United States Department of the Interior

BUREAU OF LAND MANAGEMENT
MEDFORD DISTRICT OFFICE
3040 Biddle Road
Medford, Oregon 97504
email address: or110mb@or.blm.gov

IN REPLY REFER TO:
1792 (116)
China Keeler Landscape Project EA

MAY 14 2004

Dear Interested Citizen:

My staff and I have recently completed the China Keeler Environmental Assessment (EA). This EA is the result of several years of planning and analysis in the Chapman, Keeler and China Gulch drainages of the Applegate River. The BLM is proposing to implement a project with activities focused primarily on increasing the health and vigor of forest vegetation by thinning in conifer forest, oak woodland and shrub land. Transportation system maintenance, including renovation of existing roads, new road construction and road decommissioning are proposed. Fuel hazard reduction is an integral part of all treatments and would be accomplished using hand, mechanical and prescribed fire methods.

Most residents of southern Oregon recognize that wildfire and the exclusion of wildfire have had considerable effects shaping our forest and woodlands. The China Keeler project focuses on reducing wild fire hazard, restoring healthy forest ecosystems and helping to provide some of the wood products and jobs our community needs. The details of the project proposal and an analysis of the effects and a map of the project are contained in the attached EA.

Many of you have participated in field trips or meetings concerning this project. We have received a number of comments concerning the project already. The development of the project was influenced directly by comments and concerns that we heard from interested citizens. BLM has previously treated some of the lands in the planning area for fuels reduction along with many private landowners. This new project builds on some of the work and strategies already completed.

The announcement of the ***Environmental Assessment*** (EA) for the China Keeler Landscape Project is being printed in the Medford Mail Tribune on May 15th, 2004. This announcement starts the official 30-day public review period. Comments are due to us by close of business, 4:30 PM, June 15th, 2004. One important purpose of the review is to provide the public with an opportunity to comment on the BLM's determination that there are no significant impacts associated with the proposed action which are beyond those expected and described in the Medford District RMP/EIS or the Northwest Forest Plan EIS and Supplemental EIS to which the EA is tiered, and therefore, an environmental impact statement is not necessary.

During the review period, we welcome your comments on the content of the EA. Prior to making my Decision on this project, my staff and I will consider all pertinent site specific comments. Comments that clearly articulate site specific issues or concerns are most useful to us. The comments received, including names and addresses, will be available for public review. Individual respondents may request confidentiality. If you wish to withhold your name and/or address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

Further information on this proposed project is available at the Medford District Office, 3040 Biddle Road, Medford, Oregon 97504 or by calling Edward Reilly in the Ashland Planning Department at (541) 618-2384. The EA and maps are posted on the Medford District web site ***www.or. blm.gov/medford*** under Planning Documents/Environmental Assessments.

Sincerely,

for Richard J Drehobl
Field Manager
Ashland Resource Area

3 Attachments

1 - China Keeler EA (pp 101)
2 - China Keeler Appendix (pp 112)
3 – China Keeler Proposed Action Map

ENVIRONMENTAL ASSESSMENT

for

CHINA KEELER LANDSCAPE PROJECT

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

EA No. OR-116-04-01
May, 2004

This environmental assessment (EA) for the proposed China Keeler 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: China Keeler Landscape Project

LOCATION: T.38S.,R.3W., Sections 8,9,15-22,31,32 EA NUMBER: OR-116-04-01
T.38S. R.4W. Sections 13,22-27,34,35
T.39S., R3W Sections 5-7
T.39S.,R.4W., Sections 1-3,11,12
Willamette Meridian

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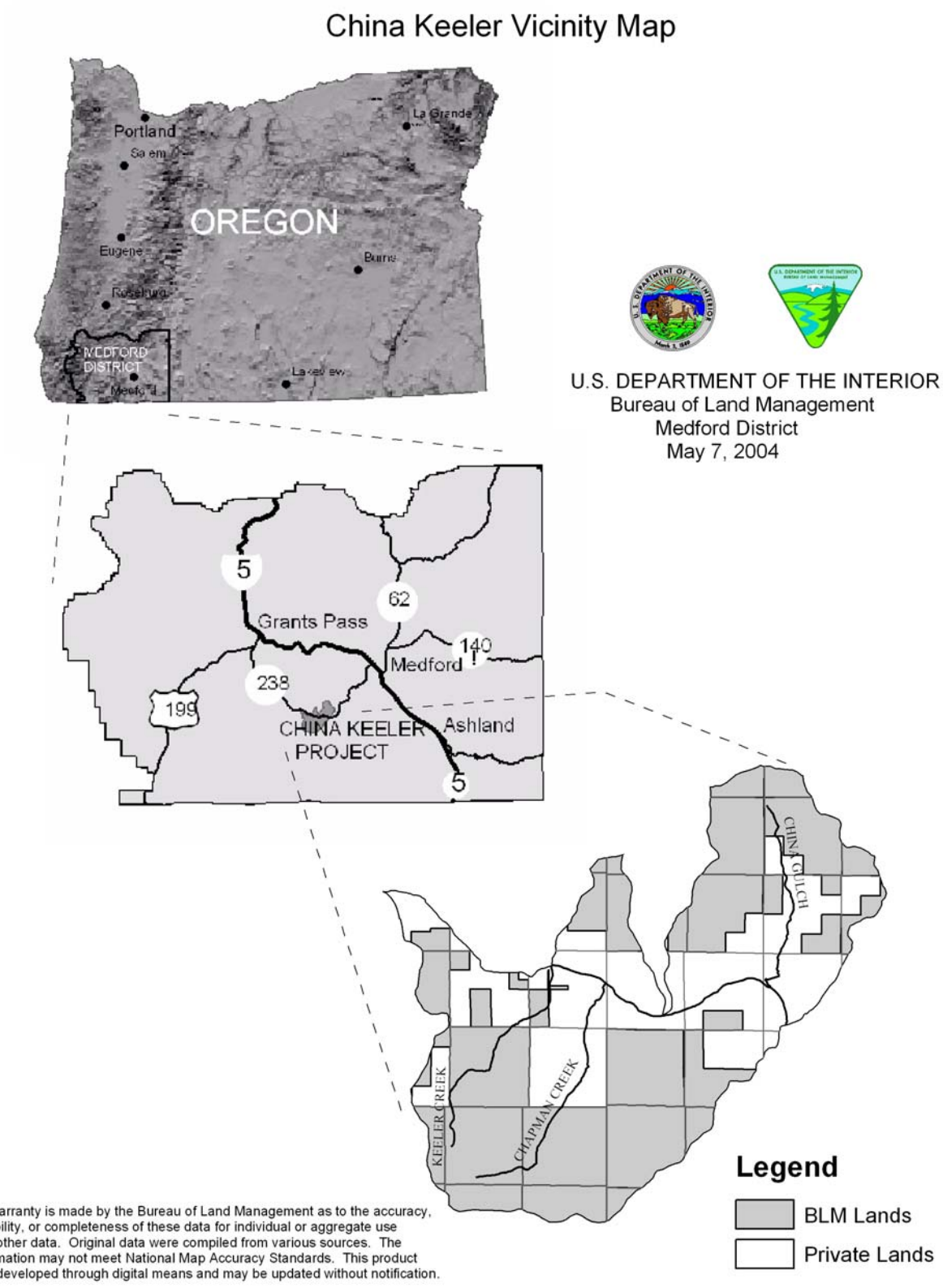

Map 1 – Vicinity Map for China Keeler Project

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CHAPTER I
PURPOSE AND NEED

INTRODUCTION

The China Keeler Landscape Management Project was created by the Ashland Resource Area, Medford District, Bureau of Land Management to address the multiple resource objectives of managing watershed wide forest landscapes. The primary goals included in the project's design are maintaining and enhancing forest health, reducing the detrimental effects of wildfire and helping provide jobs and wood products for the local community. This document describes a set of proposed activities designed to manage the federal lands in the China Keeler planning area with an emphasis on restoring these lands to a condition that is more resilient to the effects of drought, fire and insects. The activities proposed include cutting vegetation to thin the forest, using prescribed fire to reduce fuel loads and transportation system management. Forest products including saw logs would be generated as a byproduct of thinning and would be offered for sale.

The Ashland Resource Area has utilized an ecosystem and landscape based approach in identifying the site specific activities proposed for the China Keeler Landscape Project. This process considered the current conditions of the various sub-watersheds within portions of the Middle Applegate River Watershed 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 this assessment to develop the China Keeler 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. Areas that currently have the desired density and vegetative species mix, were not selected for treatment. Other areas were excluded from the current proposal as a result of the presence of a special status species that would not directly benefit from vegetation changes. The project design includes efforts to reduce fuel loadings to minimize the effects of wildfires on both federal and private lands in and near the planning area. There are over 1,600 human-made structures on private lands within or one mile beyond 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 China Keeler Landscape project planning area encompasses approximately 12,600 total acres. BLM administers approximately 7,622 of these acres. The remainder, approximately 4,963 acres are held by numerous private landowners. Jackson County land use planning data within the project planning area shows 77% of the land is zoned forest resource, 19% farm use, 3% rural residential and 1% suburban.

The Northwest Forest Plan land allocations on BLM administered lands within the planning area are; Adaptive Management Area – 5,601 acres, Riparian Reserve – 1,647 acres and great gray/northern spotted owl late seral reserve - approximately 374 acres. Management activities are proposed for approximately 2,730 acres, or 36 percent of the BLM administered lands within the project area. The great gray and 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, young

conifer stands and grassland are proposed for non–commercial treatments.

The proposed China Keeler project is one of several landscape projects designed to meet the forest health and fuel management objectives in the Applegate Subbasin. Other landscape projects that are proposed for out-year planning in the Applegate Subbasin include Bald Lick, Prince Castor, Bald Lime, and Deadman's Palm. Previous projects that have been implemented or planned in the Applegate Subbasin include Forest Creek, Spencer Lomas, Buncom and Bobar. The Rogue River National Forest, Applegate Ranger District also has the Wagner Gap, Little Applegate Stewardship, Applegate River Corridor, Beaver Newt and miscellaneous fuel reduction projects planned in the Little Applegate River 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, address aquatic ecosystem concerns and assist in providing a sustainable supply of forest products.

BACKGROUND

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 China Keeler 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) Middle Applegate Watershed Analysis (USDI 1995)

(5) USFWS Biological Opinion (1-14-03-F-511, October 2003);

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

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 China Keeler 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 previously managed 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 1995), 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). 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, the alternative action and associated Project Design Features, or defer to the no action alternative.

  Note: All acres proposed for treatment in the China Keeler are being analyzed under this one environmental assessment. Some of the non-commercial units will be authorized to begin treatment under the BLM's categorical exclusion NEPA program. Non commercial thinning qualifies as a categorical exclusion under 516 DM 6 Appendix 5 C (4) (thinning and brush control), and 516 DM 2, Appendix 1 (1.12).

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

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

The main stem of the Applegate River is 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, competition for water, nutrients, and sunlight) and are more susceptible to insect infestation and high intensity wildfire. Shade intolerant plants such as ponderosa pine are declining in number. Oak woodlands are being lost as shrub species come in and dominate sites resulting in decline in the health of oak trees.

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

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, and horse back riding) throughout the area.

Some roads in the planning area are being considered for decommissioning. Closing roads may affect access to places used historically by the public.

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

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

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

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

Off Highway Vehicle (OHV)
Use of the area by off highway vehicles has been increasing over the last several years.

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

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

CHAPTER II
Alternatives

INTRODUCTION
This chapter describes in detail the activities proposed with the China Keeler Landscape Project. The chapter discusses three alternatives – No Action (Alternative A), the proposed action (Alternative B), and modified action (Alternative C).

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

Thinning is accomplished in commercial conifer forest by a timber sale contract which sells material over eight inches in diameter at breast height. Trees to be removed greater than eight inches in diameter are designated by BLM employees. Material less than eight inches is removed through contracts that hire out cutting, and piling of material. BLM will burn the piles during wet weather conditions . Thinning in oak woodlands and shrublands is also accomplished by hiring contractors to cut, pile the material. In some areas mechanical thinning would take place with a 'slashbuster' machine that can grind unwanted vegetation into a mulch This material will decompose on the forest floor and will not need burning

A table and map detailing the proposed activities (silvicultural method, yarding systems, and 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 F.

Alternative A (No Action)
Under the "no action" alternative, none of the management activities described in the action alternatives would occur in the China Keeler 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 of trees over 8 inches DBH would occur on approximately 2,162 acres of forested stands. 643 acres of the above commercial thinning areas would also have pockets of young trees less than 7 inches in diameter thinned.
2. Non-commercial treatments (mechanical thinning, hand thinning, and prescribed fire) would occur on approximately 1,506 acres of young conifer stands, shrubland, hardwoods, and grasslands.

3. Approximately 3.9 miles of new road would be constructed in three separate areas.
4. Road decommissioning would take place on approximately 6.1 miles of existing roads.
5. Approximately 54 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 2,145 acres of forested stands. Pre-commercial thinning (thinning of young conifer stands) would occur on approximately 643 of the same acres being commercially harvested.
2. Non-commercial treatments (mechanical thinning, hand thinning, and prescribed fire) would occur on approximately 1,416 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 4.7 miles of existing roads.
5. Approximately 58 miles of existing roads in the project area would be renovated to bring them up to current BLM standards.

The following narratives help to describe the proposed forest management activities. All activities are designed to promote healthier forests and woodlands and reduce fuel hazard.

Prescribed Burning – Carefully controlled fire is used to reduce the amount of hazardous fuels and rejuvenate the remaining vegetation. Usually done in late winter through spring, the burns can be done in any type of vegetation such as conifer forest, oak woodland, shrub and grasslands. Types of burns include broadcast burning over a continuous area, understory burning in conifer stands, and burning of hand piles. Sometimes helicopters are used to ignite the fire for a burn in a shrub field.

Conifer Forest Thinning – Thinning dense stands helps restore health and vigor of the remaining trees by reducing competition. Selective cutting and removal of trees allows the remaining larger, healthier trees to grow with renewed vigor. Trees greater than eight inches in diameter can be sold with a 'commercial' timber sale. In addition to the commercial size trees, smaller trees less than eight inches that contribute to fire hazard and competition will also be removed. The trees that are less than eight inches are typically cut, piled and burned. The thinning typically reduces the forest canopy from the pretreatment canopy closure of 70%-90% to after treatment canopy closure of 50%-60%. Trees continue to grow and the canopy will increase in the future.

Douglas-fir Mistletoe Reduction - Dwarf mistletoe is a parasitic plant that affects the health, vigor and growth of conifer trees. Dwarf mistletoe reduces diameter and height growth and can kill or predispose a tree to attack by insects or other diseases. Goals for this prescription are to reduce the amount of mistletoe in the infected trees by cutting those trees with the heaviest infection.

Douglas-fir Understory Reinitiation (Regeneration Cut) – Regeneration cuts are often used when the stand has severely declined in health and many of the trees have very small crowns and are very weak and dying. The treatment is conducted with the goal of opening the

forest canopy to the point where young trees will be established. A minimum of 16-25 of the largest, healthiest trees per acre are left.

Pine Site Thinning - Areas that have historically favored pine have sometimes developed understories of Douglas-fir as a result of fire exclusion. The goal on these sites is the retention of existing large ponderosa pine and subsequent development of young pine. The treatments would leave the best, healthiest pine and remove many of the competing Douglas-fir trees, allowing the pine to once again dominate the site.

Douglas-fir Pole Thinning - Stands averaging 5 – 11 inches in diameter (pole sized) would be thinned to increase health and vigor. These stands may be included for limited removal of commercial saw logs. The stands are typically very dense and growing slowly. Depending on the proximity to a road, the cut material can be offered for a variety of products.

Young Conifer Forest or 'Pre-Commercial' Thinning – Young stands of trees where the average diameter is less than eight inches are thinned to promote healthier remaining trees. The unwanted trees are typically cut, piled and burned. This type of work is sometimes called PCT or pre-commercial thinning.

Oak woodland treatments – Removal of competing vegetation in areas that have Oregon white oak as the dominant vegetation type. The competing vegetation is typically shrubs or smaller trees that have encroached into the oak woodland due to fire exclusion. Removal can take place by hand cutting and piling, or the use of a machine called the slashbuster. A slashbuster is a tracked vehicle that can cut and grind the undesired vegetation into mulch. Machines such as the slashbuster are sometimes referred to as mechanical treatment.

Shrubland treatments - Thinning is used to reduce the density of shrub-dominated vegetation and rejuvenate the remaining trees and shrubs. It can be achieved through mechanical methods such as hand cutting with chainsaws, the slashbuster or prescribed fire.

Grassland treatment– Controlled burning is performed in grass dominated areas to rejuvenate perennial grass and manage encroaching shrub and tree species. Burning is done at the proper time of year to discourage non-native species and encourage native species.

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: Acres of conifer forest treated by silviculture prescription

PRESCRIPTION	ACRES		
	ALT A	ALT B	ALT C
Moist Douglas Fir (WDF) Commercial Conifer Thinning	0	156	156
Dry, Douglas Fir (DDF) Commercial Conifer Thinning	0	1577	1577
Pine Regeneration(P)	0	259	242
Douglas-fir Poles (DFP)	0	16	16
Douglas-fir Mistletoe	0	132	132
Douglas-fir Regeneration (REG)	0	22	22
Total Acres	0	2,162	2,145

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

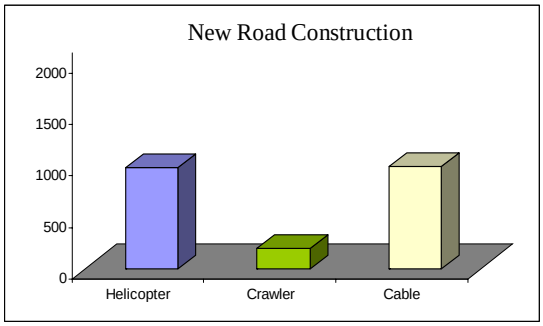
TABLE 2-2: Current and future road mileage by road category

ROAD SUMMARY	MILES		
	ALT A	ALT B	ALT C
Existing BLM Roads In Project Area	31.7	31.7	31.7
Proposed New Road Construction	0	3.9	0
Proposed Decommissioning	0	6.1	4.7
Proposed maintenance/renovation on existing roads	N/A	54.3	57.9
Roads Currently Closed with Gates/Barricades	9.1	9.1	9.1
Additional Roads Closed with Gates/Barricades	N/A	5.8	1.9
Total BLM Roads after Project (Closed and Open)			
BLM Roads Closed In Project Area	N/A	14.9	11
BLM Roads Open In Project Area	N/A	14.6	16

TABLE 2-3. Non-commercial acres treated by dominant vegetation type

PRESCRIPTION	ACRES		
	ALT A	ALT B	ALT C
Young Conifer Stands (PCT)	0	889	889
Oak Woodlands (OW)	0	277	277
Shrubland (S)	0	317	227
Grass (G)	0	23	23
Total Acres	0	1,506	1,416

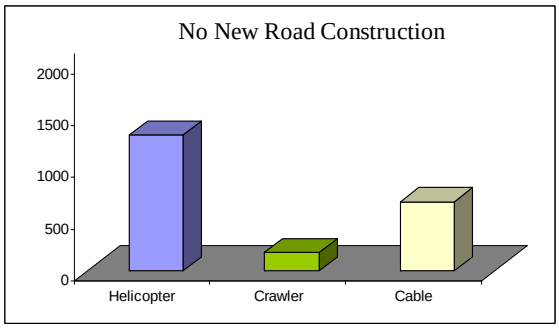
CHART 2-1: Logging systems utilized for commercial treatment



Alternative B

New Road Construction

Helicopter	975 Acres
Crawler/Tractor	195 Acres
Cable	992 Acres
Total Acres	2,162 Acres



Alternative C

No New Road Construction

Helicopter	1,309 Acres
Crawler/Tractor	172 Acres
Cable	664 Acres
Total Acres	2,145 Acres

Logging Costs

Table 2-4 displays the changes that would occur for logging systems with Alternative C (no new road development) vs. Alternative B (with new road development). The cost of implementing the treatments with out any new roads is greater, primarily because of an increase in the number of acres accessed via helicopter and in some case greater flight distance.

