chain saws to thin small brush and trees. Pre-commercial thinning with a "Slashbuster" has the potential to disturb soil in Riparian Reserves. However, the nature of the machine significantly reduces soil disturbance: it mows down small trees like a giant chipper, spreading chips and sticks evenly across the soil. The operator then drives on this protective chip layer before grinding up the next little group of small trees. Additional PDFs requiring "no driving" buffers and limiting the slope at which Slashbusters can operate will protect stream banks from entry or damage, eliminating any potential for localized sediment production. Handpiles will be kept out of streams and draws, in order to eliminate any possible fine sediment production from the bare burned soil after the piles are burned. (Note that post-project monitoring in the Applegate has found no incidence of ash or soil from burned handpiles entering streams; the duff layers and the rings of unburned fuel around the burned area are effective at stopping any runoff–in fact, no run-off was observed.) Therefore, PCT and Slashbuster work do not have the potential for adversely affecting aquatic habitat.

Broadcast burning associated with the fuel treatments would also have a negligible effect on sediments in the streams. As explained in the Soil section, broadcast burning increases the amount of mineral soil exposed by a varying amount, depending on the depth and consumption of the forest floor. As the broadcast burning will be an underburn, the intensity of the burn would be moderate to light and have little direct effect on soil properties. A light surface fire will generally only char the litter, leaving most of the mineral soil at least partially covered. Most soil and ash movement occurs during the first season after the

slash is burned and quickly diminishes as vegetation cover re-establishes. The increase in erosion rates over present levels would be slight as a result of burning the handpiles and/or a light intensity underburn. As described in the Hydrology section of Chapter 4, the increased potential of soil particles reaching the local waterways as a result of the prescribed burning would be negligible as underburning in Riparian Reserves would be avoided and handpiling of slash would not occur near waterways. In addition, handlines would not be constructed around Riparian Reserves, in order to avoid the creation of a sediment route into the Reserve. The small amounts of ash or soil contributed to streams would be insignificant and within the amounts analyzed for in the Medford RMP EIS.

Riparian Reserves

Thinning of small diameter trees within some Riparian Reserves is proposed to improve the growth rate of conifers for future large wood recruitment at a site-specific level, protect vegetative diversity, and facilitate less-damaging wildfires. Over time, as these trees fall into streams, there could be an increase in larger pool frequency at individual sites. This may cause some site-specific improvements along the small headwater streams, benefiting aquatic insects, amphibians, or riparian flora and fauna. However, LWD is currently so scarce across the project area, that the addition of larger wood would not even have any significant beneficial effects in the mainstem of HUC 7 drainages, should this wood move downstream in a flood event.

The thinning will not reduce shade on the streams, so temperature will not rise as a result of this precommercial understory thinning. As the trees get larger, there should be some increase in shade over the stream as their crowns fill out. The effect of the stream temperature may be noticeable at the site specific level; however, because water temperature is also affected by other factors (e.g. discharge, floodplain recharge, groundwater), temperature improvements may be indiscernible.

Cumulative Effects

The cumulative effects of the Bobar Project and projected future federal and private actions are discussed below. For the purposes of this analysis, BLM assumes that private industrial timber lands will be harvested according to the current Oregon Forest Practices Act, and private residential and agricultural land impacts will continue at current levels.

As described earlier in the document, the Little Applegate and Applegate River-McKee watersheds have experienced numerous anthropogenic disturbances at many spatial and temporal scales. In the last 100 years, fire suppression, private industrial timber harvest and road construction in riparian zones, instream wood removal, channel straightening, continued irrigation water withdrawals and rural residential development have all contributed to the degradation in fish habitat. Although another "perturbation" on the landscape, the Bobar Project hopes to correct some of the problems in the watershed. The silvicultural prescriptions attempt to restore more "natural" forest, woodland, grassland, and riparian conditions in the hopes of facilitating natural ecological processes (e.g. nutrient cycling, low-impact and patchy wildfires). With riparian prescriptions, road decommissioning, and road renovation BLM hopes to restore stream channel function. In other words, the proposed work should reduce the impact of past disturbances– at least on federal lands.

Unfortunately, the Bobar Project is too small to ameliorate the conditions on private land. The treated Riparian Reserves are such a small portion of the landscape, that at large scales (HUC-5 and HUC-6), there are no expected improvements to fish habitat condition. Off-channel habitat generally occurs in the low gradient alluvial portions of a river system, i.e. the Little Applegate and Applegate Rivers. In the Bobar Project Area, off-channel habitat has been destroyed by gold mining, agriculture, valley-bottom road

construction, and river channelization. The Bobar Project will not be able to restore off-channel habitat, nor will it adversely affects off-channel habitat. Roads, mining tailings, irrigation systems, flood-control berms and residential development have restricted floodplain connectivity for low gradient stream reaches. The Bobar Project does not contain any activities that can improve floodplain connectivity across these large scales.

As discussed in the Fish section of Chapter 3, streambed substrates within the analysis area lack variation in size because there are few instream structures (wood, root wads, log jams) to sort and grade cobbles and gravels. This results in poor spawning habitat, low quality pool habitat, and embedded stream cobbles. At these large scales, it would take improvements in channel structure throughout the entire watershed to significantly improve substrate sorting and availability. With the adverse impacts from private land (e.g. wood removal after floods, channel constraints, clearcutting), it is unlikely that any small amount of increased LWD from federal lands will be enough to create channel complexity and restore sediment in fish-bearing reaches, including coho Critical Habitat and Essential Fish Habitat. Any improvement in the size or amount of wood produced at the HUC 7 scale would only be a tiny amount of what would be needed to actually improve LWD amounts in the Little Applegate and Applegate Rivers.

As explained in the Hydrology section of Chapter 4, the Bobar Project will have no effect on stream water temperatures. Water temperatures in the mainstem rivers and major tributaries are significantly affected by irrigation water withdrawals, riparian tree removal for agriculture, and stream channelization on private land. Until these factors are improved, any improvements on upstream federal land will have less than a negligible effect on listed fish or other aquatic species.