Table 2-4: Changes in units treated and estimated cost difference Alternative B vs. Alternative C

Road	Dropped units # and (ac.)	Change tractor logging to helicopter # and (ac.)	Change cable logging to helicopter # and (ac.)	Increase flight distance # and (ac.)	Road construction cost Alt B	Increase in logging cost Alt C
38-3-7.0	2 (3ac.) 3 (14ac.)		4 (47 ac.) 6 (109 ac.)	16 (3 ac.) 6 (9 ac.)	$44,000	$100,695
38-4-13.0			1 (8 ac.)		$ 1,750	$ 3,946
38-4-34.0		18 (10 ac.)	18 (24 ac.) 19 (6 ac.)	17 (16 ac.) 18 (19 ac.)	$36,000	$ 63,973
38-4-34.1			20 (40 ac.)	20 (12 ac.)	$28,000	$ 39,235
38-4-34.2			31 (25 ac.)		$ 3,500	$ 17,250
38-4-36.1		37 (13 ac.)	37 (48 ac.)		$24,000	$ 63,661
39-4-11.1			55 (21 ac.)		$ 5,250	$ 12,173
SUM	17 acres	23 acres	328 acres	59 acres	$142,500	$300,933

Tractor and cable logging costs were determined using the Pacific Northwest Logging Cost computer program. Helicopter logging costs were determined using Helipace computer program.

The changes in logging costs represent the savings when an average of 5.1 mbf/acre is being harvested during the first entry. All future commercial entries would have continued logging cost savings with no future construction cost.

PROJECT DESIGN FEATURES (PDFs)

Project Design Features (PDFs) are an integral part of the project design for each alternative. PDFs include seasonal restrictions on many activities in order to minimize erosion and reduce disturbance to wildlife. PDFs also outline protective buffers for sensitive species, mandate the retention of snags, and delineate many measures for protecting Riparian Reserves throughout the project. Most PDFs reflect Best Management Practices and standard operating procedures. **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. **Minimize helicopter logging and rely on more road construction for access to project areas.** Constructing enough roads to manage the project area without helicopters would require 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 routes chosen for the proposed action minimize the resource impacts and the amount of new road construction required to treat the areas proposed and provide for a long term transportation system.

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. Not treating oak woodlands and shrublands would not provide the reduction of fuels and increase of vigor expected from those treatments.

4. **Exclude commercial harvest and only remove small non-commercial sized trees.** 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 increasing forest health, reducing fuel loadings and improving tree vigor because it would not remove enough of the vegetation on the majority of sites to reduce competition or reduce fuel loads. It would not assist in the goal of providing some of the wood product needs for the local community.

CHAPTER III
Affected Environment

This chapter presents a description of the existing (baseline) physical, biological, and human social and economic environment that may be affected by the Proposed Action or alternatives. The discussion of Affected Environment describes the existing conditions within the Project and Planning Areas associated with the implementation of proposed actions and provides a basis for understanding the consequences associated with implementation of alternatives considered in detail (Chapter IV, Environmental Consequences).

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 effects to that component and found the proposed action or alternatives would have minimal or no effects.

Forest Vegetation - Health and Composition

The present day landscape pattern of the vegetation in the China Keeler project area is a result of topography, fires from 1864, 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 7,630 acres of federally-owned land in the China Keeler project area. The project area is presently composed of the following vegetation types: grassland, 40 acres; shrubland, 626 acres; hardwood/woodland, 1,038 acres; seedlings/saplings (0 to 4.9 inches DBH), 409 acres; small conifer timber (5 to 11 inches DBH), 516 acres; and large pole and mature conifer (11 inches or greater DBH) timber, 5,001 acres.

Some of the stands within the China Keeler project area have been previously harvested (5 percent of the project area is in an early seral stage). Natural mortality has also created openings in the canopy layer. Natural mortality is a result of Douglas-fir dwarf mistletoe, bark beetles and windthrow. The understory of these stands consists of dense pockets of conifer regeneration and shrubs. The regeneration ranges from seedling to small pole size trees, with many of these trees being suppressed as a result of growing under crowded conditions with limited moisture. These young stands would benefit from thinning. There are approximately 1,532 acres of natural stands suitable for this precommercial thinning in the project area.

In the project area, many of the commercial forest stands originated from the 1864 large-scale fire. Most of the forest stands became established within 10 years after a fire, although the harsher sites may have taken 30 to 40 years to become forested. Because the fire was forest-replacing in nature, individual timber stands now tend to be fine grained. 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 65 and 140 years old. However, there are 130 to 200 year old trees in fewer numbers. The oldest trees found were 302 and 345 years old. The age classes greater than 140 are the least frequently found. These older stands or patches of older trees are in the understory reinitiation stage of forest development.

Some of the larger trees are dying and young trees are starting to grow in the openings created by the dead trees. Consequently vertical stand structure is diverse.

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 average canopy closure for the China Keeler project area is 87 percent and ranges from 69 to 99 percent. Some forest stands have previously 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 found in the China Keeler project area: Douglas-fir, ponderosa pine, and white oak. The PSME (Douglas-fir)/RHDI (poison oak) and PSME/RHDI-BEPI (Piper's Oregon grape) 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), PSME - ABCO (white fir) - HODI (cream brush ocean spray), and PSME/BENE (dwarf Oregon grape). Small areas of PIPO-QUKE (California black oak) are present. The PIPO-PSME association is slightly cooler and wetter than the PIPO-QUKE association. 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. Two oak associations may be found; QUGA-PSME/RHDI and QUGA/CYEC (hedgehog dog tail).

Changes in species composition and stand structure are occurring over the landscape. Many second growth trees and trees with old-growth characteristics are dying as a result of high tree stocking levels. Douglas-fir, referred to as the climax species, is replacing ponderosa pine, sugar pine and incense cedar because of its more shade-tolerant nature. Douglas-fir is encroaching upon the edges of the oak woodlands, and mortality of Douglas-fir along these edges has been noticeable during the last few years. White leaf 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 white leaf 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 white leaf manzanita is the species that will pioneer the site following future disturbance. Other shrub species dying out of the conifer stands include deer brush ceanothus, cream brush ocean spray, 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. The number of commercial size (over eight inches DBH) trees per acre range from 102 to 1,227. The overall average for the China Keeler project area is 413 merchantable trees per acre. Average radial growth for the last decade at the time of inventory is .45 inches. The average relative density for the area is .75 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 47. Trees with vigor indices below 30 will succumb to attack from bark beetles of relatively low intensity. Trees with vigor between 30-70 can withstand progressively higher attacks but are still in danger of

mortality from the insect attacks. Trees with vigor between 70-100 can generally survive one or more years of relatively heavy attacks and trees with indices above 100 generally cannot be killed by bark beetles (Waring, 1980).

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

Forest pathogens are also changing the forest stand structure and forest development pattern. Phellinus pini (red ring rot) is affecting Douglas-fir and ponderosa pine. It appears to be more common on dry sites when trees are stressed. Some of the infected trees are beginning to die or are subject to stem breakage thus allowing light to reach the forest floor and the understory reinitiation stage to begin. Phaelous schweinitzii (brown cubical butt rot) is also present. Douglas-fir dwarf mistletoe is a significant pathogen throughout the project area with approximately 132 acres infected to some degree.

In the project area, the overall average amount of coarse woody material (CWM) is approximately 8.3 tons per acre (range; 1.9 to 29.7 tons/acre). The coarse woody material stem diameters were concentrated in the 3 to 31 inch classes at the large end and averaged 841 linear feet per acre for all decay and diameter classes. Coarse woody material was most often found to be in a decomposition class 3 and 4. Stand inventory data shows that there is a range of 0 to 152 damaged (includes physical defects or pathogens) trees/acre.

Fire and Fuels

Fire is recognized as a key natural disturbance process throughout Southwest Oregon (Atzet and Wheeler 1982). Human-caused and lightning fires have been a source of disturbance to the landscape for thousands of years. Native Americans influenced vegetation patterns for over a thousand years by igniting fires to enhance values that were important to their culture (Pullen, 1995). Early settlers to this area used fire to improve grazing and farming and to expose rock and soil for mining. Fire has played an important role in influencing successional processes. Large fires were a common occurrence in the area based on fire scars and vegetative patterns and were of varying severities.

Climate and topography combine to create the fire regime found throughout the project area. Fire regime refers to the frequency, severity and extent of fires occurring in an area (Agee 1991).

Current work describes five national fire regimes (Schmidt et al. In press):

Fire Regime 1: 0-35 year return, low severity fire
Fire Regime 2: 0-35 year return, high severity fire
Fire Regime 3: 35-100+ years return, mixed severity fire
Fire Regime 4: 35-100+ year return, high severity fire
Fire Regime 5: 200+ year return, high severity fire

Fire Regimes 3, 4, and 5 are subdivided based on vegetation and fire frequency. These fire regimes represent historic fire regimes, prior to the era of fire exclusion. Three historic fire regimes are found within the project area.

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

Fire Regime 2. 0-35 years, high severity
Includes true grasslands and savannahs with typical return intervals of less than 10 years and ceanothus and Oregon chaparral with typical return intervals of 10-25 years. Fire severity is generally high to moderate. Approximately 8% of the project area is classified in these vegetation types.

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

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

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 serve as a thinning mechanism, thereby, naturally regulating the density of the forests by killing unsuited and small trees. In addition, ponderosa pine trees that thrive in fire prone environments are quickly shaded out by the more shade tolerant Douglas-fir or white fir species in the absence of fire. As a result, some late-successional forests have undergone a rapid transition from ponderosa pine stands to excessively dense true fir stands. Trees growing at lower densities, as in ponderosa pine stands, tend to be more fire-resistant and vigorous. Eventually they grow large and tall, enhancing the vertical and structural diversity of the forest. Some populations of organisms that thrive in the more structurally diverse forests that large trees provide are becoming threatened.

Many forests developed high tree densities and produced slow growing trees rather than faster growing trees after abrupt fire suppression became policy in about 1910. In the Douglas-fir series in southwest Oregon there has been an increase in tree basal area with a shift to more shade tolerant species (Atzet 1996). Trees facing such intense competition often become weakened and are highly susceptible to insect epidemics and tree pathogens. Younger trees (mostly conifers) contribute to stress and mortality of mature conifers and hardwoods. High density forests burn with increased intensity because of the 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 shrublands 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 increased development of homes in the wildland urban interface, dispersed camp sites, recreational use, and major travel corridors add to the risk component for the possibility of a fire occurring from human causes. The time frame most conducive for fires to occur in the project area is from July through September.

Information from the Oregon Department of Forestry database from 1967 to 2001 show a total of 88 fires occurred throughout the project area. Lightning accounted for 31 percent of the total fires and human caused fires accounted for 51%. Unknown causes accounted for 18% of the fires. The following table is a break down of the fires within the project area:

Total Number of Fires	Size Class	Size
71	A	<.25ac
12	B	.26-10ac
4	C	10.1-100ac
1	D	100.1-300ac

The class D fire was caused by lightning. One of the class C fires was started by lightning, one by a rancher and two from unknown causes.

The following table breaks down the cause of human started fires within the project area.

Cause of Fire	Number of fires
Rancher/Farmer	7

Forest Workers	2
General Landowner	12
Public Utility	6
Recreationist	7
Motorist	7
General Public	4

Only 26% or 23 fires started on BLM managed lands. Of these fires, 73% were started by lightning and the remaining fires were human caused.

Fire Hazard

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

Fire Hazard Rating	Percentage of Acres in each Category
Low hazard	10%
Moderate hazard	41%
High hazard	49%

Air Quality

Fuels management activities generate particulate pollutants in the process of treating natural and activity related fuels. Smoke from prescribed fire has the potential to effect air quality within the project area as well as the surrounding area. The use of prescribed fire for ecosystem restoration can produce enough fine particulate matter to be a public health and/or welfare concern. Fine particulates in smoke can travel many miles downwind impacting air quality in local communities, causing a safety hazard on public roads, impairing visibility in class I areas, and/or causing a general nuisance to the public. If properly managed, most negative effects of prescribed fire smoke can be minimized or eliminated.

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

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

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

Particulate matter smaller than 10 micrometers (PM 10) is a term used to describe airborne solid and liquid particles. Because of its small size, PM 10 readily lodges in the lungs, thus increasing levels of respiratory infections, cardiac disease, bronchitis, asthma, pneumonia, and emphysema.

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

Smoke Aloft

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

Ground Level Smoke

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

Nonattainment Areas

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

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

PM 10 and smaller at ground level.

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

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

For the purpose of maintaining air quality, the State Forester and the Department of Environmental Quality shall approve a plan for the purpose of managing smoke in areas they designate. The authority for the State administration is ORS 477.513(3)(a).

ORS468A.005 through 468A.085 provides the authority to DEQ to establish air quality standards including emission standards for the entire State or an area of the State. Under this authority the State Forester coordinates the administration and operation of the plan. The Forester also issues additional restrictions on prescribed burning in situations where air quality of the entire State or part thereof is, or would likely become adversely affected by smoke.

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

Soils

The China Keeler Project area consists mainly of the China Gulch watershed and the Chapman/Keeler watershed. Timber harvesting last occurred in the China Gulch watershed between 1989 and 1993 when small amounts of scattered dead trees were salvaged. Except for miscellaneous salvage, the Chapman/Keeler watershed was last entered for timber harvest around 1987 when approximately 96 acres were shelterwood cut and about 106 acres had the overstory removed. Both watersheds have recovered nicely from previous management activities with erosion rates being near natural levels in most areas except where roads and motorcycle trails exists. Some roads in the China Gulch watershed are presently located in or near riparian areas. The remaining roads in the Chapman/Keeler watershed either traverse across the hill slope or are located near ridge tops. Most of these roads are in stable condition. Soils series identified in the project area are Caris, Offenbacher, Jayar, Manita, McMullin, Ruch, Vannoy, Voorhies. The mapping units and soils description are described below and a map showing the location of the soils on the landscape is on file at the Medford District office.

25G/26G-Caris-Offenbacher gravelly loams, 50 to 80 percent slopes.
This map unit is on hillslopes. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 25 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. This unit is about 60 percent Caris soil and 30 percent Offenbacher soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used. Included in this unit are small areas of Tallowbox, Vannoy, and Voorhies soils; small areas of McMullin soils and Rock outcrop on ridges and convex slopes; and, on concave slopes, soils that are similar to the Caris and

Offenbacher soils but have bedrock at a depth of more than 40 inches. Also included are small areas of Caris and Offenbacher soils that have slopes of less than 50 or more than 80 percent. Included areas make up about 10 percent of the total acreage.

The Caris 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 gravelly loam about 7 inches thick. The upper 13 inches of the subsoil is dark yellowish brown very gravelly clay loam. The lower 11 inches is dark yellowish brown extremely gravelly loam. Bedrock is at a depth of about 31 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is very gravelly loam or is stony. Permeability is moderate in the Caris soil. Available water capacity is about 2 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. This is a highly sensitive soil on slopes that exceed 70 percent and moderately sensitive on slopes below 70 percent as related to soil productivity effects from disturbance.

The Offenbacher 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, leaves, and twigs about 1 inch thick. The surface layer is dark grayish brown and dark brown gravelly loam about 9 inches thick. The subsoil is reddish brown and yellowish red loam about 25 inches thick. Bedrock is at a depth of about 34 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is very gravelly loam or is stony. Permeability is moderate in the Offenbacher soil. Available water capacity is about 4 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. This soil is a moderately sensitive soil as related to soil productivity effects from disturbance (i.e., prescribe burning).

87G-Jayar very gravelly loam, 45 to 70 percent north slopes.
This moderately deep, well drained soil is on hillslopes. It formed in colluvium derived dominantly from metamorphic rock. Elevation is 3,600 to 5,300 feet. The mean annual precipitation is 40 to 60 inches, the mean annual temperature is 40 to 45 degrees F, and the average frost-free period is less than 100 days. The native vegetation is mainly conifers and an understory of grasses, shrubs, and forbs.

Typically, the surface is covered with a layer of needles, leaves, and twigs about 1 inch thick. The surface layer is very dark grayish brown very gravelly loam about 5 inches thick. The next layer is dark brown very gravelly loam about 6 inches thick. The subsoil also is dark brown very gravelly loam. It is about 13 inches thick. Bedrock is at a depth of about 24 inches. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is stony. Permeability is moderate in the Jayar soil. Available water capacity is about 3 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. This soil is a moderately sensitive soil as related to soil productivity effects from disturbance (i.e., prescribe burning).

Included in this unit are small areas of Woodseye soils and Rock outcrop on ridges and convex slopes and soils that are similar to the Jayar soil but are influenced by serpentine, have less than 35 percent rock fragments, or have bedrock at a depth of more than 40 inches. Also included are small areas of Jayar soils that have slopes of less than 45 or more than 70 percent. Included areas make up about 20 percent of the total acreage.

108E - Manita loam, 20 to 35 percent slopes.

This deep, well drained soil is on alluvial fans and hillslopes. It formed in alluvium and colluvium derived dominantly from metamorphic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 20 to 40 inches, the mean annual temperature is 47 to 54 degrees F, and the average frost-free period is 100 to 170 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

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. In some areas the surface layer is gravelly. Permeability is moderately slow in the Manita soil. Available water capacity is about 8 inches. The effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate. This soil is a least sensitive soil as related to soil productivity effects from disturbance (i.e., prescribe burning).

Included in this unit are small areas of Darow, Vannoy, and Voorhies soils on ridges and convex slopes, Selmac soils on concave slopes, poorly drained soils near drainageways and on concave slopes, Ruch soils on toe slopes, and soils that are similar to the Manita soil but have bedrock at a depth of more than 60 inches. Also included are small areas of Manita soils that have slopes of less than 20 or more than 35 percent. Included areas make up about 20 percent of the total acreage.

113G-McMullin-Rock outcrop complex, 35 to 60 percent slopes.
This map unit is on hillslopes. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 18 to 40 inches, the mean annual temperature is 45 to 52 degrees F, and the average frost-free period is 100 to 180 days. The native vegetation is mainly grasses, shrubs, and forbs.

This unit is about 60 percent McMullin soil and 30 percent Rock outcrop, The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used.

The McMullin soil is shallow and well drained. It formed in colluvium derived dominantly from igneous and metamorphic rock. Typically, the surface layer is dark reddish brown gravelly loam about 7 inches thick. The subsoil is dark reddish brown gravelly clay loam about 10 inches thick. Bedrock is at a depth of about 17 inches. The depth to bedrock ranges from 12 to 20 inches. Permeability is moderate in the McMullin soil. Available water capacity is about 2 inches. The effective rooting depth is 12 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. This is a highly sensitive soil as related to soil productivity effects from disturbance (i.e., prescribed burning).

Rock outcrop consists of areas of exposed bedrock. Runoff is very rapid in these areas.

195F - Vannoy silt loam, 35 to 55 percent slopes.
This moderately deep, well drained soil is on hillslopes. It formed in colluvium derived from metamorphic rock. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 20 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs.

Typically, the surface is covered with a layer of needles, leaves, and twigs about 3/4 inch 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. The depth to bedrock ranges from 20 to 40 inches. Permeability is moderately slow in the Vannoy soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. This is a moderately sensitive soil as related to soil productivity effects from disturbance activities.

In some areas the surface layer is gravelly or very gravelly loam. Included in this unit are small areas of Voorhies soils, Caris and Offenbacher soils on the more sloping parts of the landscape, McMullin soils and Rock outcrop on ridges and convex slopes, Manita soils on the less sloping parts of the landscape and on concave slopes, and soils that are similar to the Vannoy soil but have bedrock at a depth of more than 40 inches. Also included are small areas of Vannoy soils that have slopes of less than 35 or more than 55 percent. Included areas make up about 20 percent of the total acreage.

196/197F - Vannoy-Voorhies complex, 35 to 55 percent slopes.
This map unit is on hillslopes. Elevation is 1,000 to 4,000 feet. The mean annual precipitation is 20 to 40 inches, the mean annual temperature is 46 to 54 degrees F, and the average frost-free period is 100 to 160 days. The native vegetation is mainly conifers and hardwoods and an understory of grasses, shrubs, and forbs. This unit is about 60 percent Vannoy soil and 30 percent Voorhies soil. The components of this unit occur as areas so intricately intermingled that mapping them separately was not practical at the scale used. Included in this unit are small areas of McMullin soils and Rock outcrop on ridges and convex slopes, Caris and Offenbacher soils on the more sloping parts of the landscape, Manita soils on the less sloping parts of the landscape and on concave slopes, and soils that are similar to the Vannoy soil but have bedrock at a depth more than 40 inches. Also included are small areas of Vannoy and Voorhies soils that have slopes of less than 35 or more than 55 percent. Included areas make up about 10 percent of the total acreage.

The Vannoy 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, leaves, and twigs about 3/4 inch 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. The depth to bedrock ranges from 20 to 40 inches. In some areas the surface layer is gravelly or very gravelly loam. Permeability is moderately slow in the Vannoy soil. Available water capacity is about 5 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. This is a moderately sensitive soil as related to soil productivity effects from disturbance activities.

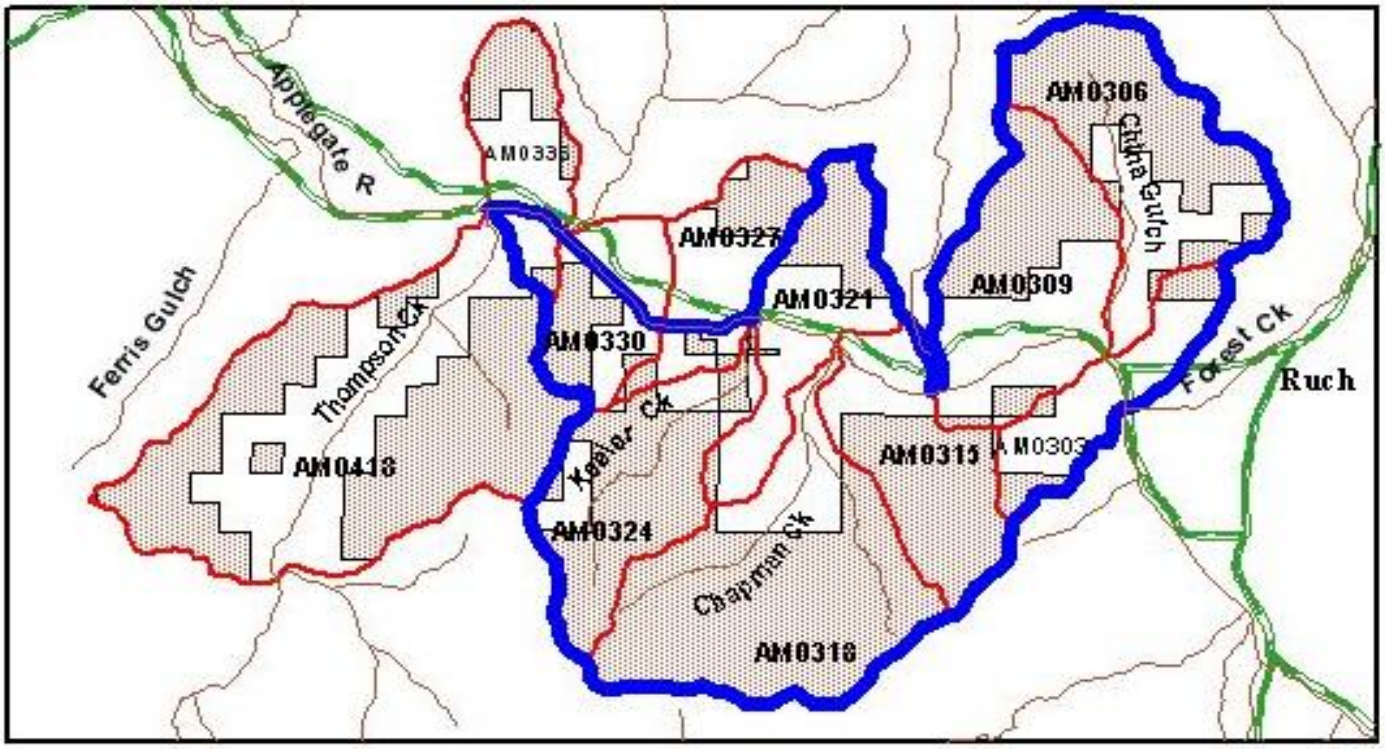
The Voorhies soil is moderately deep and well drained. It formed in colluvium derived dominantly from metamorphic rock. Typically, the surface is covered with a layer of needles and twigs about 1 inch thick. The surface layer is very dark grayish brown and dark brown very gravelly loam about 8 inches 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. The depth to bedrock ranges from 20 to 40 inches. Permeability is moderate in the Voorhies soil. Available water capacity is about 3 inches. The effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. This is a moderately sensitive soil as related to soil productivity effects from disturbance activities.

Hydrology
Streamflow, water quality, and channel morphology

Project Area and Associated Drainage Areas

The proposed 19 square mile China Keeler project area is within the central portion of the Middle Applegate River Watershed. All of the land within the project area drains into the portion of the Applegate River between Thompson Creek (near Applegate) on the west and Forest Creek (near Rd 238 / Hamilton Rd intersection) on the east. The project area is located approximately in the lower third of the 771 square mile Applegate River Subbasin with 499 square miles of the Applegate River Subbasin remaining above the project area.

Map 2: China Keeler Project Area



Map 2 shows an outline of the project area (bold line) as well as the drainages that are associated with the project area. The shaded areas denote BLM-managed lands. The China Gulch, Chapman Creek, and Keeler Creek areas each drain their respective watershed into a single outlet point at their respective confluence points with the Applegate River. The Lower Thompson Creek (AM0418) drainage area lies outside of the project boundary and drains the lower portion of the Thompson Creek watershed into a single point at the confluence with the Applegate River. The Thompson Creek drainage was included in the analysis because it contains a proposed access road to the project area.

The remaining drainages (marked with as asterisk in Table 3-1) are frontal watersheds that drain directly into both sides of the Applegate River along the entire river interface either by means of surface flow in small, individual channels or by subsurface flow. Note that three of these drainage areas (AM0036, AM0330, and AM0327) have a portion of the drainage on the north side of the river that is not included in the project area. Obviously, these areas will not be directly affected by project activities that occur on the other side of the river.

Most of the BLM land is located in the upper elevations of the respective drainage areas while the private lands dominate the lower valley along the Applegate River. Some of the private lands are owned by timber companies and their management is guided in part by the Oregon Forest Practices Act. Most of the private land use along the river is either residential or agricultural.

Table 3-1: Drainage Areas Associated with the China Keeler Planning Area

Drainage Code Number	Drainage Area Location	BLM acres within project area	Private acres within project area	Total acres within project area	Total Drainage Area (acres)	Total Drainage Area (square miles)
AM0303*	Between China Gulch and Forest Cr	218	646	864	864	1.3
AM0306	**China Gulch drainage**	1,238	659	1,897	1,897	3.0
AM0309*	Between Long Gulch and China Gulch	936	930	1,866	1,866	2.9
AM0315*	Between Chapman Cr and Long Gulch	909	398	1,307	1,307	2.0
AM0318	**Chapman Cr drainage**	2,254	461	2,714	2,714	4.2
AM0321*	Between Keeler Cr and Chapman Cr	462	740	1,201	1,201	1.9
AM0324	**Keeler Cr drainage**	1,185	335	1,521	1,521	2.4
AM0327*	Between Gage 14366000 and Keeler Ck	78	136	214	939	1.5
AM0330*	Between Humbug Cr and Gage 14366000	312	233	544	845	1.3
AM0336*	Between Thompson Cr and Humbug Cr	32	143	175	894	1.4
AM0418	**Thompson Cr drainage below Tallowbox Cr**	0	0	0	4,291	6.7
	Totals	**7,623**	**4,680**	**12,303**	**18,339**	**28.7**

*** Frontal drainages that do not drain to a single point**

Precipitation Regime

Average annual precipitation in the China Keeler project area ranges from approximately 25 to 42 inches. Precipitation predominately falls between the months of November and March and summer months are typically very dry. The rain patterns in the winter months are wide based with relatively low intensity and long duration in contrast to localized, short duration, and high intensity summer storms that occasionally occur. Data on recent extremes of monthly precipitation is readily available on the Internet from Oregon Climate Service for NOAA stations located in Applegate (west edge of the project area) at http://www.ocs.orst.edu/pub_ftp/climate_data/tpcp/tpcp0217.up and in Ruch (east side of the project area) at http://www.ocs.orst.edu/pub_ftp/climate_data/tpcp/ tpcp7391.up.

Transient Snow Zone

The transient snow zone is defined as the elevation range between 3,500 and 5,000 feet where there is a higher probability of rain-on-snow precipitation events. This zone is of interest to land managers since greater snow accumulation can occur in clearings, producing the potential for higher peak flows during rain-on-snow events. The *Oregon Watershed Assessment Manual* (OWAM) that was developed by Watershed Professionals Network 1999 for the Governor's Watershed Enhancement Board provides a method for assessing the potential risk for peak flow increases from runoff originating in the transient snow zone. This risk assessment method indicates that drainages with more than 25% of the area in the transient snow zone may be at risk for possible peak flow increases.

The elevation range of the China Keeler project is from 1,260 feet at Applegate to 5,023 feet at Tallowbox Mountain. Table 3-2 shows that the Chapman Creek drainage is within the transient snow zone and therefore, may have a risk of increased peak flows.

Table 3-2: Portion of Project Area Within the Transient Snow Zone.

Drainag Are Numbe	**Locatio**	Acres in Precipitation			% in Snow
		Rainfal Zon	Transien Zon	Snow	
AM030	Between China Gulch and Forest	864	0	0	0
AM030	China Gulch	1878	19	0	1
AM030	Between Long Gulch and China	1866	0	0	0
AM031	Between Chapman Cr and Long	1252	55	0	4
AM031	Chapman Cr	1938	776	0.3	29
AM032	Between Keeler Cr and Chapman	1201	1	0	0
AM032	Keeler Cr	1282	239	0	16
AM032	Between Gage 14366000 and Keeler	939	0	0	0
AM033	Between Humbug Cr and 14366000	845	0	0	0
AM033	Between Thompson Cr and Humbug	894	0	0	0
AM041	Thompson Cr drainage Tallowbox	4281	10	0	0

The OWAM risk assessment chart indicates that more than 85% of the area in the transient zone would have to have less than 30% crown cover to cause a detectable increase in peak flows (based on Figure 3, Page IV-11of the OWAM). Aerial photo analysis shows that approximately 2% of the critical zone is in this range. Consequently, the risk of increased peak flows in Chapman Creek is low under current conditions.

It should be noted that, for this eco-region, the historic crown closure is listed as greater than 30% (Eco-Regions of Oregon, www.oweb.state.or.us/pdfs/wa_manual99/apdx1-ecoregions.pdf) and current closure in this transient zone is estimated at 69% which is well above the 30% minimum value. Consequently, under current conditions, snow accumulation in the transient zone of the Chapman Creek drainage may be less than what may have occurred historically.

Streamflow and Groundwater

Land management activities have the potential of affecting the streamflow regime and the groundwater patterns within the watershed. This section discusses the situation in the China Keeler project area.

Flow Regime

Moderate to high streamflows usually occur between mid-November and April, with runoff peaking in February and March. Significant flows can also be produced by the local, high

intensity summer storms though these events are relatively rare and their effect is limited to the local area. The lowest streamflows generally occur in August and September. Streamflows in the Applegate River are partially regulated by Applegate Dam which controls the flow from 223 square miles of the river basin and thus regulates approximately 44% of the flow to the project area. The dam has moderated the extreme values of both high and low flows in the mainstem Applegate River resulting in reduced peak flows and less extreme low flow conditions. Many of the tributary streams in the project area become dry in late summer.

Water Allocations

Use of water through valid water rights and other water withdrawals increase the likelihood that the streams and wells will go dry in late summer, especially in drought years. Table 3, developed from the Middle Applegate Watershed Analysis, shows the existing water right allocations for the largest streams in the project area compared to the estimated mean August surface flow. The Keeler Creek mining allocation is not being used at this time.

Table 3-3: Water Rights (from Middle Applegate Watershed Analysis)

Stream and Oldest Priority Date	Uses and Percent of Total Allocation	Allocation Rates (cfs)			Estimated Mean August Surface Flow (cfs)	Ratio of Surface Allocation to Mean August Surface Flow
		Surface Water	Ground-water	Total		
Chapman Creek 2/17/1955	irrigation (100%)	1	0	1	0.1	10
China Gulch 12/31/1930	irrigation (100%)	0.05	0.31	0.36	0.07	0.71
Keeler Creek 12/31/1890	mining (98.79%) irrigation (1.17%) domestic (0.04%)	27.33	0	27 mining 0.33 other	0.06	450 mining 5.5 other

Stream Types

Surface water in the proposed China Keeler project area includes streams, springs, wetlands, reservoirs, and ditches. Streams in the project area are classified as perennial, intermittent with seasonal flow (long duration intermittent), intermittent with ephemeral flow (short duration intermittent), and dry draws with ephemeral flow. Streams categorized as perennial or intermittent on federal lands are required to have Riparian Reserves as defined in the Northwest Forest Plan. Dry draws do not meet the Northwest Forest Plan definition for streams needing Riparian Reserves. Streams on private forest lands are managed according to the Oregon Forest Practices Act. Stream types on federal lands were identified through site visits; non-federal land stream types were estimated using aerial photo interpretation and extrapolation from information on adjacent federal lands (Table 3-4).

Table 3-4. Miles of Stream associated with the China Keeler Project Area

Drainage Area Number	In/Out China Keeler Area	Miles of Stream by Type and Ownership								Total Stream Miles		
		Perennial		Long Duration Intermittent		Short Duration Intermittent		Dry Draw				
HUC7		BLM	Other Lands	BLM	Other Lands	BLM	Other Lands	BLM	Other Lands	BLM	Other Lands	All Lands
AM0303	**In**		0.9		0.8	1.3	3.2	1.6	3.1	2.9	8.0	10.9
AM0306	**In**	0.5	1.8	1.8	4.1	5.7	2.4	10.2	2.1	18.2	10.4	28.6
AM0309	**In**		2.7	2.3	4.5	3.8	1.6	7.4	3.0	13.5	11.8	25.3
AM0315	**In**	0.1	1.0	2.5	0.9	4.1	0.4	5.9	0.4	12.6	2.7	15.3
AM0318	**In**	4.9	2.2	1.0	0.1	2.4	1.4	18.6	3.5	26.9	7.2	34.1
AM0321	**In**		1.8	0.6	1.8	1.8	2.7	2.3	2.6	4.7	8.9	13.6
AM0324	**In**	2.7	0.8	0.8	0.2	2.9	0.6	10.6	3.0	17.0	4.6	21.6
AM0327	**In**	0.1	0.8		0.2	0.3	0.2	0.5	0.4	0.9	1.6	2.5
	Out			0.9	2.0	0.5	1.3	1.5	0.9	2.9	4.2	7.1
AM0330	**In**	0.4	1.1		0.8	0.3	0.3	2.4	1.2	3.1	3.4	6.5
	Out				0.3		0.7		1.3		2.3	2.3
AM0336	**In**		0.6		0.5			0.3	0.2	0.3	1.3	1.6
	Out			0.2	2.2	1.0	1.7	2.9	1.1	4.1	5.0	9.1
AM0418	**Out**	1.9	5.7	1.6	5.0	6.2	4.7	15.5	5.4	25.2	20.8	46.0
Total		10.6	19.4	11.7	23.4	30.3	21.2	79.7	28.2	132.3	92.2	224.5

Springs, wetlands and reservoirs

Springs, wetlands and reservoirs on BLM-administered lands within the project area have been identified and mapped in GIS. All of the features are less than one acre and are contained within a Riparian Reserve protection area. The majority of the springs are located within the Chapman Creek drainage area (Table 3-5). Springs that appear to be used by private parties are identified in Appendix K.

Table 3-5. Springs, Wetlands and Reservoirs on BLM-Administered Land within the China Keeler Project Area

Drainag Are	**Drainage**	Number present on BLM-managed lands		
		Springs	Wetland	Reservoi
AM0303	Between China Gulch and Forest	0	0	0
AM0306	China Gulch	8	2	2
AM0309	Between Long Gulch and China	10	0	0
AM0315	Between Chapman Cr and Long	3	0	0
AM0318	Chapman	20	1	1
AM0321	Between Keeler Cr and Chapman	5	0	1
AM0324	Keeler	7	1	1
AM0327	Between Gage 14366000 and Keeler	0	0	0
AM0330	Between Humbug Cr and Gage 14366000	2	0	0
AM0336	Between Thompson Cr and Humbug	0	0	0
	Tota	**55**	**4**	**5**

Upland Conditions Affecting Streamflow

Upland disturbances that change the local hydrologic processes can, in turn, affect streamflow. Evaporation from soil and water surfaces as well as transpiration from plants affect the amount of water available for streamflow. The amount and type of vegetation growing in the area and the condition of the soil surface also affects the net amount of water that enters the ground. Fire and compaction can reduce the infiltration properties of the soil, resulting in increased runoff. Compaction can also impede the subsurface movement of water as it moves downslope in shallow aquifers. Roads and ditches can intercept both surface and subsurface flow thereby changing the local drainage pattern.

Roads

Roads can be a concern if they change the local drainage pattern and force the natural drainage system, that has developed over millennia, to adjust to a new regime. For example, a road might intercept storm flow and transport it into another drainage. The channel in the drainage receiving the additional flow must start an adjustment process to accommodate this flow increase while the original channel responds to a reduction in water.

Well-designed roads with a properly functioning drainage system will attempt to mimic the local natural drainage pattern by keeping the local downslope movement of water similar to the pre-road condition. However, during extreme events (drought or peak flow) any hydrologic differences between the artificial drainage associated with the road system and the natural system become more critical and can cause noticeable effects to the local environment.

Road failures can adversely affect the aquatic system in several different ways. A fill or cut slope failure produces soil material that could potentially increase the sediment input to a stream. Culvert failures can cause the water to be diverted from one drainage to another thereby affecting the channel stability of both systems.

There are many factors that determine the risk associated with roads. Roads that are designed and maintained to replicate the local conditions generally present less risk. In contrast, unauthorized access on roads that are not maintained present a higher risk of causing an adverse effect in the watershed.

Table 3-6. Road Miles and Road Density by Drainage Area, Project Area and Ownership

Drainage Area Number	Roads From GIS Data				Additional Roads From Aerial Photos				Total Road Miles	Road Density (mi/mi^2)		Percent of Area in Roads *	
	Within Project Area		Outside Project Area		Within Project Area		Outside Project Area			Within Project Area	Outside Project Area	Within Project Area	Outside Project Area
	BLM	Other	BLM	Other	BLM	Other	BLM	Other					
AM0303	1.9	8.3			0.1	4.0			14.3	10.6		6.0%	
AM0306	4.4	6.6			2.8	5.6			19.4	6.6		3.7%	
AM0309		8.9			1.7	2.8			13.4	4.6		2.6%	
AM0315	3.7	3.1			0.8	1.2			8.8	4.3		2.5%	
AM0318	4.1	3.6			0.5	1.9			10.1	2.4		1.4%	
AM0321	0.2	4.2			0.4	4.3			9.1	4.9		2.8%	
AM0324	7.0	2.3			1.0	0.7			11.0	4.6		2.6%	
AM0327	0.3	0.8	0.1	5.2		0.2	1.2	2.9	10.7	3.8	8.3	2.2%	4.7%
AM0330		1.3		2.7	0.6	1.1		3.6	9.2	3.5	13.3	2.0%	7.6%
AM0336		1.0		2.4		0.9	1.3	1.5	7.2	7.1	4.7	4.0%	2.6%
AM0418			10.5	5.1			7.0	8.6	31.3		4.7		2.6%
Total	**21.6**	**40.1**	**10.6**	**15.4**	**7.9**	**22.8**	**9.5**	**16.6**	**144.5**	**4.8**	**5.5**	**2.7%**	**3.1%**

* Based on 30 foot average width

Road density provides a general index of relative extent of the amount of road in the project drainages. Table 3-6 shows road miles as determined from the BLM GIS data base and from an aerial photo survey. Many roads such those hidden by tree canopy, jeep and OHV trails and recently new private roads are not included in the table. It is estimated that the percentage of undetected roads may be as much as 30% on private lands and 10% on federal lands (Dave Squyres, personal communication). The risk associated with roads depends, in part, on the road density. However, many other factors need to be considered for a full risk determination. Table 3-6 shows drainage area AM0303 with the highest road density, a consequence of the higher residential use in that area. The percentage of the drainage area in roads is a similar index. The Oregon Watershed Assessment Manual suggests that rural drainages with more than 8% roads have a high potential of experiencing more than a 10% increase in peak flows. Drainages with 4-8% have a moderate risk and less than 4% have a low risk. Table 3-6 shows that AM0303 has a moderate risk of having an increase in peak flows while the remaining drainages are in the low risk category.

Road location is also important. Roads near the stream and mid-slope may have a greater chance of directly affecting the hydrologic function of the stream system. Table 3-7 shows the number of stream crossings by stream type for each of the drainage areas. Note that 65% of the BLM crossings are over dry draws that are generally located nearer to the ridgetop.

Several tributaries in the project area are experiencing channel downcutting and streambank erosion due to road crossings with undersized or “shotgun” culverts. The majority of road-related problems were identified in the Chapman Creek and Keeler Creek drainages.