As described in detail in the Hydrology Report, high road density in all watersheds and subwatersheds puts them at risk for water quality and stream flow problems. Implementation of PDFs will be even more important to ensure that road work does not create adverse cumulative effects in the project area. However, the cumulative effect of all the proposed project work would have positive impacts to instream fine sediment loading and peak flows in smaller, fishless streams. However, these changes will be too small to have any immediate positive impact to fish. Too many other factors influencing peak flows and sediment loading make the contributions of this project unnoticeable in fish-bearing streams. Over time, if restoration projects like the road renovation proposed in Bobar continue in the watershed, the cumulative effects of such restoration could have positive effects on fish habitat.

Although improving conditions at these specific sites, riparian areas in the Bobar Project area have been highly altered from a century of fire suppression, residence construction, agriculture, and forest management. Therefore, it is unlikely that the improvements to small areas will improve the overall function of riparian areas across each drainage.

Fisheries - Alternative C - Variable Prescriptions With No New Roads

Direct Effects

Direct Effects for Alternative C would be the same as for Alternative B. Road renovation in Grouse Creek is proposed, regardless of whether new roads are constructed elsewhere in the project area.

Indirect Effects

The impacts to fisheries would be slightly less than in Alternative B because there would be no new road construction in this alternative. Although there would be no new road construction in Alternative C, the road decommissioning and renovation may still add a short term increase of fine sediments at specific sites within the project area. Again, it is not expected that these small increases would have any negative

effect on stream systems. With time, the road renovations should decrease the fine sediment input rate and improve stream habitat downstream from problem areas, especially in Grouse Creek.

The indirect effects of commercial harvest, precommercial thinning, and fuels treatments are the same as for Alternative B. The fewer number of units would have no impact on the risk of fine sediment input to streams.

Cumulative Effects

The cumulative effects of this project on parameters important for fish habitat (e.g. sediment, temperature, or Large Wood) would be the same as for Alternative B. There would be no difference in cumulative effects as long as renovated and decommissioned roads are properly maintained and do not contribute fine sediments to streams. However, if roads are not properly maintained, then they may contribute to the cumulative negative effects of private, federal and state roads on fish habitat.

Wildlife

Wildlife - Alternative A- No Action

This alternative would have no immediate effect on the species discussed below. However, the on-going wildland fuel accumulation in the area would continue. This fuel buildup could facilitate stand replacement type wildfires in the event of an ignition. In the event of a stand replacement fire in the project area, many acres of suitable habitat for some or all of these species could be destroyed. It is impossible to determine the site specific, acute, effects of a theoretical, yet likely, wildfire, however the 2002 Squire fire which borders the Bobar project area on it's northern edge burned very intensely in un-managed timber-stands, and burned somewhat less intensely in stands which had been subject to commercial thinning and fuels reduction treatments. While thinned stands did suffer significant large tree mortality in some cases, untreated stands generally suffered higher or almost complete mortality.

The Applegate Valley is currently experiencing a die off of many large and medium sized trees due to the drought of 2001-2002 and insects. Large trees are important habitat components in forested stands for many species of wildlife. Dense stand conditions increase the effects of drought on large trees, leading to higher mortality than would occur in less dense stands. The continued death of large trees favors those wildlife species which specialize in the use of large snags and down wood, but this is at the expense of other species which prefer or require large live trees. The no-action alternative would allow the current process of large tree die off to take it's course and continue into the future because stand density would not be significantly reduced as is proposed under the action alternatives.

Many natural openings, brushfields, and meadows in the project area are being shrunken due to uninterrupted succession and encroachment. This process favors some species of wildlife which prefer or require more closed habitats with denser vegetation. This is at the expense of other species which prefer more open habitats. The no-action alternative would allow this process of succession and encroachment to continue unless and until a disturbance occurs which sets back the process.

Many areas that historically were in a white oak savannah habitat condition have been encroached by brush and young conifers. This condition weakens the old acorn producing oaks and subjects the oaks to the danger of being damaged or killed by unusually intense wildfire fueled by the thick brush understory.

The no action alternative would allow this process of brush encroachment into oak savannah habitat to continue.

Northern Spotted Owl *(Strix occidentalis caurina)*

No action: This alternative would have no immediate direct effect on this species.

Alternative B:

This project occurs within the provincial home range radius (1.3 miles) of 2 known spotted owl sites, both of which are inside the project area planning boundary. The loss of suitable habitat within the provincial home range radii of these sites constitutes Incidental Take of these owl sites. Incidental Take and the loss of suitable spotted owl habitat as a result of this proposed project requires consultation with the U.S. Fish and Wildlife Service (USFWS). This consultation occurred as part of the Medford District programmatic consultation for fiscal year 2002 and 2003 projects. A Biological Opinion addressing this consultation was issued by the USFWS on Oct. 12, 2001 (B.O. #1-7-01-F-032). The USFWS concluded that the projects covered in the consultation (including Alternative 2 and Alternative 3 of this proposed project) were not likely to jeopardize the survival of the spotted owl as a species.

Table 1 (below) displays the anticipated changes to spotted owl habitat suitability under this alternative.

Table 1. Spotted Owl habitat changes anticipated under Alternative B of the Bobar project.

Current habitat rating		Post-harvest habitat rating	Acres
Suitable	----->	Suitable	1,674
Suitable	----->	Dispersal	24
Suitable	----->	non-habitat	1,201
Dispersal	----->	Dispersal	1,541
Dispersal	----->	Non-habitat	550

Alternative C:

Same as Alterative B except that the acres affected are somewhat less than in Alternative 2. Table 1 (below) displays the anticipated changes to spotted owl habitat suitability under this alternative. A comparison between table 1 (above) and table 2 (below) clearly shows the differences between the action alternatives with regard to spotted owl habitat.

Table 2. Spotted Owl habitat changes anticipated under Alternative C of the Bobar project.

Current habitat rating		Post-harvest habitat rating	Acres
Suitable	----->	Suitable	1,835
Suitable	----->	Dispersal	19
Suitable	----->	Non-habitat	1,045
Dispersal	----->	Dispersal	1,621
Dispersal	----->	Non-habitat	470

Great Gray Owl *(Strix nebulosa)*
No action: No effect.