Table 3-7: Stream Crossings Identified in the BLM GIS Database

Drainage Area Number	# of Stream Crossings by Stream Type and Ownership								Total	Crossings / mi^2
	Perennial		Long Duration		Short Duration		Dry Draw			
	BLM	Other	BLM	Other	BLM	Other	BLM	Other		
AM0303		3		4	3	11	4	12	37	27.4
AM0306	2	2	1	12	9	8	7	4	45	15.2
AM0309		6		15		6		3	30	10.3
AM0315		4	2	1	2	1	8	1	19	9.3
AM0318	14	2			9	1	59	12	97	22.9
AM0321		5		5		4		5	19	10.1
AM0324	6	1			6	2	28	11	54	22.7
AM0327				11		17			28	19.1
AM0330		1		4		3		11	19	14.4
AM0336				7		1			8	5.7
AM0418	5	19	1	12	8	16	25	9	95	14.2
Grand Total	27	43	4	71	37	70	131	68	451	15.7

Trails

Trails have the potential to adversely affect streams and water quality in the same manner as roads. In particular, trails that are created through dispersed use without the benefit of design or proper maintenance can produce serious erosion and adversely affect water quality. Good design and regular maintenance is essential to minimize the effect of these trails.

Off Highway Vehicle (OHV) use in non-designated areas is common in the China Keeler area, particularly in the AM0306 and AM0309 drainage areas. This use is especially damaging in wet weather when ruts are formed that cause accelerated erosion when the surface water is directed away from the natural drainage. Since these areas are often in remote locations, the erosion may progress unabated for an extended period of time, resulting in extensive damage.

Timber Harvest

Timber harvest activities that expose soil to surface erosion can result in accelerated rates of sediment production. Skid trails and yarding corridors can expose soil and also cause compaction. Burn piles and underburning can also result in more soil exposure. Increased openings in the forest canopy from harvest activity can result in more snow accumulation and may increase the amount of streamflow during rain-on-snow events (see Transient Snow Zone above). In general, tree crowns intercept precipitation and reduce the effect of extreme storm events while the tree roots provide stability to the soil. Consequently, open areas without vegetative surface cover may have a larger risk of increased sediment production.

The BLM-managed land in the upland portion of the project area tends to be well forested while the private land in the lower valley is more open due to agricultural and residential use. Table 3-8 shows the variety of vegetation conditions for the BLM-administered lands. Table 3-9 shows the estimated crown closure for the drainage areas based on an aerial photo survey using BLM 2001 aerial photos.

Table 3-8: BLM Vegetation Condition Class by Drainage Area

Acres and % of BLM Vegetation Condition Class by Drainage Area									
Drainage	Grass	Brush	Woodland	Early Seral	Poles	Mid Seral	Mature	Private	Total
AM0303		12.5	44.8	40.4	42.6	79.2		643.9	863.4
		1%	5%	5%	5%	9%		75%	100%
AM0306	19.1	96	337.3	28.5	64.8	587.1	103.6	660.9	1897.3
	1%	5%	18%	2%	3%	31%	5%	35%	100%
AM0309		355	150.1		142.4	163.8	126.7	927	1865
		19%	8%		8%	9%	7%	50%	100%
AM0315			75.7	15.5	7.5	394.9	419.7	393.6	1306.9
			6%	1%	1%	30%	32%	30%	100%
AM0318	8.6		219.5	183	215.1	982.4	642.2	463.2	2714
	0%		8%	7%	8%	36%	24%	17%	100%
AM0321	11.9	160.9	231.5		4.7	36.6	12.1	743.8	1201.5
	1%	13%	19%		0%	3%	1%	62%	100%
AM0324		1	23.1	141.2	14.7	433.2	569.6	337.9	1520.7
		0%	2%	9%	1%	28%	37%	22%	100%
AM0327		193	86.4			30.9	47.9	580.9	939.1
		21%	9%			3%	5%	62%	100%
AM0330			76		3.6	72.9	166.8	526.3	845.6
			9%		0%	9%	20%	62%	100%
AM0336		165.9	160.9			2	30.2	535	894
		19%	18%			0%	3%	60%	100%
AM0418	53.9	31.4	644.7	228.9	107.9	836.4	649.4	1737.3	4289.9
	1%	1%	15%	5%	3%	19%	15%	40%	100%

Table 3-9: Average Crown Cover in the Project Drainage Areas

Drainage	BLM		Private		Total Drainage	
	Acres	% Crown Cover	Acres	% Crown Cover	Acres	% Crown Cover
AM0303	218	75%	646	15%	864	30%
AM0306	1238	65%	659	55%	1897	62%
AM0309	936	60%	930	15%	1866	38%
AM0315	909	70%	398	20%	1307	55%
AM0318	2254	70%	461	60%	2714	68%
AM0321	462	50%	740	30%	1201	38%
AM0324	1185	80%	335	75%	1521	79%
AM0327	358	50%	581	60%	939	56%
AM0330	319	60%	526	35%	845	44%
AM0336	359	60%	535	15%	894	33%
AM0418	2554	50%	1737	20%	4291	38%

As mentioned previously in the precipitation section, the historic crown closure for this eco-region is listed as greater than 30%. Table 3-9 indicates that the crown cover on BLM-managed lands is well above the lower end of the historic range.

Wildfire

Wildfire is a natural process that is part of the forest maintenance and regeneration cycle. Fire suppression management can result in increased fuel build-up with an increased risk of eventually experiencing a hotter, more devastating fire than would be experienced under a more natural fire regime. The severe fires can be more damaging to streams and water quality because they often

expose more soil by burning the duff layer on the forest floor. The suppression effort associated with a severe fire can also be damaging. Dozer lines and hand constructed firelines need to be carefully rehabilitated to prevent serious resource damage. Also, since more large wood is consumed in a severe fire, a deficiency of stabilizing wood material can result in increased erosion processes. BLM's current fire management strategy is to mimic the effect of small, low intensity fires with a systematic fuel reduction program (See fire and fuels discussion).

Water quality

The Applegate River through this project area is on the 2002 Oregon DEQ 303(d) water quality limited list for stream temperature. Stream temperatures in smaller streams that are closer to their respective source areas are typically cooler. BLM stream temperature monitoring indicates that all of the streams on BLM-administered land in the China Keeler area meet the 64°F maximum criteria with the exception of a small portion of Keeler Creek. Data from 1998-2000 indicate that the 64°F criteria was exceeded for a brief period each year at the lowest BLM boundary in section 25. Additional data from 2000 indicates that points in Keeler Creek above the 26/35 section line meet the 64°F criteria.

Further study would be required to determine if the Keeler Creek temperature values are consistent with natural conditions or if the higher temperatures are the result of a management activity such as shade removal or flow modification. Meanwhile, the Riparian Reserve requirements assure that the stream will receive the maximum shade possible on federal lands.

Sedimentation associated with channel erosion is ongoing to a limited extent in the planning area. During BLM stream surveys, the tendency for streambank failure was evaluated with a "slump potential" rating. Table 3-10 shows a comparison of the slump potential ratings on the main tributaries as determined during the stream survey process. In general, channel stability is expected to improve as Riparian Reserves mature and additional structural material is added to the channel area.

Table 3-10: Slump Potential Ratings for Stream Reaches Surveyed by BLM.

Creek	Low	Medium	High
Chapman Cr	52%	41%	7%
Keeler Cr	55%	39%	6%
China Gulch	36%	60%	4%

Stream Morphology

Applegate River

All of the planning area drains into a segment of the Applegate River located between river miles 24 and 32 where it drops 120 feet from an elevation of 1380 feet to 1260 feet. The river is characterized by numerous depositional bars and some split channels. The flow has been regulated since December of 1980 by the Applegate Reservoir and the river is adjusting to the new flow regimen. In particular, there is a reduction in the amount of sediment material from sources upstream of the dam. Also, the reduction of the peak flood flows has reduced the capacity of the river to move sediment material that is generated by all of the tributary streams that enter the river below the dam. Consequently, sediment accumulation and associated channel adjustment may occur near the mouth of the supplying streams including those in the project area.

Tributaries

The three main tributaries in the China Keeler planning area are: Keeler Creek, Chapman Creek

and China Gulch. Keeler and Chapman Creeks are both north facing and share a common source area at Tallowbox Mountain. China Gulch is south facing and consequently has a distinctively different vegetation composition (see Vegetation section).

The Medford BLM uses a stream classification system (Rosgen 1996) to categorize stream channels. These categories are based on stream gradients, stream sinuosity, valley form, entrenchment, and confinement.

Most of the streams on BLM-administered lands in the project area are located in the upper reaches of drainage areas and are classified as type Aa+, A or type B streams. Type Aa+ streams are uniquely associated with channel gradients greater than 10%. The A and B type channels are associated with gradients in the 4 to 10 % range. Table 3-12 shows that the mean channel gradient for the main streams is in the 15-18% range. The channels of these streams are typically confined to a narrow valley and are generally stable. However, debris and gravel materials do accumulate in the channel at lodge points that eventually fail and may cause a debris torrent. The recurrence cycle of these failures is dependent upon the size and availability of the wood material and the quantity of movement of the streambed material.

Table 3-11 shows representative channel composition for the BLM portions of the streams. Note the high silt/clay content in China Gulch.

Table 3-11: Average Channel Bed Composition on BLM-Surveyed Streams

Stream	Silt/Clay	Sand	Gravel	Cobble	Boulder	Bed Rock
Chapman Cr		5%	24%	40%	20%	11%
Keeler Cr	7%	9%	19%	37%	19%	9%
China Gulch	70%		20%	10%		

Table 3-12 contains some watershed indices that provide a means for comparison of drainages within the planning area as well as with drainages in other watersheds. The watershed area value corresponds to the expected water yield of a watershed and provides an indication of stream size. The stream distance value also indicates stream size and is often used with stream temperature data that tends to correlate with stream size (larger streams having higher temperatures).

Table 3-12: Watershed Morphological Indices

Stream Name	Area mi^2	Stream Distance Mouth to Divide (mi)	Vertical Relief (ft)	Average Channel Gradient (%)	Watershed Sinuosity	Stream Density miles/mi^2	Flow Contribution Area (sq ft/ft)
Chapman Cr	4.2	3.8	3705	18%	1.2	8.0	657
Keeler Cr	2.4	3.9	3725	18%	1.2	9.1	581
China Gulch	3.0	3.2	2458	15%	1.0	9.6	547

The vertical relief is a direct measurement of the potential energy of the streams. This value and the stream gradient indicate that these channels are capable of transporting coarse gravel material. Channel sinuosity is the ratio of the thalweg length to the straight-line distance between two points on a stream. The watershed sinuosity is a coarser measurement of the ratio of the mapped channel distance to the straight-line distance between the mouth and the watershed divide. Deviations in the mapped channel are usually related to geological influences that add complexity and control to the watershed and provide an indication of the extent that geological features have

deflected the channel. In this case, China Gulch appears to be a simpler (less complex) system and may have less channel diversity than the other streams.

The stream density is directly related to the runoff capability of the watershed. High density streams tend to be flashy during high flows and less productive during low flows. The flow contribution area is the reciprocal of the stream density and can be thought of as the lateral area that is contributing to each foot of stream channel. For example, Keeler Creek, on the average, has 290 square feet of contributing area on each side of the channel for every foot of channel (a perpendicular strip 145 ft on each side). The data in the table suggests that the summer water yield in China Gulch may be less than that of the other streams.

Stream Size

Due to the hierarchal nature of watersheds, streams tend to get larger at points further downstream from the watershed divide. With the change in size are changes in aquatic habitat conditions. Larger streams typically have larger pools, lower gradients, and warmer temperatures. Table 13 shows the range of channel sizes in the project area for BLM-managed land. The mean bankfull width and depth represent the cross-section of a flow with a 1-2 year return interval. The flood prone width is the expected channel width during a 20-30 year flow event.

Table 3-13: Dimensions of Streams on BLM-Administered Land in the China Keeler Project Area **(**Data collected from 1997 BLM Stream Survey)

AM0306 is the China Gulch drainage and the smaller channel dimensions are due to the fact that the BLM-managed streams are located further upstream than the BLM-managed streams in the

Drainage Number	Perennial Channels				Intermittent Channels			
	Bankfull Width (ft.)	Bankful Depth (ft.)	Flood Prone Width (ft)	Gradient (degrees)	Bankfull Width (ft.)	Bankful Depth (ft.)	Flood Prone Width (ft)	Gradient (degrees)
AM0303					1.1 - 2.2	0.3 - 0.5	2 - 8	7 - 17
AM0306	2.1 - 3.2	0.2 - 0.3	7 - 18	5	1 - 4.8	0.1 - 0.5	2 - 29	7 - 29
AM0309					1.1 - 4.3	0.2 - 0.4	2 - 11	7 - 21
AM0315	6.0	0.9	10.0	5	1.3 - 6.1	0.1 - 0.7	3 - 26	4 - 23
AM0318	2.5 - 10.1	0.4 - 1.4	4 - 17	5 - 21	1 - 3.9	0.2 - 0.5	0 - 13	10 - 34
AM0321					0.8 - 4.2	0.1 - 0.5	2 - 12	7 - 30
AM0324	0.5 - 10.2	0.2 - 0.9	7 - 22	1 - 18	0.8 - 4.7	0.1 - 0.5	2 - 13	10 - 31
AM0327	38.3		100.0	1	1.7 - 3.2	0.2 - 0.4	2 - 7	10 - 20
AM0336					1.1 - 3.5	0.1 - 0.4	3 - 8	7 - 15

other drainages. AM0318 (Chapman Creek) and AM0324 (Keeler Creek) have similar dimensions which is consistent with their similar size. A portion of the Applegate River that flows across BLM-managed land in drainage AM0327 was surveyed. The larger perennial dimensions for AM0327 are for the Applegate River.

Fisheries

The Applegate River flows through the middle of the project area; management activities are planned in the watersheds on both sides of the river. Several native fishes spawn and rear in the

Applegate: coho salmon, steelhead (*Oncorhynchus mykiss*), chinook salmon (*O. tshawychta*), Pacific lamprey (*Lampetra tridentata*), sculpin (*Cottus spp*.), and Klamath smallscale suckers (*Catostomus rimiculus*) (USDI 1995b). Several non-native species have also invaded or been introduced to the river, among them smallmouth bass and golden shiners. Historically, fish were probably abundant in Chapman Creek, Keeler Creek, and even China Gulch, and opportunistically used the lower reaches of smaller intermittent streams for flood refugia or possibly even spawning. Gold mining, agriculture and other human activity eliminated fish from all streams except Chapman and Keeler Creeks. Currently, fish numbers in these two streams are very low. Recent BLM surveys (unpublished) have found cutthroat in Chapman Creek and cutthroat and one rainbow/steelhead in lower Keeler Creek.

On June 18, 1997, (FR62(117):33030] the National Marine Fisheries Service (NMFS) listed Southern Oregon/Northern California Coasts (SONCC) coho salmon as "Threatened" under the Endangered species act [FR 62(17:33038]. On May 5, 1999, NMFS designated "Critical Habitat" for SONCC coho [FR64(86):24049]. Within the project area, coho only spawn and rear in the Applegate River; historically, they may also have used portions of Chapman and Keeler Creeks. Critical Habitat is roughly determined by the estimated historical distribution of SONCC coho. Therefore, within the project area, the Applegate provides occupied Critical Habitat, and portions of China Gulch, Chapman and Keeler Creeks are considered *unoccupied* Critical Habitat. In addition, the Applegate River and portions of China Gulch, Chapman and Keeler Creeks are considered Essential Fish Habitat for Klamath Mountains Province steelhead.

Over 70% of the Riparian Reserves protect intermittent streams, many of which are short duration due to aspect, soils, and vegetation types found in the area.

Table 3-14 shows the number of miles of fish bearing and non-fish bearing streams by sub drainage.

Table 3-14: Stream miles on BLM administered land within the China Keeler Project analysis area. Fish-bearing miles are approximate, based upon the best information available. All miles are calculated from current BLM Geographic Information System layers (May 2003), which are updated with verified fish data from ARWC surveys, ODFW surveys, BLM on-the-ground surveys, and similar sources.

HUC 7 Drainage (and Drainage Number)	**Fish-bearing**	**Non-fish bearing**			**Total All Streams**
	All stream types	**Perennial**	**Intermittent**	**Total**	
Chapman Creek (AM 0318)	1.8	5.2	5.0	10.2	12.0
Keeler Creek (AM 0324)	2.0	1.7	4.3	6.0	8.0
China Gulch (AM 0306)	0.2	2.1	13.3	15.4	15.6
(AM 0303)	0.5	0.4	5.3	5.7	6.2
(AM 0309)	2.1	0.8	11.9	12.7	14.8
(AM 0315)	1.0	0.2	7.8	8.0	9.0
(AM 0321)	0.6	1.1	7.1	8.2	8.8
(AM 0327)	0.9	0	0.7	0.7	1.6
(AM 0330)	1.0	0.5	1.4	1.9	2.9
(AM 0336)	0.6	0	0.5	0.5	1.1
(AM 0418)	0	0	0	0	0
Total	**10.7**	**12.0**	**57.3**	**69.3**	**80.0**

Riparian Reserves on BLM managed lands along Chapman, Keeler and the other north-facing streams are generally in good shape. Alder, bigleaf maple, canyon live oaks, incense cedar, and Pacific yew add diversity and canopy layers to the Douglas-fir overstory along upper stream reaches. Typical riparian shrubs like ninebark and hazel are present in some reaches. The result is adequate shade and cover for fish, and more woody debris than is commonly found in the Applegate, although the amount is still below optimal levels (USDI 1995b, BLM unpublished data). In the Riparian Reserves along the lowest stream reaches, Douglas-fir is beginning to invade ponderosa pine and oak woodlands. These woodlands would historically have been more open, although the riparian areas (in the first 50 feet or so along each side of the stream) were probably still well-shaded from shrubs, maples and other riparian hardwoods. On private industrial forest land, riparian areas are generally more open and brushy; a larger proportion of conifers have been removed near the streams.

Wildlife

The vegetation condition classes presented in the table below provide habitat for the terrestrial wildlife species found in the proposed China-Keeler project area. Acreage of each vegetation condition class and several wildlife species that are representative of the various habitats are also displayed. Approximately 200 vertebrate terrestrial wildlife species are known or suspected to occur in the proposed project area including those species that migrate through the area.

Table 3-15 Wildlife species by habitat type known or suspected in the China Keeler planning area.

Vegetation Condition Class	Acres in Project Area – BLM Administered Land	Representative Species
Grassland	40	gopher snake, California ground squirrel, western meadowlark
Brushland/Shrubland	626	western fence lizard, wrentit, dusky-footed woodrat
Hardwood/Woodland	1,038	acorn woodpecker, western gray squirrel, common garter snake
Seedling/Sapling	409	solitary vireo, deer mouse, black-tailed deer
Poles	516	Golden-crowned kinglet, porcupine,
Mid-Seral	2,790	Pacific giant salamander, western tananger,
Mature	2,212	northern spotted owl, northern flying squirrel

Threatened/Endangered Species

The northern spotted owl (Strix occidentalis caurina) is a federally listed threatened species. There are four known spotted owl sites on BLM administered land within the proposed project area. Portions of the proposed project area are also within the provincial home range radius (1.3 mile) of three other known northern spotted owl sites. Due to the proximity of these three sites to the proposed project area, the owls at these sites could use suitable habitat within the proposed project area for roosting and/or foraging.

There are approximately 3,295 acres of suitable spotted owl habitat and 1,630 acres of dispersal-only habitat on BLM administered land within the proposed project area. Suitable habitat includes nesting, roosting or foraging habitat and generally has the following attributes: high degree of canopy closure (approx. 60%+), multilayered canopy, large snags, and coarse woody debris. Dispersal-only habitat provides spotted owls some degree of protection from predators during dispersal and other activities, and generally has the following attributes: conifer stands with an average diameter of approximately 11 inches and 40-60 percent canopy closure. Approximately 1,795 acres of the suitable habitat and 590 acres of the dispersal-only habitat are reserved from treatment.

Northern Spotted Owl Critical Habitat

Approximately 3,500 acres of the proposed project area are in designated critical habitat for the northern spotted owl – Critical Habitat Unit (CHU) OR-74. The constituent elements of northern spotted owl critical habitat are nesting, roosting, foraging, and dispersal habitat. Collectively, nesting/roosting/foraging habitat is "suitable habitat" as described above. There are approximately 1,900 acres of suitable habitat and 760 acres of dispersal-only habitat in CHU OR-74 within the proposed project area. Approximately 1,340 acres of suitable habitat and 330 acres of dispersal-only are reserved from treatment.

Special Status Species

Special Status Species are those species that are federally listed as threatened or endangered, proposed or candidates for federal listing as threatened or endangered, or are BLM designated sensitive or assessment species. The table below lists special status species that are known or are likely to be present in the proposed project area (FT = Federal threatened; BS = Bureau Sensitive; BA = Bureau Assessment):

Table 3-16 Special Status Species in the China Keeler Analysis Area

CHINA-KEELER SPECIAL STATUS SPECIES		
Common Name	**Scientific Name**	**Status**
Northern Spotted Owl	Strix occidentalis caurina	FT
Northern Goshawk	Accipiter gentilis	BS
Lewis' Woodpecker	Melanerpes lewis	BS
Siskiyou Mountains Salamander	Plethodon stormi	BS
Northwestern Pond Turtle	Clemmys marmorata marmorata	BS
Common Kingsnake	Lampropeltis getulus	BA
Townsend's Big-Eared Bat	Corynorhinus townsendii	BS
Fringed Myotis	Myotis thysanodes	BA

Generally, Bureau sensitive species have restricted ranges and have natural or human-caused threats to survival. Where BLM actions could have a significant effect on their range-wide status, management direction is to protect and manage the species and their habitat so that the Bureau actions will not contribute to the need to list the species as federally threatened or endangered.

Bureau assessment species are species that are of concern, and may need protection or mitigation in BLM activities. However, the level of concern for these species is less than for the sensitive species.

Survey and Manage/ Protection Buffer Species

The Northwest Forest Plan provides extra protection for some species through Survey and Manage (S&M) standards and guidelines (S&Gs). The S&Gs generally require that surveys be conducted for certain species and that located sites be protected. The S&Gs are applicable to ground-disturbing activities/projects. To comply with the S&Gs, the proposed project area was surveyed for the following S&M species; Siskiyou mountains salamander (*Plethodon stormi*), great gray owls (*Strix nebulosa*), red tree voles(*Arborimus longicaudus*), and two species of terrestrial mollusks (*Helminthoglypta hertleini* ,and *Monadenia chaceana*. The results of the surveys follow:

- Siskiyou Mountains salamander – Numerous sites were found in the portion of the proposed project area south of the Applegate River; none were found north of the river.

- Great gray owl – One nest site was located in the proposed project area.

- Red tree vole – Several red tree vole nests were located in the portion of the proposed project area south of the Applegate River, none were found north of the river.

- Mollusks: No target mollusk species were found.

Connectivity

There is one inter-watershed connectivity corridor within the proposed project area (Middle Applegate Watershed Analysis 1995). This corridor is located near the lookout on Tallowbox Mountain.

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 1998 through 2002. Surveys documented 53 occurrences for 13 species.

Table 3-17 – Known vascular plants within the China Keeler planning area

Species	Status	Occurrences
Camissonia graciliflora	BAO	1
Clarkia heterandera	BAO	5
Cryptantha milobakeri	BAO	1
Cypripedium fasciculatum	BSO, C	9
Fritillaria gentneri	FE	3
Hieracium greenei	BTO	2
Lithophragma heterophyllum	BTO	23
Mimulus bolanderi	BAO	1
Mimulus congdonii	MW	2
Mimulus douglasii	BTO	2
Pellaea mucronata ssp. mucronata	BAO	1
Smilax californica	BTO	1
Zigadenus exaltatus	MW	2

Camissonia graciliflora: This species grows on shrubby hillsides and open oak woodlands in clay soils at elevations of less than 2500ft. The one known occurrence within the project area, T38S, R3W, SEC 15, will be buffered with a 150 ft radius buffer.

***Clarkia heterandera*:** This species occurs in shady sites in foothill woodland, yellow pine forest, and chaparral communities ranging in elevation from 1500-5100 ft. The five known occurrences within the project area, T38S, R3W, SEC 31, will be buffered with a 150 ft radius buffer.

Cryptantha milobakeri

The one known occurrence in T38S, R4W, SEC 35 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. The nine known occurrences of this species within the project area; T38S, R3W, SEC 18 (1 site), T38S, R3W, SEC 31 (1 site), T39S, R3W, SEC 5 (1 site), T39S, R3W, SEC 6 (3 sites), T38S, R4W, SEC 13 (1 site), T38S, 4W, SEC 25 (1 site), and T39S, 4W, SEC 1 (1 site), will be buffered with a 150 ft. radius buffer.

Fritillaria gentneri: This species occurs in southwestern Oregon in white oak woodland, mixed evergreen forest, and mixed white oak / rosaceous chaparral. The three known occurrences within the following sections; T38S, R3W, SEC 16 (1 site), T38S, R3W, SEC 21 (1 site) and 38S, 3W, SEC 22 (1 site) will be buffered with a 150 ft radius buffer.

Mimulus bolanderi: is known to occur in gravelly soil under wedgeleaf ceanothus (*Ceanothus cuneatus*) chaparral. The one known occurrence in T38S-R3W-SEC 20 will be buffered with a 150 ft radius buffer.

Pellaea mucronata var mucronata: is a fern that occurs in California, Nevada, and Oregon. There are only three known sites in Oregon and all of these are located on the Medford District. The one known occurrence in T39S, R4W, SEC 1 will be buffered with a 150 ft radius buffer.

Hieracium greenei, Lithophragma heterophyllum, Mimulus douglasii, and Smilax californica are Bureau "tracking" species and *Mimulus congdonii* and *Zigadenus exaltatus* are Medford Watch species. Bureau tracking species and Medford watch species 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 by qualified botany contractors over a time period extending from 2001 through 2003. Surveys documented 11 occurrences for four species.

Table 3-18 – Known vascular plants within the China Keeler planning area

Species	Status	Occurrences
Fabronia pusilla	MW	1
Hedwigia stellata	BTO	2
Tortula subulata	BTO	5
Tripterocladium leucocladulum	BAO	3

***Tripterocladium leucocladulum*:** occurs at low elevations and forms dense silky mats on shaded to exposed rocks, cliffs, and bark of hardwoods such as Oregon white oak, tanoak, canyon live oak, and bigleaf maple. The three known occurrences in the project area; T39S, R3W, SEC 5 (1 site), T39S, R3W, SEC 7 (1 site), and T39S, R4W, SEC 12 (1 site) will be buffered with 100 ft radius buffer 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 *Fabronia pusilla* is a Medford Watch Species. Neither Bureau "tracking' or Medford Watch species require mitigation.

Noxious Weeds

All of the proposed activity area was surveyed for noxious weeds by qualified botany contractors

over a time period extending from 1998 through 2002. Surveys documented 35 occurrences for four species.

Approximately 49 acres (.7%) of BLM land within the project area is known to harbor noxious weeds. Adjacent private lands in the Applegate drainage are also known to harbor many populations of noxious weeds. BLM is not authorized to survey private lands and as a consequence, the extent of these populations is currently unknown.

Table 3-19 – Known Noxious weed sites within the China Keeler planning area

Location	Weed Species	#sites	Acres	% of Project Area
38-3W-8	*Centaurea solstitialis (Star thistle)* *Cirsium vulgare (Bull thistle)*	7 5	3.8 .1	<.1% <.1%
38-3W-9	*Centarurea solstitialis* *Cirsium vulgare* *Cirsium arvense (Canada thistle*)	1 2 1	.1 1 .1	<.1% <.1% <.1%
38-3W-15	*Centaurea solstitialis* *Cirsium vulgare*	2 1	4.4 .1	<.1% <.1%
38-3W-16	*Centaurea solstitialis*	4	16.8	.2%
38-3W-17	*Centaurea solstitialis* *Cytisus scoparius (Scotch Broom)*	1 1	1.3 .1	<.1% <.1%
38-3W-20	*Centaurea solstitialis*	1	1	<.1%
38-3W-21	*Centaurea solstitialis*	1	.6	<.1%
38-3W-31	*Centaurea solstitialis*	1	1	<.1%
39-3W-5	*Centaurea solstitialis* *Cytisus scoparius*	2 1	17 .1	.2% <.1%
38-4W-34	*Centaurea solstitialis*	2	.6	<.1%
38-4W-35	*Centaurea solstitialis* *Cirsium vulgare*	9 4	1.2 .5	<.1% <.1%
39-4W-1	*Cirsium vulgare*	4	.1	<.1%
39-4W-2	*Centaurea soslstitialis*	1	.6	<.1%
	Totals	**51**	**49.7**	**.7%**

Weed Expansion Probability

Yellow Star Thistle (*Centaurea solstitialis*) is known to occupy 31 sites (45.5 ac) scattered across 12 sections within the project area. Most of these sites are in the vicinity of roads. The probability of weeds spreading into adjacent areas "Weed Expansion Probability" is outlined for star thistle and the other three species of weeds known to occur within the project area.

Table 3-20 Weed Expansion Probability

Weed Species	Expansion probability (% of BLM acres in project area)	Expansion probability (% of BLM acres in project area)	Expansion probability (% of BLM acres in project area)	Expansion probability (% of BLM acres in project area)
	Very High	**High**	**Mod**	**Low**
Centaurea solstitialis	10%	7%	25%	58%
Cirsium arvense	0%	0%	2%	98%
Cirsium vulgare	6%	1%	9%	84%
Cytisus scoparius	.1%	0%	.2%	99.7%

Total acres analyzed for weeds inside the project area boundary = 7,630

Expansion probability is based on the following factors; plant association susceptibility to each weed species, presence of a seed source (weed sites), proximity of roads to known weed sites, proximity of roads to management areas, and canopy closure of management areas. Each of these factors is known to affect the dissemination of weeds from a point source. Based on these factors, Yellow Star Thistle has a very high probability of spreading to approximately 10 percent (763 ac) of the BLM lands within the project area boundary and a high probability of spreading to an additional seven percent (534 ac) of the lands within the BLM project area. At the current time, approximately 83 percent of the area has a low to moderate probability of weed expansion for Yellow Star Thistle.

The one known site of *Cirsium arvense* (Canada Thistle) is located adjacent to the project area boundary in T38S-R3W-SEC 9 and occupies approximately .1 acre. Approximately two percent of the lands within the project area have a moderate probability for the spread of this species.

Cirsium vulgare (Bull Thistle) is known to occupy 16 sites within the project area boundary. Approximately seven percent of the BLM lands within the project area have a high to very high probability for the spread of this species.

Cytisus scoparius (Scotch Broom) occupies two sites on .2 acres and has a very high expansion probability on approximately eight acres..

Noxious weeds are known to occupy 53 acres of the BLM lands within the project area boundary. In addition, approximately 1297 acres of the BLM land within the project area has a high to very high probability for the spread of Yellow Star Thistle, and 507 acres of the land have a high to very high probability for the spread of Bull Thistle.

CHAPTER IV
ENVIRONMENTAL CONSEQUENCES

This chapter describes the effects of implementing the alternatives described as considered in detail in Chapter II. The Council on Environmental Quality (CEQ) regulations direct agencies to succinctly describe the environment that could be affected (Chapter III, Affected Environment) along with describing the importance of the impacts (40 CFR 1502.15).

The discussion in Chapter III, Affected Environment, describes the existing conditions within the Planning Area. Chapter III also provides a basis for understanding the consequences associated with implementing each of the alternatives. Chapters III and IV are intended to help provide an understanding of the environmental effects that would result from implementing either alternative considered in detail.

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

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

Forest Vegetation

Alternative A - No Action

Direct and Indirect Effects

No action would allow forest stands to remain overstocked and individual tree vigor and growth would remain poor. A sample of dominant trees showed an average decadal radial growth of .45 inches or .90 inches diameter growth per decade in the China Keeler project area.. During the drought year 2001, the radial growth of dominant trees was less than 1 millimeter. During 2002, radial growth averaged 1 millimeter. When radial growth is less than .5 inches per decade, pine trees cannot pitch-out bark beetles and tree mortality results (Dolph, 1985). Tree mortality represents a reduction in stand volume production, a decline in forest health and a potential for the loss of the many benefits of healthy forest cover including habitat and economic value.

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, forest cover and the multitude of benefits will be lost. Silvicultural options for managing forest 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 have mature live trees for approximately 30 to 50 years and spotted owl habitat would be degraded. The bark beetles may also disperse to adjacent unthinned watersheds and kill more trees. Hardwood tree, shrub and forb species would become more abundant and provide forage and hiding cover for big game animals. Song bird habitat would be enhanced also.

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

Where dense forest stands persist overtime, canopy closure would remain at 90 to 100 percent. When tree mortality is singular or in small patches, canopy closure may approach 50 to 80 percent. Where large patches of trees die, canopy closure would be 0 to 40 percent.

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

Alternative B - Variable Prescriptions With Proposed Road Construction

Direct and Indirect Effects

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

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

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

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

However, approximately 1,320 acres of proposed commercial treatment have been deferred from treatment because of Siskiyou Mountains Salamander habitat. Individual stands in salamander habitat would remain in poor vigor and tree mortality can be expected in the future. As mortality begins, canopy closure would decrease thus degrading salamander habitat.

In addition to the commercial thinning treatment, 1,532 acres would be precommercially thinned (young conifer tree thinning). If all road construction is completed, the cost of the precommercial thinning would be lower because of increased accessibility. The excess, small diameter trees less than 8 inches DBH would be cut from under the drip lines of old-growth trees to assure their survival. Elsewhere the excess tree stems would 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 implementing the variable 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 again 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 and able to persist long term.

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. Low canopy closure is needed to allow young trees to become established in the stand.

There were approximately 1,320 acres of commercial forest land removed from the project because of wildlife concerns. Leaving these lands 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 1,320 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 1,532 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 Middle Applegate Watershed to the Applegate-River-McKeeBridge` and Bear Creek watersheds. Forest fragmentation would not result. Surrounding BLM administered lands would be managed with similar prescriptions to assure forest health.

Alternative C - Variable Prescriptions With No New Roads

Direct and Indirect Effects
This alternative would eliminate commercial vegetation management on an additional 17 acres of forest land (1% reduction from the all road alternative). 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. Precommercial vegetation management would probably occur on all 1,532 acres, although the cost will be greater due to more limited access. Direct and indirect effects in the treated areas would be the same as Alternative B.

Cumulative Effects
A 1% reduction in commercial vegetation management would result across the landscape. This could cancel-out the effects of our vegetation treatments in adjacent forest stands 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. Cumulative effects in the treated areas would be the same as Alternative B.

Fire and Fuels

Cumulative Effects

Alternative A - No Action
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, surface fuels and aerial fuels (crown density) would also increase within these stands. Increasing stand densities and fuel loadings would increase the chance of more acres that would burn in high intensity fires within the project area. Fire fighter safety would continue to be an issue as well as the potential of resource damage.

The objectives of improving grasslands would not be achieved. 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.

Alternative B - Variable Prescriptions With Proposed Road Construction

Direct and Indirect Effects

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

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

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

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

The road proposed in section 27 would access a major ridge line between this project area and the Lower Thompson Creek project. This road would access approximately 100 acres of commercial thinned units. The ridge line that this road would access has approximately 300 acres of

previously treated stands in the Lower Thompson Creek project. Maintenance burning of the shaded fuel break would be easier and less costly if this new road was in place. Also maintenance burning of the other treated stands would have less risk of escape due to better access to the top of these units.

The new road from section 8 into section 17 is along a major ridge line which accesses over 400 acres in sections 8 and 17l. This road is above private land residents in the China Gulch area and would give access for suppression efforts in the event of a wildfire. Faster response time of suppression forces to an area is a major factor in keeping wildfires small in size. Without this road approximately 90 acres of unit 2 would be dropped due to no access to the upper portion of the unit.

Human caused fires could increase with more roads. This can be mitigated to a large degree by blocking roads that are proposed. Human caused fires on BLM land over the past 35 years have been a minor component of fires (7%) that have occurred within the project area. The majority of fires that have started on BLM land have been caused by lightning (73%).

Cumulative Effects

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

The 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 C - Variable Prescriptions With No New Roads

Direct, Indirect Effects & Cumulative Effects

Impacts are the same as Proposed Action, Alternative B with the following discussion:

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 increased risk of escape due to the lack of availability and mobility of people, equipment and water. Limited or no access would preclude the use of underburning and broadcast burning. Cost associated with manual treatment of units (slashing and handpiling) increases when access is limited.

Impacts Common to both Alternative B & C - Spring versus Fall Burning

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

The surface fuel loading in a unit dictates fire intensity. A common method to reduce fuel loadings before underburning is implemented is to use manual treatment (slashing, hand piling

and burning). Even after manual treatments surface fuel levels in the 1, 10 and 100 hour fuels (1/4" to 3") are often so high that a low intensity burn is not possible. When this is the case underburning is done in the spring.

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

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

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

Impacts Common to both Alternative B & C - Air Quality

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 I and II is not expected to effect visibility within the Crater Lake National and neighboring wilderness smoke sensitive Class I areas (Kalmiopsis and Mountain Lakes) during the visibility protection period (July 1 to September 15). Prescribed burning is not routinely conducted during this period primarily due to the risk of an escape wildfire.

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

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

Prescribed burning would be scheduled primarily during the period starting in January and ending in June. This treatment period minimizes the amount of smoke emissions by burning when duff

and dead woody fuel have the highest moisture content, which reduces the amount of material actually burned. Smoke dispersal is easier to achieve due to the general weather conditions that occur at this time of year.

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

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

Soils

Cumulative Effects

Alternative A - No Action

The effect of the no action alternative on the soil resource would be the continuance of existing erosion rates coming from the roads throughout the planning area. The risk of catastrophic fire in the watershed would continue to increase. A catastrophic fire of any appreciable size would dramatically increase erosion rates and could result in high soil productivity losses. When compared to the proposed action alternative(s), there would be no increase in erosion rates short-term but no decrease in erosion and rates long-term as a result of the no action alternative.

Alternative B - Variable Prescriptions With New Road Construction

Direct and Indirect Effects

Under this alternative, approximately 195 acres would be tractor logged using designated skid trails, 992 acres would be skyline-cable logged using partial suspension, and 975 acres would have the logs removed with a helicopter. All of the slash created by the logging would be treated to reduce the total fuel loading on-site.

Under undisturbed forest conditions, surface erosion processes are generally unimportant and considered a natural part of the ecological processes. Because of the importance of surface protection, the degree of soil disturbance has often been used as an index to compare surface erosion hazards for alternative log yarding systems. Studies have shown that in the western United States, the degree of soil disturbance is directly proportional to the amount of activity on the site. In comparing studies of clear-cut units, on average tractor logging causes soil disturbance on 28 percent of the site, 5 percent for suspended cable yarding and 2 percent for helicopters (Megahan, nd). A study that permitted an evaluation of the effects of partial cutting silvicultural systems on soil disturbance revealed that mineral soil was exposed on 17 percent of the area by single tree selection and 13 percent bare soil exposed for group selection (Haupt, 1960). It is estimated the commercial timber harvest activities planned in this alternative would disturb about six to eight percent of the ground in the proposed harvest area. As a result of implementing designated skid trails, the units tractor logged would result in approximately twelve percent of the area in skid trails. Designating skid trails would most likely minimize the area that would be deeply disturbed during tractor logging operations.

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

Broadcast burning associated with the fuel treatments would have a moderate effect on the soil resource. Broadcast burning increases the amount of mineral soil exposed by a varying amount, depending on the depth and consumption of the litter layer on the forest floor. Additional soil exposure, beyond that due to logging, can be as little as eight percent or over forty percent (Perry et. al., pg.111). As the broadcast burning planned in this project will be an underburn, the intensity of the burn would be light to moderate and have slight direct short-term effect on soil properties. A light surface fire will generally only char the litter, leaving most of the mineral soil at least partially covered. Most soil and ash movement occurs during the first season after the slash is burned and quickly diminishes as vegetation cover re-establishes.

The increase in erosion rates over present levels would be minimal as a result of burning the handpiles and/or a light intensity underburn. Piled slash burns hotter than broadcast slash, increasing consumption of organic matter and nutrient losses. High soil temperatures generated under burning piles (typically, about 5-10 % of the harvested area) severely and negatively affect soil properties by physically changing soil texture and structure and reducing nutrient content (Perry et al, pg. 115). The increase potential of soil particles reaching the local waterways as a result of the prescribed burning would be low as underburning in riparian reserves would be avoided and handpiling of slash would not occur near waterways. Overall, soil productivity would experience a slight negative decrease short-term but potential long-term positive effects would be realized from the proposed actions as the risk of catastrophic fire is diminished.

Impacts associated with roads would have the greatest impact on the soil resource as approximately four acres of land is disturbed and taken out of vegetation production for every one mile of road proposed. Roads affect geomorphic processes by four primary mechanisms: accelerating erosion from the road surface and prism itself by both mass and surface erosion processes; directly affecting channel structure and geometry; altering surface flowpaths, leading to diversion or extension of channels onto previously unchannelized portions of the landscape; and causing interactions among water, sediment, and woody debris at engineered road-stream crossings.

Most of the new road construction, approximately 3.9 miles, would be located on or near ridgetops in stable areas, thus minimizing the likelihood of disturbed soil reaching stream channels. Roads in ridgetop positions may have a small affect on the local drainage network by initiating new channels or extending the existing drainage network by concentrating runoff. Although concentrated road runoff channeled in roadside ditches can extend the channel network by eroding gullies or intermittent channels on hillslopes, the probability of this occurring is low

as new roads are designed to be outsloped with few ditchlines. The extension of a mid-slope road (BLM # 38-4-34.0) would moderately increase erosion in the upper Hinkle Gulch drainage area. The new mid-slope construction would be only a few hundred yards before reaching the ridge area. The soil erosion increase would be quite noticeable the first few significant rain events after construction.