Alternative B:
Potential nest sites (trees with defect) would be reduced on approximately 175 acres subject to regeneration harvest. The quality of foraging habitat would be increased substantially by opening up existing brushfields that are almost certainly not attractive hunting spots for this open area hunter. Thinning dense stands enough to allow grass to come into the understory and provide clear flight lanes to the ground would convert stands currently of little value as foraging habitat for this species into "new" foraging areas. Opening the forest canopy may reduce the suitability of 264 acres of potential nesting habitat.

Alternative C:

Same as alternative B except that amount of forested acreage treated would be 34 acres less than in

Alternative B.

Northern Goshawk (*Accipiter gentilis*)
No action: No effect.

Alternative B:

Canopy closure would be reduced below 50% on approximately 264 acres of forest habitat subject to regeneration and pine site harvest prescriptions. These acres would be potentially less suitable for nesting goshawks.

Alternative C:

Canopy closure would be reduced below 50% on approximately 34 more acres than under Alternative B.

Golden Eagle (*Aquila chrysaetos*)
No action: No effect.

Alternative B:

Potential nest sites (large trees with defect) would be reduced on approximately 175 acres of regeneration harvested stands. New ridge top roads would reduce the suitability of timber stands for nesting by this species. New ridge top roads could also negatively affect existing but unknown nest sites.

Alternative C:

Same as Alternative B except that there would be no impacts associated with new roads.

Fisher *(Martes pennanti*)
No action: No effect.

Alternative B:

It is largely unknown what steps are necessary to protect the species and its habitat other than retention/protection of potential dens, which are hollow logs and trees, large cavities in trees and snags, and large horizontal brooms. The proposed silvicultural prescriptions do not target typical den structures for removal. However, on the 175 acres of proposed regeneration harvest some trees with potential den structures would probably be removed. Individuals of this species are known to be reluctant to cross major, paved roads such as Hwy. 62. The effects of road construction as proposed in this alternative are not known. However, the proposed roads are much narrower than Hwy 62, have a natural rock surface as opposed to pavement, and would be closed to public vehicle traffic. Additionally, most of the proposed road construction would be through habitats not typically associated with fisher use such as brushfields and grasslands. It is anticipated that these features would reduce any impact of the proposed roads on any fisher that may be in the area.

Alternative C:

Same as Alternative B except that any effects associated with road building that would occur under Alternative B would not occur under this Alternative

Siskiyou Mountain Salamander (*Plethodon stormii*)

No action: This alternative would have no direct or immediate effect on this species.

Alternative B:

Approximately 1000 acres of known occupied suitable habitat for this species was withdrawn from consideration for timber harvest and fuels treatments in the early planning stages of the Bobar project. Another 250 acres of suspected suitable habitat would be modified by removal of non-commmercial sized materials (generally less than 8-inch DBH). This type of treatment has been allowed in known occupied sites by all the historic and current Management Recommendations and Standards and Guidelines ever developed for this species. The interagency Standards and Guidelines for protection of known sites for this species call for the retention of all overstory trees. The scientific literature suggests that this species does best at sites with at least 70% canopy closure. None of the proposed treatments in this 250 acres would remove overstory trees. If slash piles created as a result of fuels reduction work on these 250 acres are burned during a season when any salamanders potentially occupying the habitat are well below ground this activity should have no effect on the species. Project design features/mitigation measures call for burning the piles only under these conditions. It is anticipated that there would be little if any effect on this species.

Alternative C:

Same as Alternative B.

Other Special Status Species

The following is a list of special status species that would not likely be affected by either action alternative. They (or their habitat) are not known or suspected to occur in the proposed project area, or no negative effect to their habitat is anticipated under either action alternative.

Bald Eagle (*Haliaeetus leucocephalus*)
Peregrine Falcon (*Falco peregrinus*)
Lewis' Woodpecker (*Asyndesmus lewis*)
White-headed Woodpecker (*Dendrocopos albolarvatus*).
Black-backed Woodpecker (*Picoides arcticus*)
Northern Three-toed Woodpecker (*Picoides tridactylus*)
Western Pond Turtle (*Clemmys marmorata*)
Townsends Big-eared Bat (*Plecotus townsendii*)
Red Tree vole *(Arborimus longicaudus)*
Special Status Terrestrial mollusks

Deer winter range:

No action: No effect.

Alternative B.

The proposed new road in the west central portion of the project area traverses a large block of deer winter range. The construction of this road would facilitate the implementation of approximately 400 acres brushfield thinning, oak woodland restoration and grassland and burning operations in the deer winter range. These operations would increase forage quantity and quality. The presence of the road is expected to have a negative effect on deer winter range values due to increased use of the area by off–highway vehicles. Although the new road would be gated, it is difficult to keep OHV's off of closed roads.

Alternative C.

The new road proposed in Alternative B would not be built. Because of the lack of good access, the approximately 400 acres of brushfield, oak woodland, and grassland treatments in deer winter range proposed in Alternative B would not occur under Alternative C.

Proposed New Roads and the effect on wildlife:

No action: No effect.

Alternative B:

This alternative would result in a net decrease in open road miles. There are positive benefits from limiting the disturbance of motorized vehicles. Along with the total number of road miles, the distribution of roads on the landscape can be of concern. Under this alternative, a large area of over 1000 acres on the west central edge of the project area that is currently un-roaded would become roaded. Roads have a variety of effects on wildlife, primarily the disturbance and habitat changes that roads bring. Although the new road would be gated, it would still be accessible to Off Highway Vehicles (OHVs). OHVs can disturb wildlife and allow access further into areas that would not be as easily accessed by foot. The construction of roads allows decreased cost for implementing treatments that can be of benefit to some species of wildlife. It is doubtful that some of the areas would ever be treated without the new road development. Some of the areas proposed for treatment would benefit multiple wildlife species through the development of superior forage for browsing animals, development of additional acorn crops and healthier conifer forest more resilient to drought, insect attacks and wildfire.

Wildlife - Cumulative Effects-Alternative A

Dense stand conditions in combination with drought effects are increasing tree mortality, especially in the older, larger trees. This die-off is producing new and numerous snags, which is beneficial for snag dependent species. Ongoing fire suppression, dense forest conditions, and drought are increasing the risk for catastrophic stand replacement fire in the project area. Should such a fire occur, current habitats will be altered toward those species that require or can utilize very open, nonforested conditions. Large catastrophic wildfire will likely negatively effect the northern spotted owl, northern goshawk, the fisher, and may likely positively effect the great gray owl, It is impossible to determine the site specific, acute,

effects of a theoretical, yet likely, wildfire.

Wildlife-Cumulative Effects-Alternative B

The potential for loss of wildlife species is primarily associated with reductions of older forest seral stages and habitat fragmentation. Effects of species abundance are associated with changes in seral stage frequency and changes in species composition associated with silvicultural systems and habitat protection. Proposed actions for Alternative B potentially cumulatively affecting wildlife include alteration of dense forest habitat, disturbance from new road and existing roads, management and development activities on private land, and drought

There are no treatments in old growth forest. However, some stands in mature seral stages are being treated with a resulting loss in forest canopy and stand density. Fragmentation is increased with construction of new roads.

In the planning area, the combination of reducing dense forest habitat and building new roads will decrease habitat for dense forest dwellers and increase habitat for more open forest dwellers. Increased habitat for open forest dwellers is somewhat reduced by the existence of new roads. On lands adjacent and beyond the analysis area, however, the cumulative effects of Alternative B and activities ongoing and planned will not significantly contribute to the short-term alteration of seral diversity (forest age groups), but will enhance stands in the long term toward late-successional stages (Medford District Resource Management Plan EIS, p. 4-24 to 4-35). Conditions resulting from treatments will contribute positively (both short and long term) to biological diversity (p. 4-35),

Habitat protections for the northern spotted owl and the great gray owl will minimize cumulative impacts to species abundance for these and other species associated with similar habitats.

Development and management on private lands will reduce the extent and benefits from land management and habitat improvements in Alternative B resulting in continued low snag abundance and cavity-user populations, and low abundance of coarse woody debris. However, the reduction of fire potential in Alternative B in conjunction with creating more resilient and faster growing trees will eventually reduce the negative impacts from activities on private lands.

Wildlife - Cumulative Effects - Alternative C

In addition to the discussion above in Alternative B, this alternative would result in a net decrease in open road miles. Thus fragmentation and the effects of roads on disturbance will be less than alternative B.

Botany

Botany - Alternative A - No Action

Direct, Indirect, and Cumulative Effects

The no action alternative would have no direct affect on the continued persistence of the Federally listed *Fritillaria gentneri* or the Bureau Special Status Plants *Camissonia graciliflora, Cypripedium fasciculatum, Cypripedium montanum, Isopyrum stipitatum, Sedum laxum ssp. heckneri, and Sedum*

oblanceolatum within the confines of the Bobar Timber Sale harvest units or the proposed brushing and burn units. Detrimental indirect and cumulative effects might result if management activities allow fuel levels to accumulate to the point that a stand destroying fire occurs.
The no action alternative would have no direct affect on the continued persistence of *Bryoria tortuosa, Crumia latifolia* or, *Dendriscocaulon intricatulum* within the confines of the Bobar Timber Sale harvest units or the proposed brushing and burn units. *Bryoria tortuosa* occurs on trees and shrubs in well-lit, open stands, most frequently on Ponderosa pine, white oak, and whiteleaf manzanita. *Crumia latifolia* is restricted to riparian rock faces and *Dendriscocaulon intricatulum* is most frequently observed on California Black Oak stems in mixed conifer/ hardwood and oak- woodland communities. Detrimental indirect and cumulative effects might result if management activities allow fuel levels to accumulate to the point that a stand destroying fire occurs.
At least two noxious weed species, *Centaurea solstitialis* (8 sections) and *Taeniatherum caput-medusae* (1 section) occur within the project area in open disturbed sites. Noxious weeds can out-compete the native flora, and rare plants, for water, light and space. If left un-treated, noxious weeds can reduce habitat suitability for the Bureau Special status plants adapted to those habitats. With the no action alternative, noxious weeds will continue to spread.

Botany - Alternative B - Variable Prescriptions With Proposed Road Construction

Direct, Indirect, and Cumulative Effects

The four known occurrences of the Federally listed *Fritillaria gentneri* within the following sections; T39S, R2W, SEC 7 (1 site) and T39S, R3W, SEC 2 (3 sites) will be buffered with a 150 ft radius buffer. *Fritillaria gentneri* typically occurs in open to semi open oak woodland and conifer-oak woodland communities. Reducing canopy closure to the minimum 40 percent would result in minimal to nonexistent indirect and cumulative effects and would pose no threat to the continued persistence of this species at the four sites in question or within its currently known range. None of the four sites would be directly impacted from the proposed road construction. The primary effects of road construction on the existing sites would be an increase in off road vehicle use, an increase in foot traffic, and an increased likelihood of camper or hunter caused fire. Any or all of these factors could lead to damage or loss of sites in the vicinity of the proposed road. These potential effects will be minimized by the stipulation that all new road construction will be closed to public access including off road vehicle use.

The 45 known occurrences of the Bureau Special Status Plants *Camissonia gracilliflora, Cypripedium fasciculatum, Cypripedium montanum, Isopyrum stipitatum, Sedum laxum ssp. heckneri, and Sedum oblanceolatum* will be buffered with a 150 ft. radius buffer and the 163 occurrences of the Northwest Forest Plan species *Bryoria tortuosa*, *Crumia latifolia*, and *Dendriscocaulon intricatulum* will be buffered with a 100 ft radius buffer in accordance with Medford BLM District Office Instruction Memorandum OR110-2000-8 dated 23, June, 2000. This buffering provides protection from physical disturbance and microclimate alterations associated with timber harvest activities.

Under Action Alternative I, there would be no direct affect to any Bureau Special Status or Northwest Forest Plan plants.

Vascular Plant Species indirect and cumulative effects:

Camissonia gracilliflora, Isopyrum stipitatum, Sedum laxum ssp. heckneri, and *Sedum oblanceolatum* normally occur in open areas and would be able to persist on the sites they currently occupy if the the canopy cover was thinned to the minimum allowable level of 40 percent. As a consequence, indirect and cumulative effects to these species, from the proposed action, would be minimal to nonexistent.