Increased sediment delivery to streams after road building has been well documented in the research literature in the Pacific Northwest and Idaho. The largest sediment losses occur during road building and before exposed soils are protected by re-vegetation, surfacing, or erosion control materials. After construction, surface erosion from road surfaces, cutbanks, and ditches represents the dominant source of road-related sediment input to streams (Gucinski et.al.,2001 pg.14)

The Water Erosion Prediction Project (WEPP) model was used to estimate the erosion and sediment production from proposed road construction and renovation for this project. The WEPP model is a physically-based soil erosion model that provides estimates of soil erosion and sediment yield considering specific soil, climate, ground cover, and topographic conditions. As the with any erosion model, predicted erosion or sediment values are, at best, within plus or minus fifty percent of the true value. For this reason, the values listed are relative indicators of effects that are presented for comparative purposes and are no way portrayed as absolute values.

The WEPP model indicates that the proposed new mid-slope road construction would produce an average of nearly eight hundred pounds of eroded soil annually over a ten year period and approximately fifty pounds of sediments. A similar length of road constructed on the ridge would result in approximately five hundred pounds of eroded soils annually over a ten year period and no sedimentation. The comparison demonstrates that although erosion rates increase as a result of the road construction, an increase in sedimentation rates are very minimal on roads constructed on or near ridges. The sedimentation resulting from the mid-slope road is primarily associated with the disturbance near drainage areas where vegetation buffers are minimal.

The decommissioning of approximately six miles of road would decrease erosion rates to near natural rates within a ten year period. There would be a slight short-term increase in erosion rates the first few rain events after road decommissioning work is completed. A long-term decrease in erosion rates associated with the roads in China Gulch and Chapman Creek areas would result from the decommissioning project. The surfacing of about 4.4 miles of existing natural surface road will help in reducing surface erosion from roads and decrease sediments reaching local waterways which is a slight direct positive effect.

Cumulative Effects

The cumulative effects to the soil resource in the analysis area as a result of this alternative would be a moderate short-term increase in erosion rates as a result of harvesting timber and fuel reduction activities (i.e., slashing, prescribed burning) which would last about three to five years. A slight long-term decrease in erosion rates would occur as the affected harvest units re-establish ground cover, land that was once occupied by roads are put back into producing vegetation (ground cover), and the risk of catastrophic wildfire is reduced. The watersheds affected by the proposed project would continue to experience slight to moderate increase over natural erosion rates long-term from existing roads. Although most of the roads are in stable condition, the cut/fill slopes associated with the road(s) continue to be susceptible to erosive forces. Overall, the effects to the soil resource as a result of this alternative would be consistent with those described in the Medford District Resource Management Plan (USDI 1995).

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, the proposed treatments are considered to have a net positive influence on soil resources.

Alternative C - Variable Prescriptions With No New Roads

Direct and Indirect Effects
Under this alternative, approximately 172 acres would be tractor logged using designated skid trails, 664 acres would be skyline-cable logged using partial suspension, and 1,309 acres would be yarded off site with a helicopter. All of the slash created by the logging would be treated to reduce the total fuel loading on-site.

The effects of this proposal on the soil resource would be similar to those of proposed action alternative except for less erosion rate increase from not building 3.9 miles of road. This would maintain approximately 16 acres of land undisturbed and producing vegetation. The roads in China Gulch (approx. 1.4 mi.) would be renovated instead of decommissioned. Although the short-term direct impacts would be less than the proposed action alternative, the long-term decrease in erosion rates would not be realized in the China Gulch drainage from decommissioning the roads. The Chapman Creek drainage would still realize the long-term decrease in erosion rates as the roads in the bottom of the drainage would be decommissioned. The effects to the soil resource as a result of the timber harvest and fuels treatment in this alternative would be slightly less than the proposed action alternative as there would be approximately 334 more acres of helicopter logging and 328 less acres of cable yarding. The harvesting of timber using tractors on designated skid roads would be about 23 acres less than the proposed action alternative. As previously stated, helicopter logging disturbs about 2 percent of the harvest area while cable yarding disturbs about 5 percent. Effects to the soil resource as a result of the non-commercial treatments would be similar to those described in the proposed action.

Cumulative effects
Cumulative effects to the soil resource in the analysis area would be slightly less than the proposed action alternative short-term but, overall, the erosion rates would be slightly higher long-term in the China Gulch drainage as a result of road not being decommissioned.

Hydrology

Effects of Alternatives on Stream Channel Morphology, Streamflow, and Water Quality in the Immediate China Keeler Project Area

This section discusses the direct and indirect effects expected by the proposed project activity on the BLM-managed lands in the immediate activity area. For the most part, this area consists of the upper reaches of the drainages associated with the China Keeler Project (see map 2). Table 4-1 provides a summary of the expected effects within the activity area.

Table 4-1: Summary of Expected Hydrologic Effects on BLM-Administered Lands in the Immediate Activity Area

Key: 0 = no effect (i.e. no change from existing conditions); + = beneficial effect; - = low adverse effect; -- = moderate adverse effect, ---= high adverse effect.

Analysis Variable		Alternative A			Alternative B		Alternative C	
		Short Term	Long Term[1]		Short Term	Long Term	Short Term	Long Term
			Without Severe Fire	With Severe Fire				
Stream Morphology / Stream Channels	Channel Structure (large wood)	-	-	--	0	+	0	+
	Width-to-depth Ratio	-	--	---	0	+	0	+
Streamflow and Groundwater		+ or -	-	---	+	+	+	+
Water Quality	Stream Temperature	+	+	--	0	+	0	+
	Fine Sediments	+	--	---	-	+	-	+

1/ Potential long-term effects under Alternative A include a high risk of a severe intensity, stand-replacement fire. Effects are shown for both no fire and severe fire scenarios.

Alternative A No Action Alternative

Direct Effects

Alternative A provides for no change in the current condition. Therefore it would have no direct effects on streamflows, groundwater, stream channels, channel morphology, or water quality.

Indirect Effects

Alternative A Stream Channel Morphology

Existing Roads – In the short term under Alternative A, roads would be improved on the normal road maintenance schedule for the Medford District. Meanwhile, existing rates of erosion and sedimentation associated the with the road system (identified in Chapter 3) would continue.

In the long term, a higher road failure rate associated with the older roads could result in some modification of a stream channel in the vicinity of the failure. For example, a culvert failure could cause local channel scour and downstream deposition of material.

OHV Use - At the present time, unauthorized Off Highway Vehicle (OHV) use on BLM-administered lands within the planning area is causing soil compaction, rutting, flow interception and flow diversion. Under the no action alternative, any remedial action to address this issue would not have the benefit of large-scale planning effort. Addressing the issue in the context of this project provides an opportunity to fully consider associated factors such as transportation systems, vegetation condition, fire hazard, overall water quality, funding and recreational uses. Consequently, an optimal solution is unlikely and local stream channels will continue to be impacted.

In the long term, if the OHV issue is not addressed, the rutted areas will continue to develop and affect increasingly larger portions of the local drainage. If the rutting makes the trail impassible, typically a new, adjacent trail is established resulting in even more resource damage. The end result is a damaged drainage that will continue to deteriorate as long as the unauthorized use continues.

Headwater streams - In the short term under Alternative A, the dense forest stands would continue to provide abundant small woody material to the headwater stream channels. This material would add water storage capacity and could increase summer flow but it lacks the strength of larger wood material and decomposes more rapidly. The moderation of storm flows by the dense stands that was mentioned in Chapter 3 would further promote the accumulation of

these relatively weak debris accumulations due to the limited transport capacity of the flow. Also the root systems of this dense vegetation would provide stability to the sideslopes and the channel area.

In the long term, the channels would continue to be loaded with relatively small woody material and accumulated sediment from the sideslopes. However, after a severe fire event, debris torrents (a large slug of rocks, trees, dirt, etc. pouring down a stream channel) are likely and the channels could become severely scoured. Recovery from this condition would be especially slow due to the deficiency of large wood before the fire and the consumption of available wood by a fire.

Lower reaches - In the short term in the lower elevation channels, where the sideslopes and channel gradient are less steep, the large wood accumulations are less plentiful. However, these areas are, under more natural conditions, depositional areas and, due to the effective filtering by the upstream debris accumulations, may be receiving an undersupply of depositional material. As a consequence of having less large wood structure and less bedload supply, local channel instability may be occurring.

In the long term, debris torrents may stop in the lower reaches of the tributary channel in which case, the transported material would fill the channel and result in a long-term channel readjustment. This impact could be particularly troublesome for private landowners with improvements near the channel but could be beneficial to the aquatic system.

Applegate River- In the short term, the river is receiving an undersupply of bedload material because the upstream supply is limited by the dam and the supply from the local tributaries is limited by the headwater accumulations. This condition would normally increase the erosive power of the river but this tendency is held in check by the peak flow regulation. The net result is a semi-stable channel condition with a reduced transport capacity.

In the long term, debris torrents may occur in the upper tributaries and if the sluiced material reached the Applegate River, the fine component would gradually be washed downstream but the larger material would remain below the mouth of the tributary for an extended period of time because of the reduced transport capacity of the river. These additional accumulations are likely to cause local destabilization of the river with associated bank cutting and channel adjustment. These changes would probably directly affect river-front property owners.

Alternative A - Streamflow and Groundwater

Existing Roads - Under Alternative A, the current conditions in the project area would continue. Older roads in the area would be maintained but not upgraded or decommissioned and would continue to influence local runoff and groundwater flow as identified in Chapter 3.

In the long term, older roads with limited drainage capability are more likely to experience a road failure during an extreme precipitation event causing subsequent adjustments to local flow and groundwater conditions. For example, severe downcutting may occur in the vicinity of the failure that would result in the lowering of the local water table causing an associated reduction in summer flow. Or, a channel may become diverted and an alternative drainage developed.

OHV Use - Local flow and groundwater would be affected by the OHV use described above under Stream Channel Morphology. Surface water on the compacted trail could be intercepted by ruts and diverted in the surface drainage system, causing an increase in local streamflow. This change in flow regime could start a long sequence of channel adjustments. Compaction on the

trail surface would reduce water movement into the soil and affect water movement through the soil which would further destabilize the area.

In the long term, the changes in groundwater and flow that were identified above would continue and become more acute.

Headwater Streams - Under Alternative A dense stands of trees and brush would compete for any available groundwater, keeping the amount of water available for summer flow to a minimum. However, the increased crown cover would intercept more precipitation and thus reduce the effect of peak storm flows. The increased crown cover would also provide more small woody material that would tend to accumulate and contribute to in-channel water storage. Consequently, in the short term, low flow may increase or decrease depending upon whether the increased transpiration loss is balanced by the increase in water from in-channel storage. The effect of large storms on stream flow would remain moderate as described in Chapter 3.

In the long term, with no stand management, a severe, stand-replacement fire is likely (see Fire section) and it could drastically alter the streamflow and groundwater regime. Immediately after a severe fire, the loss of vegetation would make more groundwater available for streamflow and low summer flows would likely increase. However, the absence of vegetation would also cause increases in flows during storm events that would scour out stored material in headwater streams. The likelihood of a debris torrent would increase, resulting in an additional loss of water storage capability. As explained in the "Fire" section, the risk of a severe, stand-replacement fire would continue to be very high under Alternative A.

Over time, recovery from the effects of a severe fire would occur. In a relatively short time vegetation would reestablish and less water would be available for summer flow. Since channel storage would also likely be reduced, there would probably be a net decrease in water available for summer flow. The reduction in large wood would adversely affect channel storage for a long period of time until the wood is replenished.

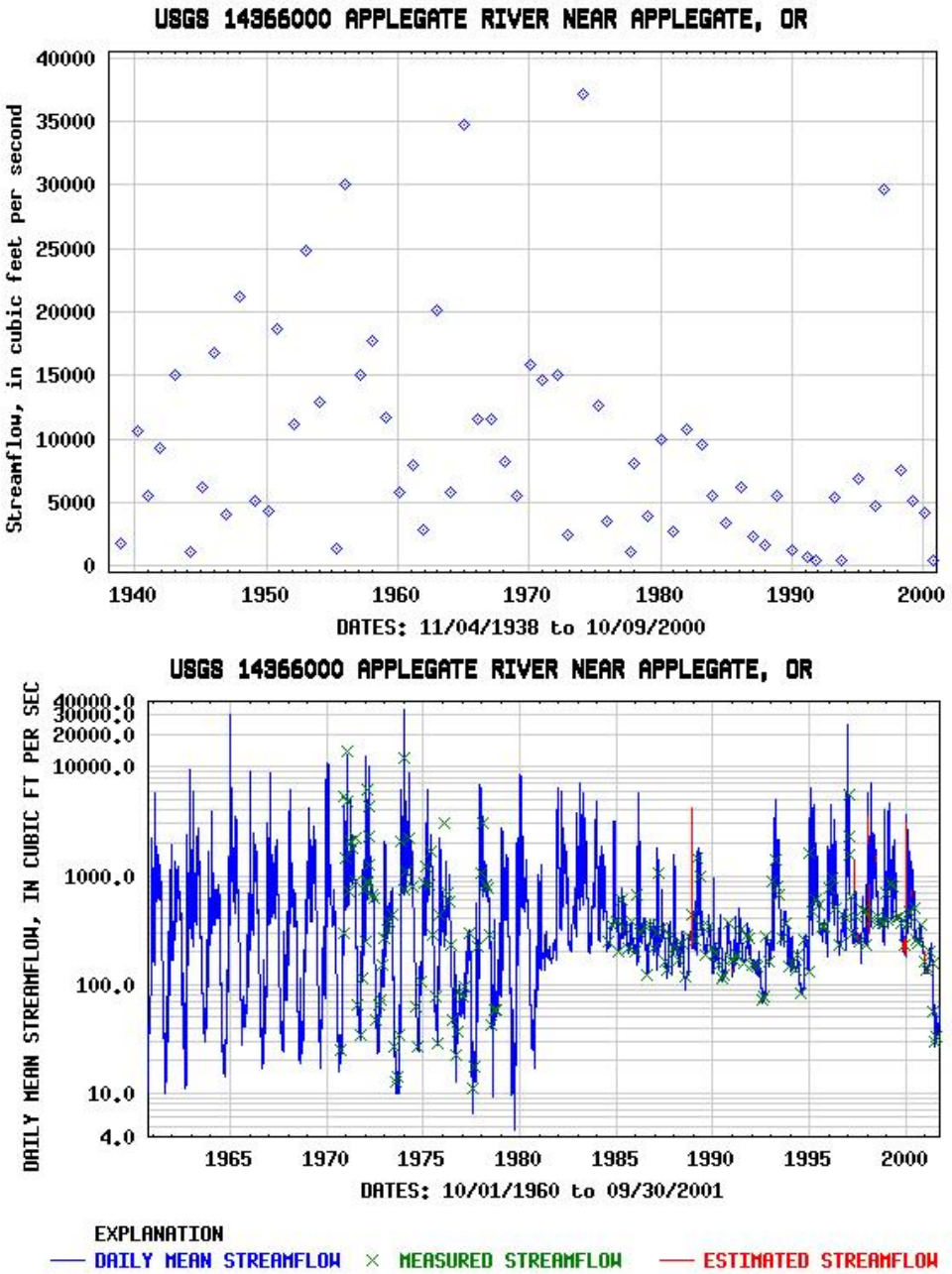
Lower reaches - In the lower reaches, channel downcutting (see Stream Channel Morphology above) could cause a lower water table with less groundwater input for summer flow.

A debris torrent could cause significant damage in the lower reaches. If it went all the way to the Applegate River the slurry-like mixture could take out bridges and other structures along the affected tributary. If it dumped the material in the lower reach it may have to be mechanically removed. If the material stopped and plugged the lower channel, local groundwater could increase. Conversely, if the debris torrent scoured out the channel, the water table would drop and local groundwater could decrease.

Applegate River - The flow contribution of the project area to the Applegate River is expected to be roughly proportional to the contributing area or about 4%. Figures 4-1 and 4-2 shows how the Applegate Reservoir that was activated in 1980 affects both low flows and high flows.
The Applegate River would receive higher peak flows from the tributaries after a severe fire event. The net effect on the river flow would depend upon the number of tributaries that are producing exceptional flows.

Figure 4-1 Mean daily streamflow at Applegate, OR for 1960-2000.

Figure 4-2. Peak streamflows at Applegate, Oregon for the period of record.



Alternative A – NoAction -Water Quality

Under Alternative A there would be no indirect effect on the 303(d) listed parameters for the Applegate River: flow modification and stream temperature. Stream shade on BLM-administered lands in the project area would be maintained in the short term and increase in the long term as vegetation in the Riparian Reserve areas continue to mature.

Existing Roads – In the short term, existing rates of erosion and sedimentation associated the with the road system (identified in Chapter 3) would continue. Any local change in the flow

regime caused by the road prism could tend to affect water quality albeit the changes may be small. For example, a road across a draw can result in a groundwater accumulation on the upslope side that could provide additional cool water to a local stream during the summer or it could deplete the cool water supply to another portion of a stream. Likewise, a condition that increases winter runoff could result in more sedimentation and local erosion.

In the long term, extreme storm events eventually can impact roads. Older roads with large fill slopes and smaller culverts may be particularly susceptible to failure. The abundant in-channel stored material discussed above under Stream Channel Morphology can easily reduce the flow capacity of a culvert, resulting in a road washout or a channel diversion. Debris torrents can take out roads at crossings or effectively bury them under very large amounts of material. All of these situations can cause increased sediment delivery to the stream system.

OHV Use - The exposed surfaces can contribute sediment if the OHV trail runoff reaches a watercourse. This problem is compounded by the fact that OHV use in wet weather is particularly appealing to OHV riders. The turbidity and sedimentation can become quite severe if rutting and channel development occurs.

In the long term, the rate of erosion from this use could increase with corresponding increases in sediment production. This condition would continue until either the source material is depleted or the use is stopped and the area is rehabilitated.

Headwater Streams - In the short term, water quality in the headwater streams would remain good. The channel storage zones consisting of fine sediment and small wood material would effectively filter the water and the dense crown closure would provide shade, thereby keeping stream temperatures cool.

Without a severe fire event the sediment and debris material identified above under Stream Channel Morphology would tend to accumulate in the channels. Occasionally some accumulations may get too large and fail or readjust. In other cases a quasi-equilibrium may be established between the decay rate and the accumulation rate resulting in a relatively stable situation. This material eventually could be removed by an extreme flow event. However, severe fire would increase the risk of failure due to the higher flows and the weakened structure. After an abrupt failure the damaged channel would no longer trap sediments and there would be sustained sediment production as the channel readjusted to the new configuration. Stream temperature in the headwater streams would be affected by the reduction in riparian shade due to the fire and any change to the summer flow regime.

Lower reaches - In the lower reaches, near the mouth of the tributaries, any ongoing channel instability could contribute sediment to the water causing increased turbidity and downstream sedimentation.
Stream temperature could be influenced somewhat by the quantity of flow from upstream. Larger quantities of cool inflow from the headwater area could reduce local stream temperatures.

In the long term, the lower reaches the channel would have to readjust to conditions created as a consequence of any upstream failures and there would be corresponding changes in sedimentation. Stream temperature would be affected by changes in local groundwater contribution and riparian shade.

Applegate River - Aside from the possible effect from old roads or OHV use, the sediment

delivered by the tributaries in the China Keeler project area would be relatively low. The temperature of the water entering the Applegate River is strongly influenced by the amount of groundwater and the local shade conditions. Groundwater inflow from the frontage drainages and the surface flow from any flowing tributaries is probably cooler than the ambient temperature of the river, thus providing a limited amount of thermal refugia. Since the proportion of water contributed to the river by the project area is very small, no detectable temperature change would be expected on the ambient river temperature. However, the inflow may provide a small amount of thermal refugia at the inflow interface.

In the long term, abrupt changes in the stored sediment in headwater channels could send a pulse of sediment to the river that could have a noticeable effect. Generally the duration of the turbidity plume would be relatively short but the subsequent upstream channel adjustment in headwater channels could contribute slightly to a higher background rate of sediment production. The introduction of a large quantity of material into the river would affect the stability of the river (see Stream Morphology). Any change of the ambient river temperature would be negligible but small micro-refugia zones could be compromised.

Alternative B - Variable Prescriptions With Proposed Road Construction

This discussion emphasizes changes from Alternative A

Alternative B actions that may contribute an effect to watershed hydrology

The following tables quantify key differences between Alternatives A and B that may affect hydrology of the project area. This information will be used to analyze the direct and indirect effects on channel morphology, streamflow, and water quality.