There are 10 known *Cypripedium fasciculatum* sites within the boundary of the proposed project area. The variable radius buffers around known sites should allow for the continued persistence of isolated pockets of this species, however, reduction of canopy closure to less than 60 percent in the surrounding stand will greatly reduce or completely eliminate the possibility that this species will spread to other parts of the stand in the foreseeable future.

There are three known *Cypripedium montanum* sites within the boundary of the proposed project area. The variable radius buffers around known sites should allow for the continued persistence of isolated pockets of this species, however, reduction of canopy closure to less than 60 percent in the surrounding stand will greatly reduce or completely eliminate the possibility that this species will spread to other parts of the stand in the foreseeable future.

None of these sites would be directly impacted from the proposed road construction. The primary effects of road construction on the existing sites would be an increase in off road vehicle use, an increase in foot traffic, and an increased likelihood of camper or hunter caused fire. Any or all of these factors could lead to damage or loss of sites in the vicinity of the proposed road. These potential effects will be minimized by the stipulation that all new road construction will be closed to public access including off road vehicle use.

Nonvascular Plant Species indirect and cumulative effects:

Bryoria tortuosa often occurs in stands of whiteleaf manzanita (*Arctostaphylos viscida*) that are exposed to direct sunlight. It has a high tolerance for dry sites conditions and will most likely continue to exist on the site even if the harvest units in question are thinned to the minimum level of 40% canopy closure. As a consequence, indirect and cumulative effects to this species, from the proposed action, would be minimal to nonexistent. Any harvest prescription that allows for the retention of existing older manzanita stems will help to insure the continued persistence of this species throughout the Applegate region of the Ashland Resource Area.

Crumia latifolia occurs on rocks in intermittent or perennially wet draws or calcareous seeps. In can occur in both open areas and under a relatively dense canopy. Existing riparian buffers will provide adequate protection for the continued existence of this species on the nine currently known sites within the project area. As a consequence, indirect and cumulative effects to this species, from the proposed action, would be minimal to nonexistent.

Indirect and cumulative effects would most likely be detrimental to *Dendriscocaulon intricatulum* which typically occurs on black oak stems less than 100 years of age under fairly dense (60 -100% canopy closure) stand conditions on ridges exposed to winter fog or in riparian areas. Removal of the canopy to the 40% level would significantly reduce the moisture retention on the site and would likely have a detrimental effect on the continued persistence of this species within the harvest units in question. However there are currently more than 300 known sites for this species across the Medford BLM District

and the loss of a few sites would pose no significant threat to the species continued existence.

None of these sites would be directly impacted from the proposed road construction. The primary effects of road construction on the existing sites would be an increase in off road vehicle use, an increase in foot traffic, and an increased likelihood of camper or hunter caused fire. Any or all of these factors could lead to damage or loss of sites in the vicinity of the proposed road. These potential effects will be minimized by the stipulation that all new road construction will be closed to public access including off road vehicle use.

Botany - Alternative C - Variable Prescriptions With No New Roads

Direct, Indirect, and Cumulative Effects

The four known occurrences of the Federally listed *Fritillaria gentneri* within the following sections; T39S, R2W, SEC 7 (1 site) and T39S, R3W, SEC 2 (3 sites) will be buffered with a 150 ft radius buffer. *Fritillaria gentneri* typically occurs in open to semi open oak woodland and conifer-oak woodland communities. Reducing canopy closure to the minimum 40 percent would result in minimal to nonexistent indirect and cumulative effects and would pose no threat to the continued persistence of this species at the four sites in question or within its currently known range..

The 45 known occurrences of the Bureau Special Status Plants *Camissonia graciliflora, Cypripedium fasciculatum, Cypripedium montanum, Isopyrum stipitatum, Sedum laxum ssp. heckneri, and Sedum oblanceolatum* will be buffered with a 150 ft. radius buffer and the 164 occurrences of the Northwest Forest Plan species *Bryoria tortuosa*, *Crumia latifolia*, and *Dendriscocaulon intricatulum* will be buffered with a 100 ft radius buffer in accordance with Medford BLM District Office Instruction Memorandum OR110-2000-8 dated 23, June, 2000. This buffering provides protection from physical disturbance and microclimate alterations associated with timber harvest activities.

Under Action Alternative II, there would be no direct affect to any Bureau Special Status or Northwest Forest Plan plants.

Vascular Plant Species indirect and cumulative effects:

Camissonia gracilliflora, Isopyrum stipitatum, Sedum laxum ssp. heckneri, and *Sedum oblanceolatum* normally occur in open areas and would be able to persist on the sites they currently occupy if the canopy cover was thinned to the minimum allowable level of 40 percent. As a consequence indirect and cumulative effects to these species, from the proposed action, would be minimal to nonexistent.

There are 10 known *Cypripedium fasciculatum* sites within the boundary of the proposed project area. The variable radius buffers around known sites should allow for the continued persistence of isolated pockets of this species, however, reduction of canopy closure to less than 60 percent in the surrounding stand will greatly reduce or completely eliminate the possibility that this species will spread to other parts of the stand in the near future. As time passes, the remaining trees will grow and the canopy closure will increase. As this happens the conditions required for the Cypripedium species will become more favorable.

There are three known *Cypripedium montanum* sites within the boundary of the proposed project area. The variable radius buffers around known sites should allow for the continued persistence of isolated pockets of this species, however, reduction of canopy closure to less than 50 percent in the surrounding stand will greatly reduce or completely eliminate the possibility that this species will spread to other parts of the stand in the near future. As time passes, the remaining trees will grow and the canopy closure will increase. As this happens the conditions required for the Cypripedium species will become more favorable.

Nonvascular Plant Species indirect and cumulative effects:

Bryoria tortuosa often occurs in stands of whiteleaf manzanita (*Arctostaphylos viscida*) that are exposed to direct sunlight. It has a high tolerance for dry sites conditions and will most likely continue to exist on the site even if the harvest units in question are thinned to the minimum level of 40% canopy closure. As a consequence, indirect and cumulative effects to this species, from the proposed action, would be minimal to nonexistent. Any harvest prescription that allows for the retention of existing older manzanita stems will help to insure the continued persistence of this species throughout the Applegate region of the Ashland Resource Area.

Crumia latifolia occurs on rocks in intermittent or perennially wet draws or calcareous seeps. In can occur in both open areas and under a relatively dense canopy. Existing riparian buffers will provide adequate protection for the continued existence of this species on the nine currently known sites within the project area. As a consequence, indirect and cumulative effects to this species, from the proposed action, would be minimal to nonexistent.

Indirect and cumulative effects would most likely be detrimental to *Dendriscocaulon intricatulum* which typically occurs on black oak stems less than 100 years of age under fairly dense (60 -100% canopy closure) stand conditions on ridges exposed to winter fog or in riparian areas. Removal of the canopy to the 40% level would significantly reduce the moisture retention on the site and would likely have a detrimental effect on the continued persistence of this species within the harvest units in question. However there are currently more than 300 known sites for this species across the Medford BLM District and the loss of a few sites would pose no significant threat to the species continued existence.

Social Effects

The county zoning within the planning area is predominately forest resource (87%). 12 % is zoned farm use and 1% is rural residential. It is expected that forest management activities will be occurring on the lands zoned forest resource.

During the implementation of the Bobar project, traffic on the roads within the planning area is expected to increase. There would be a small increase of vehicle traffic from workers traveling to and from the work site. Traffic will increase as a result of log truck traffic hauling on Little Applegate and Upper Applegate roads. During the most intensive and productive periods of commercial timber sale operations, up to 25 log truck trips could be expected in a day. These truck trips would be spread over several road routes within the planning area. Commercial Timber sale operations are typically performed using three year contract

periods. Timber haul does not usually occur during the entire year but is separated into periods with little to no activity and other periods of more intensive activity. Highway vehicle traffic is regulated by state and county laws and regulations. The BLM does not have jurisdiction over traffic traveling on state and county roads.

During portions of the commercial conifer thinning, helicopters will fly through the area's airspace and increase the amount of noise typically heard in the area of the project. Previous experience indicates that rural interface residents are most often impacted in the early morning and late evening hours (Medford District RMP/EIS, 1995). Project Design Features (PDFs) have been created to help mitigate some of the impacts. Noise disturbance to local residents would be partially mitigated by regulating operating hours, day, and seasons through portions of the project area. Generally, any helicopter logging closer than ½ mile of a residence would be restricted to an operating period of 8:00 AM to 5:00 PM, Monday through Friday. Any helicopter logging located ½ to one (1.0) mile from a residence would be restricted to an operating period of 6:00 AM to 6:00 PM, Monday through Saturday; and no operating time restrictions would be enforced when helicopter operations are greater than one (1.0) mile from a residence.

Helicopters can work based on Visual Flight Rule (VFR) conditions. The safety is up to the pilots and if clouds, fog or wind are not threatening the safety of the operation and they can see from the landing to the woods they will fly. A loaded helicopter, carrying material that could be released, may not fly over any structure at any altitude. An unloaded helicopter may fly over a structure or people if they maintain the proper altitude. In many locales that is 1000 feet but in rural settings it can be 500 feet. When loaded, the aircraft must maintain a minimum horizontal distance of 500 feet from any structures or people. The aircraft may pass over private property under load if they maintain this distance. Individual property owners do not control airspace over private property. The pilots must maintain Federal Aviation Administration (FAA) requirements. BLM has no jurisdiction or control over flight regulations.

There can be short term disturbance through noise as a result of helicopter logging. The use of helicopters is based on the need to limit road development in the project area and the Northwest Forest Plan direction to emphasize the use and testing of aerial systems and low impact logging practices in the Applegate Adaptive Management Area. The short term noise disturbance is a trade off against the development of new roads that would be needed to implement project goals.

Helicopter logging is one of the approaches that the AMA was established to test. Helicopter logging typically reduces the number of miles of road construction required to reach a given piece of ground.

The Bobar project is expected to have several small timber sale contracts along with one or larger timber sale contracts. These sales are created to provide opportunities for small local companies to bid on work. In addition to small timber sale contracts, fuel hazard reduction projects will allow opportunities for local forestry contractors to bid on contract work in the Bobar project area. It is expected that the proposed work on the project will take 4-8 years to complete.

References

Agee, J. 1993. *Fire ecology of Pacific northwest forest*. Island Press, Washington, D.C.

Agee, J.K., Bahro, B., Finney, M., Omi, P.N., Sapsis, D.B., Skinner, C.N., van Wagtendonk, J. W.,

Weatherspoon, C.P. 1999. *The Use of Fuelbreaks in Landscape Fire Management.*

Applegate River Watershed Council (ARWC). 2002. Draft *Little Applegate River Watershed assessment.* Applegate, OR.

Atzet, T. and D.L. Wheeler. 1984. *Preliminary plant associations of the Siskiyou mountain province*. USDA Forest Service, Siskiyou National Forest, Grants Pass, OR.

Atzet, T. et.al. 1996. *Field Guide to the Forested Plant Associations of Southwestern Oregon.* U.S. Department of Agriculture, Forest Service.

Cohen, Jack. 1999. *Reducing the wildland fire threat to homes; where and how much*. Based on a paper presented at the symposium on fire economics, policy, and planning: bottom line. April 5-9, 1999 San Diego, CA.Cohen, Jack. 1999.

Covington, W.W., P.Z. Fule, M.M. Moore, S.C. Hart, T.E. Kolb, J., J.N. Mast, S.S. Sackett and M.R. Wagner. 1997. *Restoring ecosystem health in ponderosa pine forests of the Southwest*. Journal of Forestry. 95(4):23-29.

Covington, W.W. and S.S. Sackett. 1984. *The affect of a prescribed burn in southwestern ponderosa pine on organic matter and nutrients in woody debris and forest floor*. Forest Science 30(3): 183-92.

Edminster, C.B. and W.K Olsen. 1996. *Thinning as a tool for restoration and maintaining stand structure in stands of southwestern ponderosa pine*. In Conference on adaptive ecosystem restoration and management: restoration of cordelleran conifer landscapes of north America. General Technical Report RM-GTR-278. Fort Collins, CO: USDA Forest Service. 61-67.