Alternative B provides for the construction of 3.7 miles of new road to access the China Keeler project sites and the decommissioning of 6.1 miles of road. In addition, about 54 miles of access road would be improved to accommodate the expected increase in project-related use.

Stream Crossings

Road stream crossing are critical points where direct and indirect effects can occur. Stream crossing installation, modification, or decommissioning can directly affect water quality in a perennial stream when soil is disturbed in the work area. Indirect effects can occur in intermittent channels during the seasonal flow period.

Table 4-2 shows the distribution of BLM stream crossings proposed under Alternative B. This table can be compared with Table 3-7 in Chapter 3 for the existing condition. Note that changes occurred only in China Gulch (AM0306), Chapman Creek (AM0318) and Lower Thompson Creek (AM0418) drainages.

Table 4-2 Total Number of Stream Crossings With Alternative B[1]

Drainage Area Number	# of Stream Crossings by Stream Type and Ownership								Total Crossings	Crossings per mi^2
	Perennial		Long Duration		Short Duration		Dry Draw			
	BLM	Other	BLM	Other	BLM	Other	BLM	Other		
AM0303		3		4	3	11	4	12	37	27.4
AM0306	0	2	1	12	1	8	4	4	32	10.8
AM0309		6		15		6		3	30	10.3
AM0315		4	2	1	2	1	8	1	19	9.3
AM0318	9	2			6	1	47	12	77	18.2
AM0321		5		5		4		5	19	10.1
AM0324	6	1			6	2	28	11	54	22.7
AM0327				11		17			28	19.1
AM0330		1		4		3		11	19	14.4
AM0336				7		1			8	5.7
AM0418	5	19	2	12	8	16	26	9	97	14.5
Total	20	43	5	71	26	70	117	68	420	14.7

Shaded cells denote values different from Alternative A.

[1]/ Note: The data for Table 4-2 is from the road layer of the BLM GIS database. It is estimated that the actual number of roads (and crossings) in the China Keeler Project Area may be as much as 30% higher. However, in Table 4-3 the net change and change in crossings per square mile are not affected by this correction and can be used for a direct comparison between alternatives.

Table 4-3 summarizes the changes in stream crossings associated with the project.

Table 4-3 Summary of Changes in Number of Crossings for Alternative B (Negative values denote a reduction in crossings)

Drainage Area Number	# of Stream Crossings by Stream Type and Ownership								Net Change	Change in Crossings per mi^2
	Perennial		Long Duration		Short Duration		Dry Draw			
	Remove	Add	Remove	Add	Remove	Add	Remove	Add		
AM0306	-2				-8		-4	+1	-13	-4.4
AM0318	-5				-3		-12		-20	-4.7
AM0418				+1				+1	+2	0.3
Total	-7			+1	-11		-16	+2	-31	

Road Density

As discussed in Chapter 3, road density provides a means to compare the effect of roads in different areas. If everything else is equal, areas with higher road densities will experience more road-related effects. However, many other factors such as design and layout, maintenance, use, surface type, etc. can influence the effect of any particular road. In the China Keeler project area there are a wide variety of road types in various levels of condition. Therefore, the road density values should be used only as a general indication of the influence of roads. In general, all of the BLM roads associated directly with this project would be in "above average" condition compared to other roads within the project area.

Table 4-4 provides for a direct comparison with Table 3-6 that showed similar information for the current condition Alternative A). The shaded cells denote values that would change with Alternative B.

Table 4-4 Alternative B Total Road Miles for All Drainages Affected by the Project[1]

Drainage Area Number	Roads From GIS Data				Additional Roads From Aerial Photos				Total Road Miles	Road Density (mi/mi^2)		Percent of Area in Roads *	
	Within Project Area		Outside Project Area		Within Project Area		Outside Project Area			Within Project Area	Outside Project Area	Within Project Area	Outside Project Area
	BLM	Other	BLM	Other	BLM	Other	BLM	Other					
AM0303	1.9	8.3			0.1	4.0			14.3	10.6		6.0%	
AM0306	3.4	6.6			2.8	5.6			18.4	6.2		3.5%	
AM0309	0.6	8.9			1.7	2.8			14.0	4.8		2.7%	
AM0315	3.7	3.1			0.8	1.2			8.8	4.3		2.5%	
AM0318	0.7	3.6			0.5	1.9			6.7	1.6		0.9%	
AM0321	0.8	4.3			0.4	4.3			9.8	5.2		3.0%	
AM0324	7.5	2.3			1.0	0.7			11.5	4.8		2.8%	
AM0327	0.3	0.8	0.1	5.2		0.2	1.2	2.9	10.7	3.8	8.3	2.2%	4.7%
AM0330	0.9	1.3		2.7	0.6	1.1		3.6	10.1	4.5	13.3	2.6%	7.6%
AM0336		1.0		2.4		0.9	1.3	1.5	7.2	7.1	4.7	4.0%	2.6%
AM0418			10.9	5.1			7.0	8.6	31.7		4.7		2.7%
Total	19.6	40.2	11.0	15.4	7.9	22.8	9.5	16.6	143.0	4.7	5.6	2.7%	3.2%

* Based on 30 foot average width.

[1]/ Note: The data for Table 4-4 is from the road layer of the BLM GIS database and was supplemented by an inventory using aerial photos. However, it is estimated that the actual number of roads (and crossings) in the China Keeler Project Area may be as much as 30% higher due to new roads and roads hidden by vegetation. In Table 4-5 the change in road density and the change in the percent of the area roaded is not affected by this correction and can be used to compare the relative effects of the alternatives.

Table 4-5 Comparison of Road Statistics for Alternatives A and B

Drainage Area Number	Added Road Miles	Decommissioned Road Miles	Net Change (Miles)	Change in road density (Mi/Mi^2)		Change in % of Area in Roads	
				Within Project Area	Outside Project Area	Within Project Area	Outside Project Area
AM0306	+ 0.5	- 1.5	- 1.0	-0.3		-0.192%	
AM0309	+ 0.6		+ 0.6	0.2		0.117%	
AM0318	+ 0.3	-3.7	- 3.4	-0.8		-0.456%	
AM0321	+ 0.7		+ 0.7	0.4		0.212%	
AM0324	+ 0.5		+ 0.5	0.2		0.120%	
AM0330	+ 0.9		+ 0.9	1.1		0.601%	
AM0418	+0.4		+ 0.4		0.1		0.034%
Star Gulch	0.0	- 0.9	- 0.9				
Total	**+ 3.9**	**-6.1**	**-1.7**	**-0.1**	**0.0**	**-0.055%**	**0.024%**

Vegetation Treatment

As discussed in Chapter 3, vegetation type, size and distribution can affect the flow of water through a watershed. Table 4-6 shows the acreage distribution for the proposed treatments and the **minimum** expected post treatment crown closure.

Table 4-6 Alternative B Treatments (acres)

Drainage Area Number	DF POLES (60%)*	DF REGEN (40%)*	DRY DF (50%)*	MISTLE-TOE RX (66%)*	MOIST DF (50%)*	PINE REGEN (20%)*	PCT (30%)*	FUEL TREAT-MENT (30%)*	Total Acres	% of Drainage Treated
AM0303			35.2			20.1	50.7		106.0	12%
AM0306			265.0			39.6	139.9	274.6	719.1	38%
AM0309			72.9			58.4	139.4	215.6	486.3	26%
AM0315	2.1	11.9	225.8	0.2		1.8	166.9		408.7	31%
AM0318	7.6	9.8	256.3	107.0	67.3	11.4	190.5		649.9	24%
AM0321			40.2				0.1	111.2	151.5	13%
AM0324			89.1		11.5	8.0	176.6		285.2	19%
AM0327			45.0				6.3		51.3	5%
AM0330			74.3				10.1		84.4	10%
AM0336			16.1						16.1	2%
Total	9.7	21.7	1,119.9	107.2	78.8	139.3	880.5	601.4	2,357.1	17%

* Value Denotes Minimum Post Treatment Crown Closure

Crown cover is directly related to watershed response as discussed in Chapter 3. Low crown cover usually corresponds with increased exposed soil, rapid runoff, increased snow accumulation and associated erosion. High crown cover generates more moderate flows but has an associated higher risk of a severe fire. The Ecoregion mapping (Eco-Regions of Oregon, www.oregon-plan.org) for this area indicates a natural crown cover of greater than 30%. Table 4-7 indicates that fires of mixed severity occurred naturally within 50 year intervals for 67% of the project area.

Table 4-7 Natural Fire Severity for the China Keeler Project Area (From the Fire and Fuels report in this document).

Severity	**Interval**	**Percent of the Project Area**
Low	0-35 years	25%
High	0-35 years	8%
Mixed	<50 years	67%

The Ecoregion mapping does not provide a median value for the natural crown cover. With a fire interval of 35 to50 years, it is reasonable that maximum crown cover may approach 90% and the median may be between 50 and 70 percent.

Table 3-9 in Chapter 3 shows the current crown cover for the project drainage areas. Table 4-8 shows the effects that the treatments listed in Table 4-6 would have on the BLM-managed portion as well as on the entire drainage. In general, the treatments would tend to reduce the risk of severe fire while keeping the canopy cover well above the natural minimum of 30%.

Table 4-8 Change in Crown Cover Associated with Alternative B

Drainage Number	BLM Land in Project Area				Total Drainage			
	Acres	Current Crown Closure	Alt B Crown Closure	Difference	Acres	Current Crown Closure	Alt B Crown Closure	Difference
AM0303	220	75%	56%	-19%	863	30%	25%	-5%
AM0306	1236	65%	49%	-16%	1897	62%	51%	-11%
AM0309	938	60%	45%	-15%	1865	38%	30%	-7%
AM0315	913	70%	57%	-13%	1307	55%	46%	-9%
AM0318	2251	70%	63%	-7%	2714	68%	63%	-6%
AM0321	458	50%	45%	-5%	1202	38%	36%	-2%
AM0324	1183	80%	70%	-10%	1521	79%	71%	-8%
AM0327	358	50%	50%	0%	939	56%	56%	0%
AM0330	319	60%	57%	-3%	846	44%	43%	-1%
AM0336	359	60%	60%	0%	894	33%	33%	0%
AM0418	2553	50%	42%	-8%	4290	38%	33%	-5%

Effects of Alternative B - Variable Prescriptions With Proposed Road Construction

Direct Effects

Stream 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. Table 4-3 shows that thirty-seven crossings would be affected by thirty-four crossing removals and three new crossings. Two of the proposed new crossings would be in the Lower Thompson Creek drainage (AM0418): one on an intermittent stream and one on a dry draw. The third crossing would be on a dry draw in the China Gulch drainage (AM0306). Culverts at the new crossings would match the local character of the channels as much as reasonably possible. However, the channel in the crossing areas would be converted to culverts.

Table 4-3 shows that seven culverts would be removed from perennial streams during the road decommissioning phase of the project. Two of these crossings are in China Gulch and the remaining five are in headwater areas of Chapman Creek. In addition, culverts would be removed from 11 intermittent stream channels and 16 dry draws. The channel area associated with the removed culverts would be shaped to match the natural configuration as much as possible and become self-maintaining. The net result is reduced road maintenance costs and a reduced risk of a culvert-related road failure.

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

Water Quality - Alternative B would have no direct effect on either summer stream temperature or flow modification on the 303(d) listed portion of 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. The proposed project would not contribute to reduced shade or increased stream temperatures in Keeler Creek.

Under Alternative B, direct effects on sedimentation would only occur in perennial streams where existing culverts are proposed for replacement or removal (no new culverts are proposed for perennial streams). Culvert replacements in perennial streams would take place as part of the proposed road renovation and are being considered for a maximum of eight sites: three on Keeler Creek, one on a Keeler Creek tributary, and four on three Chapman Creek tributaries.

The seven culvert removals from perennial streams during the road decommissioning phase of the project were already mentioned above in the Stream Channel Morphology section.

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 in-channel work associated with this phase of the decommissioning project could 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 increase in vehicular traffic associated with this project would increase the risk of a accident that results in a fuel or other chemical spill. Spilled material that would reach a perennial stream would have a direct effect on water quality. Appropriate measures would be taken to prevent and, if necessary, respond promptly to a spill situation.

Road and access management associated with this project would provide an opportunity to curtail or regulate OHV Use in the China Keeler area. This action would have the direct effect of reducing sedimentation associated with the unauthorized use of OHV trails.

Indirect Effects

Stream 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.

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 54 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.

Under Alternative B, 5.2 miles of road would be decommissioned. This action would tend to eliminate the influence of the road on the local drainage and local flows (both groundwater and surface) would tend to approach the pre-road flow patterns. Consequently the synchronization of the flows from the tributaries would tend to approach the natural condition.

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. Streamflows are not expected to be noticeably affected by soil compaction associated with this project.

Roads can affect streamflow in several different ways as discussed in Chapter 3. Table 4-4 shows the density information for the affected drainages under Alternative B. The risk associated with roads depends, in part, on the road density. However, many other factors need to be considered for a full risk determination. Table 4-4 shows drainage area AM0303 with the highest road density, a consequence of the higher residential use in that area. The percentage of the drainage area in roads is a similar index and is also shown in Table 4-4. The Oregon Watershed Assessment Manual (Watershed Professionals Network, 1999) suggests that rural drainages with more than 8% roads havea high potential of experiencing more than a 10% increase in peak flows. Drainages with 4-8% have a moderate risk and less than 4% have a low risk. Table 4-4 shows that, with the road miles shown, there would be a low or moderate risk of a detectable increase in peak flows associated with roads. Since the road numbers shown are a conservative estimate, increasing the values by 30% may provide a more realistic estimate. In that case, drainage area AM0303 would have a high risk of increased peak flows. This result would be expected due to the more extensive urban development in this drainage.

Table 4-5 shows the change in road density that would result from implementation of Alternative B. Note that the largest percent increase of the area in roads is in AM0330 which, at 2.6% has a low risk of causing a detectable increase in peak flows. The portion of AM0330 outside the project area is at 7.6% roads which is approaching the detectable threshold. The area consists of several intermittent streams that individually flow directly into the Applegate River. This higher risk is expected with more urban development. Drainage AM0303, with the highest risk in the project area at 6%, would not be further compromised by the project. In conclusion, this project is not expected to raise the peak flow risk rating of any stream in the project area. In the long term, the benefits of the road decommissioning would greatly outweigh any changes to streamflow due to road construction.

Vegetation density can also affect streamflow as discussed in Chapter 3. In general, lower densities can result in higher peak flows however, higher densities result in increased fire risk. The various proposed treatments will reduce the crown cover as shown in Table 4-6 and 4-8. Since the crown cover for the natural condition is greater than 30%, it is apparent that all of the drainages would still be within in the natural range while benefiting from a reduction in severe fire risk. For the changes shown, the peak flows are not expected to increase noticeably.

As noted in Chapter 3, the Chapman Creek drainage area has about 776 acres in the transient snow zone and more than 85% of the area would have to have less than 30% crown cover to cause a detectable increase in peak flows. Approximately 2% of the critical zone is currently in this range. With Alternative B, approximately 140 acres would receive the "Dry Douglas Fir" prescription and 65 acres would receive the "Mistletoe Treatment" prescription. Table 4.6 indicates that the minimum expected crown closure

from these treatments is 50% for the Douglas Fir and 66% for the mistletoe. Consequently, no appreciable increase in the amount of area below the critical 30% closure level is expected to occur in the transient snow zone area of Chapman Creek from the implementation of Alternative B and no increased risk of peak flows associated with rain-on-snow events is expected to occur.

Water Quality - Alternative B would have no indirect effect on either summer stream temperature or flow modification on the 303(d) listed portion of 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. The proposed project would not contribute to any reductions in stream shade or increases in stream temperature on Keeler Creek.

Management activities proposed under Alternative B that could have an indirect effect on sedimentation to streams in the China Keeler 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. 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. 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 China Keeler project area. Information about the number of crossings is provided in Tables 4-2 and 4-3.

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 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 windrowed 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. Table 4-2 shows that one intermittent and two dry draw crossings would be added with this alternative. The associated soil disturbance could result in some minor sediment transport during the first post-activity flows. Some sediment from the newly worked surfaces may reach the stream system through the road drainage network. Any turbidity and sediment increases resulting from road construction would be within the scope of the increases analyzed in the Medford District PRMP/EIS (USDI 1994, p. 4-19).

The China Keeler project includes road renovation that would bring 54 miles of roads up to current BLM design standards. Improving road drainage and resistance to wear and erosion is a restoration priority for the Middle Applegate River Watershed. 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.

Culverts/drainage structures on stream crossings would be replaced in the project area as needed to accommodate at least the 100-year flood, including associated bedload and debris. A maximum of eight culverts could be replaced on perennial streams: three on Keeler Creek, one on a Keeler Creek tributary, and four on three Chapman Creek tributaries. 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 be detectable in the Applegate River. 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 34 road crossings (7 on perennial streams, 11 on intermittent streams, and 16 on dry draws). 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 at least 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. In general, the long term benefits of decommissioning roads outweigh the relatively short term effects due to construction.

The proposed road decommissioning within Riparian Reserves and road stream crossing removal on perennial streams (Chapman Creek and China Gulch) would have the highest risk of having indirect effects on sedimentation.

On Chapman Creek (AM0318), about 1.0 mile of road within the Riparian Reserve and very near to the perennial stream channel would be decommissioned. Within this road segment, five road stream crossings would also be decommissioned. This area is in the headwaters of Chapman Creek and is about 1.6 miles upstream from the confluence with the Applegate River. Any increase in sedimentation due to soil disturbance from proposed road and road stream crossing decommissioning would be small with minimal effect on the Applegate River.

An additional 2.6 miles of road would be decommissioned on the upper ridge of the Chapman Creek drainage in the Mt Baldy area. Since no perennial crossings would be involved and the crossed channels are very small, the project associated sedimentation is expected to be very small.

On China Gulch (AM0306), about 0.8 mile of road within the Riparian Reserve and very near to the perennial stream channel would be decommissioned. Within this road segment, two road stream crossings would also be decommissioned. This area is in the headwaters of China Gulch and is about 2 miles upstream from the confluence with the Applegate River. Any increase in sedimentation due to soil disturbance from proposed road and road stream crossing decommissioning would be small with minimal effect on the Applegate River.

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 the new roads, 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 54 miles of road would have a positive long-term effect on stream sedimentation problems in the project area.

Alternative C - Variable Prescriptions With No New Roads

This alternative would use different logging systems to accomplish essentially the same vegetation treatments as Alternative B. The main differences for Alternative C are:

- No new roads
- 17 fewer acres treated in AM0306 (China Gulch)
- Roads in China Gulch (1.3 miles) would not be decommissioned but would be added to the road improvement list for a total of 57.9 miles of road improvement.

The differences in the road work are summarized in Table 4-9.

Table 4-9 Summary of road construction and decommissioning for the China Keeler Project. (No action would be taken in Alternative A.)

Drainage Area Number	Drainage Area Location	Alternative B		Alternative C	
		Added Road Miles	Decom-missioned Road Miles	Added Road Miles	Decom-missioned Road Miles
AM0303	Between China Gulch and Forest Cr				
AM0306	China Gulch drainage	+ 0.5	- 1.5		
AM0309	Between Long Gulch and China Gulch	+ 0.6			
AM0315	Between Chapman Cr and Long Gulch				
AM0318	Chapman Cr drainage	+ 0.3	- 3.7		- 3.7
AM0321	Between Keeler Cr and Chapman Cr	+ 0.7			
AM0324	Keeler Cr drainage	+ 0.5			
AM0327	Between Gage 14366000 and Keeler Ck				
AM0330	Between Humbug Cr and Gage 14366000	+ 0.9			
AM0336	Between Thompson Cr and Humbug Cr				
AM0418	Thompson Cr drainage below Tallowbox Cr	+ 0.4			
	Star Gulch tributaries outside project area		- 0.9		- 0.9
	Totals	+ 3.9	- 6.1		- 4.6

Alternative C actions that may contribute an effect to watershed hydrology

The following tables quantify key differences between Alternatives A and C that may affect hydrology of the project area. This information can be used to analyze the direct and indirect effects of implementation of Alternative C on stream channel morphology, streamflow, and water quality within the activity area.

Stream Crossings

Table 4-10 shows the distribution of stream crossings proposed under Alternative C. This table can be compared with Table 7 in Chapter 3 for the existing condition (Alternative A) and Table 4-2 for Alternative B. Note that changes occurred only in the Chapman Creek drainage (AM0318). Table 4-11 summarizes the changes in stream crossings associated with the project.

Table 4-10 Total Number of Stream Crossings With Alternative C[1]
Shaded cells denote values different from Alternative A.