Fenny, S.R., T.E. Kolb, M.R. Wagner, and W.W. Covington. 1996. *Restoration treatments benefit old growth ponderosa pine physiology and insect resistance*. Presented at the Society of American Foresters National Convention, November 9-13, 1996. Albuquerque, NM.

Fiedler, C.E., 1996, *Silvicultural applications: Restoring ecological structure and process in ponderosa pine forests*., pp 39-40., INT-GTR-341., Ogden, UT: USDA, Forest Service, Intermountain Research Station.

Franklin, et.al. 1981. *Ecological characteristics of old-growth Douglas-fir forests.* U.S. Forest Service, Pacific Northwest Forest and Range Experiment Station, General Technical Report.

Franklin, Jerry F. and Thomas A. Spies. 1991. *Ecological Definitions of Old-Growth Douglas-Fir Forests*. Wildlife and Vegetation of Unmanaged Douglas-Fir Forests, USDA General Technical Report PNW-GTR-285, pp. 61-69. Pacific Northwest Research Station.

Gaines, E.M., H.R. Kallander, and J.A. Waganer. 1958. *Controlled burning in southwestern ponderosa pine: results from the Blue Mountain plots*, Fort Apache Indian Reservation. Journal of Forestry. 58:323-327.

Graham, Russell T.; Harvey, Alan E.; Jain, Theresa B.; Tonn, Jonalea R. 1999. *The effects of thinning*

and similar stand treatments on fire behavior in Western forests. Gen. Tech. Rep. PNW-GTR-463. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 27 p.

Harrington, M.G. and S.S. Sackett. 1990. Using *fires as a management tool in southwestern ponderosa pine. In Effects of Fire Management of southwestern natural resources.* General Technical Report RM-191. Fort Collins, CO: USDA Forest Service.

Hawksworth, Frank G. 1977. *The 6-Class Dwarf Mistletoe Rating System.* USDA Forest Service General Technical Report RM-48. Fort Collins, CO.

Haupt, Scott. 2002. Personal communication.

Hayes, et.al. 1997. *Wildlife Response to Thinning Young Forests in the Pacific Northwest*. Journal of Forestry, August 1997, pp 28-33.

Huff, M., Ottmar, R.D., Alvarado, E., Vinnaek, R.E., Lehmkhul, J.F., Hessburg, P.F., Everett, R.L. 1995. *Historical and Current Forest Landscapes in Eastern Oregon and Washington*. PNW-GTR-355.

Lindemuth, A.W. 1960. *A survey of effects of intentional burning on fuels and timber stands of ponderosa pine in Arizona.* USDA Forest Service Station Paper 54.

Omi, P.N., Kalabokidis, K.D. 1991. *Fire damage on extensively vs. intensively mangaged forest stands with the North Fork Fire,* 1988. Northwest Science. Vol. 65. No. 4. pp 149-156.

Oregon Department of Environmental Quality. 1999. *Water Quality Management Plan for Sucker-Grayback Watershed*. Portland, OR.

Oregon Department of Environmental Quality. 1992. *Oregon administrative rules*, chapter 340, division 41, Rogue basin. Oregon Department of Environmental Quality. Portland, OR.

Ottmar, R.D., 1997. Letter to David Blair, Aide to Senator Ron Wyden, Washington, D.C., File Code 4400.

Pers. Comm. 2002. *Slide show on the Hayman fire effects*. The Nature Conservancy. At the Siskiyou Forest Partnership Meeting. November 23, 2002. Central Point, OR.

Rosgen, D.L. 1994. *A Classification of Natural Rivers*. Cantena 22(3): 169-199.

Ryan, K.C. and J. Losensky. 1988. *Predicting postfire mortality of seven western conifers*. Canadian Journal of Forestry. 18:1291-1297.

Sackett, S.S., S.M. Haase, and M.G. Harrington. 1996. *Lessons learned from fire use for restoring southwestern ponderosa pine ecosystems*. In Conference on adaptive ecosystem restoration and management: restoration of cordelleran conifer landscapes of north America. General Technical Report RM-GTR-278. Fort Collins, CO: USDA Forest Service. 53-60.

Samuelson, John. 2002. Personal communication.

Scott, J., 1998. *Reduce fire hazards in Ponderosa pine by thinning*. pp 20-25, Fire Management Notes. Vol. 58 No. 1.

Squyres, David. 2002. Personal communication.

Swezy, M.D., Agee, J.K., 1991. *Prescribed-fire effects on fine-root and tree mortality in old-growth ponderosa pine*., pp626-634, Canadian Journal of Forest Research, Volume 21, No. 5.

Taylor, G.H., C. Daly and W.P. Gibson. 1995. *Development of a Model for Use in Estimating the Spatial Distribution of Precipitation*. 9th Conf. on Applied Climatology, Dallas, TX. Amer. Meteor. Soc., 92-93.

UC Davis. 1996. *An overview of fire in the Sierra Nevada. In: Sierra Nevada Ecosystem Project: Final report to Congress*.

USDA Forest Service. 1986. *Interim Definitions for Old-Growth Douglas-Fir and Mixed-Conifer Forests in the Pacific Northwest and California*. Research Note PNW-447, Pacific Northwest Research Station.

USDA Forest Service. 1993. *Determining the risk of cumulative watershed effects resulting from multiple activities,* Endangered Species Act: Section 7.

USDA Forest Service. 1994. *Beaver Palmer Watershed Analysis*. Rogue River National Forest, Applegate Ranger District. Jacksonville, OR.

USDA Forest Service, Rogue River and Siskiyou National Forests, Pacific Northwest Research Station and USDI Bureau of Land Management, Medford District. 1994c. *Applegate Adaptive Management Area Ecosystem Health Assessment.* Medford, OR.

USDA Forest Service and USDI Bureau of Land Management. 1994a. *Record of decision for amendments to Forest Service and Bureau of Land Management planning documents within the Range of the Northern Spotted Owl and standards and guidelines for management of habitat for late successional and old-growth forest related species within the range of the Northern Spotted Owl*. Portland, OR.

USDA Forest Service. 1999. *Jack Cohen's response to Forest Guardian appeal on fort valley*. Region 3, July 13.

USDA Forest Service. 2002. *Rodeo-chediski fire effects summary report*. Apache Sitgraeves National Forest. August.

USDI Bureau of Land Management, Oregon State Office. 1989. *Final EIS for the control of competing vegetation in Western Oregon*. Portland, OR.

USDI Bureau of Land Management, Medford District. 1994b. *Medford District proposed resource management plan/environmental impact statement.* Medford, OR.

USDI Bureau of Land Management, Ashland Resource Area and USDA, Forest Service, Ashland and Applegate Ranger Districts. 1995. *Little Applegate River watershed analysis*. Medford, OR.

USDI Bureau of Land Management, Oregon State Office. Information Bulletin No. OR-97-064. 1996. *Implementation of Coarse Woody Debris Standards and Guidelines*. Portland, OR.

USDI Bureau of Land Management. 1998. *Applegate-Star/Boaz watershed analysis*, version 1.3. Ashland Resource Area, Medford, OR.

USDI Bureau of Land Management and Oregon Department of Forestry. 2002. *Log town fire benefits from past fuel hazard reduction.* News release. July 9.

USDI Bureau of Land Management and Oregon Department of Forestry. *undated*. *Squires Fire: observations of fire behavior in the applegate valley hazardous fuels reduction project area.*

USDI Bureau of Land Management. 2001. *Environmental Assessment for Slashbuster 3 and Manual Treatments* (EA No. OR-110-01-027). Medford, OR.

Van Wagtendonk, J.W. 1996. *Use of a deterministic fire growth model to test fuel treatments*. pp. 1155-1165 In: Sierra Nevada Ecosystem Project: Final Report to Congress, Vol II, Assessments and scientific basis for management options. University of Ca. Davis, Centers for Water and Wildland Resources.

Watershed Professionals Network. 1999. *Oregon Watershed Assessment Manual.* June 1999. Prepared by the Governor's Watershed Enhancement Board, Salem, Oregon.

Weatherspoon, C.P. 1996. *Fire-silviculture relationships in sierra forests.* In: Sierra Nevada Ecosystem Project: Final Report to Congress, Vol. II, Assessments and scientific basis for management options. Univ. of CA, Davis, Centers for Water and Wildland Resources. 1167-1176.

Wilson, J.S., Baker, P.J., 1997. *Mitigating fire risk to late successional forest reserves on the east slope of the Washington Cascade Range, USA*. Forest Ecology and Management 110, pp. 59-75.

Wooldridge, D.D. and H.Weaver. 1965. *Some effects of thinning a ponderosa pine thicket with a prescribed fire*, II. Journal of Forestry 63:92-95.

CRITICAL ELEMENTS

The following elements of the human environment are subject to requirements specified in statute, regulation, or executive order and must be considered in all Environmental Assessments.

Critical Elements

Critical Element	Affected Yes	Affected No	Critical Element	Affected Yes	Affected No
Air Quality		✔ **	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		✔**	Energy Resources (EO 13212)		✔
			Environmental Justice		✔

*These affected critical elements could be impacted by the implementing the proposed action. Impacts are being avoided by project design.

**These affected critical elements would be impacted by implementing the proposed action. The impacts are being reduced by designing the proposed action with Best Management Practices, Management Action/Direction, Standard and Guidelines as outlined in the Environmental Impact Statements (EIS)/Record of Decisions *(RMP) (USDI BLM 1995)(USDA FS; USDI BLM 1994*) tiered to in Chapter 1. The impacts are not affected beyond those already analyzed by the above mentioned documents.

Cultural Resources

The Bobar project area was surveyed for cultural resource concerns in FY 1999, under contract. All sites that were discovered were flagged, recorded, and will be avoided. The Bobar project area was also resurveyed by BLM in FY02.

CHAPTER V

List of Agencies and Persons Consulted

SUMMARY OF PUBLIC INVOLVEMENT

Outreach to the community was done through a series of mailings, public meetings and field trips.

April 2001 - Dec. 2002	Announcement of the project in the Medford Messenger and the Medford District BLM web page - updated quarterly.
February 15, 2001	Neighborhood Meeting with residents to discuss general concepts of land management in the Little Applegate Area
February 22, 2001	Neighborhood Meeting with residents to discuss general concepts of land management in the Little Applegate Area
March 4, 2001	Field Trip to discuss project goals and examples of treatments
April 22, 2001	Field Trip to discuss project goals and examples of treatments
January 1, 2002	Newspaper article in the Applegator about BLM future projects in area
March 19, 2002	Letter to residents asking for comments and concerns about project
March 21, 2002	Neighborhood Meeting with residents to discuss general goals of the Bobar Project
April 11, 2002	Field Trip to discuss project goals and examples of treatments
April 16, 2002	Flyer posted and sent to residents asking if they are interested in collaborating on fuel reduction project in the Bobar planning area
April 17, 2002	Field Trip to discuss project goals and examples of treatments
May-June, 2002	Meetings with thirteen individual landowners who have land adjacent to BLM and would like to coordinate fuel reduction work.
November 5, 2002	Neighborhood Meeting with residents to discuss details of the Bobar Project
November 6, 2002	Public Meeting at Upper Applegate Grange to give overview of project and hear concerns and answer questions about project
November 9, 2002	Field Trip to review planned treatment areas and review past treatments nearby
November 19, 2002	Walked property with two resident's adjacent to the project area to hear concerns
November 21, 2002	Meeting with residents to discuss details of project

Upon completion of this EA, a legal notification was placed in the Medford Mail Tribune offering a 60-day public review and comment period. For additional information, please contact Ed Reilly or the Ashland Resource Area Planning Department at the Medford District BLM office, (541) 618-2384.

DISTRIBUTION LIST AND AVAILABILITY ON THE INTERNET
This EA was distributed to the following agencies and organizations.

Applegate Partnership
Association of O&C Counties
Audubon Society
Headwaters
Jackson County Commissioners
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Rogue River National Forest
Southern Oregon University
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TRIBES
The Confederated Tribes
Cow Creek Band of Umpqua Indians
Confederated Tribes of the 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. National Marine Fisheries Service