Drainage Area Number	# of Stream Crossings by Stream Type and Ownership								Total Crossings	BLM Crossings/ mi^2
	Perennial		Long Duration		Short Duration		Dry Draw			
	BLM	Other	BLM	Other	BLM	Other	BLM	Other		
AM0303		3		4	3	11	4	12	37	27.4
AM0306	2	2	1	12	9	8	7	4	45	15.2
AM0309		6		15		6		3	30	10.3
AM0315		4	2	1	2	1	8	1	19	9.3
AM0318	9	2			6	1	47	12	77	18.2
AM0321		5		5		4		5	19	10.1
AM0324	6	1			6	2	28	11	54	22.7
AM0327				11		17			28	19.1
AM0330		1		4		3		11	19	14.4
AM0336				7		1			8	5.7
AM0418	5	19	1	12	8	16	25	9	95	14.2
Grand Total	20	43	5	71	26	70	117	68	431	15.0

[1]/ Note: The data for Table 4-10 is from the road layer of the BLM GIS database. It is estimated that the actual number of roads (and crossings) in the China Keeler Project Area may be as much as 30% higher. However, In Table 4-11 the net change and change in crossings per square mile are not affected by this correction and can be used for a direct comparison between alternatives.

Table 4-11 Summary of Changes in Number of Crossings for Alternative C (Negative values denote a reduction in crossings)

Drainage Area Number	# of Stream Crossings by Stream Type and Ownership								Net Change	% Change in BLM Crossings / mi^2
	Perennial		Long Duration		Short Duration		Dry Draw			
	Remove	Add	Remov	Add	Remo	Add	Remove	Add		
AM0318	-5				-3		-12		-20	-21%
Total									-20	-4%

Road Density

Table 4-12 provides for a direct comparison with Table 3-6 that shows similar information for the current condition (Alternative A) and Table 4-4 for Alternative B.

Table 4-12 Alternative C Total Road Miles for All Drainages Affected by the Project

Drainage Area Number	Roads From GIS Data				Additional Roads From Aerial Photos				Total Road Miles	Road Density (mi/mi^2)		Percent of Area in Roads *	
	Within Project		Outside Project		Within Project		Outside Project Area			Within Project Area	Outside Project Area	Within Project Area	Outside Project Area
	BLM	Other	BLM	Other	BLM	Other	BLM	Other					
AM0303	1.9	8.3			0.1	4.0			14.3	10.6		6.0%	
AM0306	4.4	6.6			2.8	5.6			19.4	6.6		3.7%	
AM0309		8.9			1.7	2.8			13.4	4.6		2.6%	
AM0315	3.7	3.1			0.8	1.2			8.8	4.3		2.5%	
AM0318	0.4	3.6			0.5	1.9			6.4	1.5		0.9%	
AM0321	0.2	4.2			0.4	4.3			9.1	4.9		2.8%	
AM0324	7.0	2.3			1.0	0.7			11.0	4.6		2.6%	
AM0327	0.3	0.8	0.1	5.2		0.2	1.2	2.9	10.7	3.8	8.3	2.2%	4.7%
AM0330		1.3		2.7	0.6	1.1		3.6	9.2	3.5	13.3	2.0%	7.6%
AM0336		1.0		2.4		0.9	1.3	1.5	7.2	7.1	4.7	4.0%	2.6%
AM0418			10.5	5.1			7.0	8.6	31.3		4.7		2.6%
Total	17.9	40.1	10.6	15.4	7.9	22.8	9.5	16.6	140.8	4.6	5.5	2.6%	3.1%

* Based on 30 foot average width

Shaded cells denote values different from Alternative A.

[1]/ Note: The data for Table 4-12 is from the road layer of the BLM GIS database and was supplemented by an inventory using aerial photos. However, it is estimated that the actual number of roads (and crossings) in the China Keeler Project Area may be as much as 30% higher due to new roads and roads hidden by vegetation. In Table 4-13 the change in road density and the change in the percent of the area roaded is not affected by this correction and can be used to compare the relative effects of the alternatives.

Table 4-13 Comparison of Road Statistics for Alternatives A and C

Alternative 3 - Changes in Road Statistics

Drainage Area Number	Added Road Miles	Removed Road Miles	Net Change (Miles)	Change in road density (Mi/Mi^2)		Change in % of Area in Roads	
				Within Project	Outside Project	Within Project	Outside Project
AM0318		-3.7	-3.7	-0.9	0.0	-0.496%	
Entire Project Area		-3.7	-3.7	-0.2	0.0	-0.109%	

Vegetation Treatment

The effects of vegetative treatment with regard to hydrology are expected to be the same for Alternative C as for Alternative B.

Direct Effects

Stream Channel Morphology - Alternative C would have the same direct effects as Alternative B on channel morphology in the project area except for the decommissioning of a the thirteen crossings in the China Gulch drainage (AM0303) and the three new crossings associated with the new roads proposed in Alternative B (see Table 4-3).

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

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 from the two perennial crossings in China Gulch (AM0306) due to road decommissioning.

Indirect Effects
Stream Channel Morphology- Alternative C would have the same indirect effects on channel morphology as Alternative B.

Streamflow- The indirect effects of Alternative C on streamflow would be similar to Alternative B with the following exceptions:

Under Alternative C, 3.7 miles (65% less than Alternative B) of road would be decommissioned. The net effect of this action would be similar to that for Alternative B except it would be proportionally reduced due to the reduction of decommissioned road.

Likewise, no increase in the risk of peak flows is expected from this alternative.

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.

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 to work with ODEQ to implement the total maximum daily load (TMDL)and water quality management plan (WQMP) completed in 2003 for the Applegate Subbasin. 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 instream work. Restoration aimed at improving water quality is described under Alternatives B and C. Alternatives B and C would include road renovation to improve roads on private timber lands as well as BLM-administered lands. Under Alternative A, special funding for restoration work would be required and no BLM-funded road renovation would occur on private lands. 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 are addressed in the Applegate River Water Quality Management Plan.

Table 4-y. Cumulative effects of the proposed alternatives on resources as observed near the mouth of the tributary streams – a qualitative and narrative assessment.

Table 4-x. Cumulative effects of the proposed alternatives on resources as observed in the Applegate River at Applegate – a qualitative and narrative assessment.

Fisheries

The Aquatic Conservation Strategy (ACS) was developed to restore and maintain ecological health of

Table 4-y (a) Resource Issue: Sedimentation

	Alt A	Alt B	Alt C	Comments
Past	-4			High initial impact from mining, log removal, roads, etc (-5), some natural recovery (1).
Present	-2			Continued recovery (1), continued local impacts (-3).
Proposal	0	0*	0*	*Trace amounts possible from general activity and road work. Alt B slightly higher than Alt C.
Future	-3	1	1	Alt A - severe fire damage, Alt B&C some recovery and improvement in channel condition.
Cumulative	-9	-5	-5	

Table 4-y (b) Resource Issue: Channel Morphology - Stability

	Alt A	Alt B	Alt C	Comments
Past	-4			High initial impact from mining, log removal, roads, etc (-5), some natural adjustment (1).
Present	-2			Continued recovery (1), continued local impacts (-3).
Proposal	0	0	0	No direct project related effects expected..
Future	-3	1	1	Alt A - severe fire damage, Alt B&C some recovery and improvement in channel condition.
Cumulative	-9	-5	-5	

Table 4-y (c) Resource Issue: Stream Temperature

	Alt A	Alt B	Alt C	Comments
Past	-3			Reduced shade and groundwater inflow
Present	0			No change
Proposal	0	0*	0*	* Possible slight improvement due to increased summer flow.
Future	-1	1	1	Alt A (-1) due to severe fire riparian damage. +1 all alts for natural shade development.
Cumulative	-4	-2	-2	

Table 4-y (d) Resource Issue: Summer Stream Flow

	Alt A	Alt B	Alt C	Comments
Past	-4			Loss of groundwater and channel storage
Present	2			Increased headwater storage
Proposal	0	0*	0*	* Possible small increase due to veg removal.
Future	-2	0	0	Alt A (-2) due to loss of storage due to severe fire.
Cumulative	-4	-2	-2	

Table 4-y (e) Resource Issue: Flood Control

	Alt A	Alt B	Alt C	Comments
Past	3			Channel clearing increased capacity (+4), Increased roads (-1) =+3 reduced floods.
Present	0			no change
Proposal	0	0	0	No detectable direct effects expected.
Future	-2	0	0	Alt A (-2) due to severe burn and reduced storage.
Cumulative	1	3	3	(More flooding with Alt A)

Table 4-y (f) Resource Issue: Groundwater inflow

	Alt A	Alt B	Alt C	Comments
Past	-3			Channel clearing lowered water table
Present	0			No change.
Proposal	0	0	0	No direct change expected.
Future	+1 -1	0	0	Alt A (+1) if deposition from severe fire; (-1) if scour from severe fire.
Cumulative	-2 -4	-3	-3	

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

Table 4-x (a) Resource Issue: Sedimentation

	Alt A	Alt B	Alt C	Comments
Past	-2			High initial impact from mining, log removal, etc (-5), some natural recovery (3).
Present	-1			Continued recovery (1), dam reduction (1), adjustment to regulated flow regime (-3).
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	-5	-3	-3	Continued impact of new flow regime (-3), severe fire effects Alt A (-2).
Cumulative	-8	-6	-6	

Table 4-x (b) Resource Issue: Channel Morphology - Stability

	Alt A	Alt B	Alt C	Comments
Past	-4			High initial impact from mining, log removal, channel alterations, etc (-5), some natural recovery (1).
Present	-3			adjustment to regulated flow regime (-3).
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	-5	-3	-3	Continued impact of new flow regime (-3), severe fire effects Alt A (-2).
Cumulative	-12	-10	-10	

Table 4-x (c) Resource Issue: Stream Temperature - Applegate River

	Alt A	Alt B	Alt C	Comments
Past	-4			Reduced channel complexity, groundwater, shade.
Present	1			Increased summer flows
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	1.5	1	1	Aggradation of channel will improve groundwater and hyporheic action.
Cumulative	-1.5	-2	-2	More structure in Applegate could help.

Table 4-x (d) Resource Issue: Summer Stream Flow

	Alt A	Alt B	Alt C	Comments
Past	-3			Reduced groundwater, water withdrawals
Present	4			Increased summer flows from reservoir
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	0	0	0	No change expected
Cumulative	1	1	1	

Table 4-x (e) Resource Issue: Flood Control

	Alt A	Alt B	Alt C	Comments
Past	3			Channel clearing increased capacity
Present	3			Reservoir flood control
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	0	0	0	No change expected
Cumulative	6	6	6	Flood protection for land use

Table 4-x (f) Resource Issue: Groundwater inflow

	Alt A	Alt B	Alt C	Comments
Past	-3			Channel clearing lowered water table
Present	-2			Higher summer flow (+1), reduced flood recharge (-3)
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	0	0	0	No change expected
Cumulative	-5	-5	-5	

Aquatic Conservation Strategy.

Table 4-14 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[2]	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[2]	Remains at current levels	Input reduced	Input reduced
Peak flows[2]	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.

2/ Discussed in detail in the Hydrology sections of this EA.

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 SONC coho salmon, their Critical Habitat, and Essential Fish Habitat. Project design features, Riparian Reserve stipulations and buffers, and site conditions 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. The SW Oregon Level 1 Team has reviewed this project and concurs with the NLAA determination. The project has been submitted to NOAA Fisheries, and a Letter of Concurrence is expected. For more information, please refer to Appendix E – ACS Strategy.

Fisheries - Alternative A - No Action

Direct and Indirect Effects

Alternative A would have no direct effect on fish or fish habitat. Indirect effects would include continued fine sediment input from poorly-designed and damaged roads, continued risk of culvert blow-out from undersized culverts, and continued upstream access problems (culvert blockages) for aquatic species.

In riparian areas with overly-dense stands of Doug-fir and other conifers, trees would continue to grow slowly. Old growth/late successional trees (primarily madrones, pines, and other conifers) would still be stressed from water competition due to the thick conifer understory (see Silviculture section), especially in the narrow zone of riparian influence in the southwest-facing China Gulch tributaries.

Without upland thinning activities, road closures and road decommissioning, the risk of severe wildfire remains high (see Fuels section). A severe wildfire could indirectly affect aquatic ecosystems.

The current scientific discussion centers around whether severe wildfires affect fish and fish habitat negatively or positively. In some areas of the West, wildfires are the source of important debris flows: large deposits of boulders, dirt, and uprooted trees that wash down from tributaries into mainstream streams. These boulders and trees sort themselves out over the next 100 years, providing pools, and other important fish habitat structure (Reeves et al. 1995). Such debris flows are not always a benefit to marginal (few fish) or isolated fish populations. Isolated fish populations can be extirpated by large post-fire ash flows or other channel scouring events, especially if refugia or escape routes are not available (Kershner, 2004).

A stream's response to a fire can vary, depending on existing conditions at the time of the fire (Russell 2004). For example, a stream could downcut and scour after a fire, simplifying the channel and reducing habitat for aquatic biota. This is especially a risk if a severe fire burns up all the downed wood in a stream channel and the soil is erosive. On the other hand, the stream could aggrade (store sediment) behind channel control structures like downed wood and large boulders. This is more likely if burned trees fall into the channel or the stream retains some structure after a fire. Aggradation is usually beneficial (for example, it creates spawning gravels for fish); however, too much can also cause problems in lower gradient systems; for example, rock can accumulate at a tributary mouth, blocking passage for a few years until the stream carves a new channel through the debris fan (J. Rossa, personal observation; Benda et al. 2003). Road systems can also become a risk factor in a wildfire: the potential for road failures increases without vegetative protection, and overland ash flow can plug culverts and also cause failures.

Tere are concerns in the China Keeler Project Area, about the potential effects of a severe wildfire. The short-term intermittent streams in Keeler and Chapman Creeks seem to be storing fine sediments (BLM, unpublished surveys, 1997). As implicated in the Hydrology section, it is likely that a severe wildfire would cause that fine sediment to be released, potentially filling downstream reaches with fine sediment and reducing fish habitat quality. Streamside logging, mining, road building and human settlement (in China Gulch) have reduced the amount of potential woody debris available for channel control after a fire. As noted elsewhere in the document, road densities are fairly high in some parts of the China Keeler project area; streams in those areas could be damaged by road failures after a severe wildfire. However, a severe wildfire in the project area could add spawning gravels to fish habitat and provide much-needed woody material to some streams. This was the pattern observed after the 2001 Quartz Gulch fire (J. Rossa, personal observation).

Therefore, Alternative A could have positive, negative, or neutral effects to fish, aquatic biota, and stream habitat.

Fisheries - Alternative B - Variable Prescriptions With Proposed Road Construction

Direct negative effects to aquatic ecosystem

There are no commercial harvest activities planned within Riparian Reserves. Some of the young stand thinning (PCT or non commercial thinning) is planned within the outer portions of Riparian Reserves. The standards for these activities are outlined in the Project Design Features in Appendix C. There are no non commercial units proposed within the watersheds of Chapman or Keeler Creek drainage areas.

The closest commercial harvest unit to occupied coho Critical Habitat in the Applegate River is in Section

26: A "dry Doug-fir" prescription unit is planned outside the Riparian Reserve. There are several additional commercial harvest units within ½ mile of the Applegate River; however all of these are hydrologically separated from the river by roads, irrigation ditches, flat agricultural land, the river's Riparian Reserve, or all of the above. The closest non commercial treatment unit to occupied coho Critical Habitat is in section 20, approximately ¾ mile from the river on the other side of Highway 238.

Under Alternative B, the only potential direct effects to fish would be related to one of the large culvert removal and replacement projects on Chapman and Keeler Creeks.

Table 4-15: Major culvert projects in China Keeler Project.

Stream	**Culvert Location**	**Project Type**	**Fish Present**
Chapman	Road #39-4-1.1, mainstem Chapman Ck., ~ 4 miles from Applegate River, 39s4w1nenw	Removal	Cutthroat
Chapman	Road #38-3-32.1, small tributary, ~ 1 ½ miles from Applegate River, 38s3w31nwsw	Replacement	None
Keeler	Road #38-3-35.3, mainstem Keeler Ck., ~ 2 ½ miles from Applegate River, 38s4w35swne	Replacement	None
Keeler	Road #38-3-35.4, small tributary, ~ 2 ½ miles from Applegate River, 38s4w35senw	Replacement	None

At the project sites, fish (cutthroat) are only present at the mainstem culvert on Chapman Creek. The fish may be temporarily disturbed by the noise and activity of replacing the culvert, and move downstream to calmer pools. 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. The movement would be within the natural parameters of their normal activity, and would have no negative effect on the fish. Similarly, amphibians and many aquatic insects can move downstream from project sites.

No other types of instream work are proposed for the China Keeler Project.

Indirect **negative** effects to aquatic ecosystem

Sediment

In the China Keeler project, the only activities with potential indirect negative effects to fish and aquatic systems would be those either in the stream channel, or with a physical route for fine sediments to reach the stream channel. Such activities include road decommissioning and associated culvert removal, culvert replacement, road renovation, and prescribed burning.

The sediment produced from road decommissioning and road renovation in Chapman and Keeler Creeks will be trapped by healthy riparian vegetation, downed wood, and thick duff layers between roads and the streams. One of the roads to be decommissioned (39-4-1, in Keeler Creek) runs within 25' of the stream; however, this portion of the road is rocky and already grown over with trees and shrubs. Major disturbance of the roadbed is very unlikely. It will be evaluated carefully to determine how thw water is routing.

In China Gulch, one of the roads to be decommissioned is separated from streams by healthy riparian

vegetation, thich duff layers and downed wood. The other road runs along the edge of a weedy meadow, and eventually actually runs in the channel. In this location, the stream is dry in the summer, when road work will take place. The channel has been heavily disturbed over the last 100 years, so the quality of aquatic habitat is extremely poor. Although some fine sediments will be produced from the road work, the sediment will be routed downstream, and will be much less at the project site than that entering the channel year after year from the poorly constructed road. The amount of sediment produced would be small enough and the distance far enough that effects of this project would be unmeasurable in the Applegate River (see Hydrology section).

The fine sediment produced from large culvert removal (Keeler Creek) and replacement (Chapman and Keeler Creeks) would be as small as possible with the use of extensive PDFs and BMPs. These BMPs and PDFs were designed to prevent accumulation and movement of fine sediments out of the project work area, especially in places where road culverts cross intermittent or perennial streams. The culvert replacement PDFs were developed by BLM engineers and fish biologists and reviewed by NOAA Fisheries in 2001.

In addition, both Chapman and Keeler Creeks have very low amounts of fine sediments in their channels. Any fine sediments produced would be stored and distributed in the streams in a way that would be unmeasurable. Certainly, the impacts to spawning and rearing habitat downstream would be less than negligible. Impacts to coho in the Applegate River would be completely unnoticeable, and therefore would not cause "take."

Broadcast burning is not likely to contribute any fine sediment to streams. Burns are conducted in the spring and fall in order to ensure a patchy moderate to light underburn. The potential of soil particles reaching the local waterways as a result of prescribed burning would be negligible as fires would not be ignited in Riparian Reserves 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. There is always a small risk of an underburn getting out of control and burning a Riparian Reserve. However the risk of this happening is very low. Therefore, the risk of a completely burned Riparian Reserve is low. Even if a Reserve burns, the amount of ash or soil contributed to streams would be within the amounts analyzed for in the Medford RMP EIS, and would be in fishless intermittent streams in brushfields or oak woodlands, which have been historically received frequent fire. Therefore, the amount of ash added would likely be within the amounts natural for the stream systems in those plant communities.

Historically, road construction, helipad construction, overstory tree removal (logging), mechanical fuel treatments, and prescribed fire have compromised aquatic habitat throughout the northwest. These activities are not affecting aquatic habitat in the China Keeler project for the following reasons:

> (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 stay on or near ridges. 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 China Keeler Project includes strict Best Management Practices (BMPs) and Project Design Features (PDFs) to control fine sediment produced during any kind of road work.

(3) 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 would be paid to yarding corridors and skid roads.

(4) Riparian Reserve buffers: 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.

(5) PDFs for fuel reduction handcrews: 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 would hike into units and use chain saws to thin small brush and trees. 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. 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 were effective at stopping any runoff–in fact, no run-off was observed(J. Rossa, personal observation).

(6) PDFs for "Slashbuster: "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. A "no treatment" buffer is required in all Riparian Reserves treated with Slashbuster, even those in brushfields. This buffer provides a physical barrier of duff, litter, sticks and riparian vegetation to trap any overland sediment movement from treated areas.

Temperature, Peak Flows: See Hydrology section.

Direct **beneficial** effects to aquatic ecosystems

Removing the culvert at road #39-4-1.1 would have direct positive effects on cutthroat populations. The culvert currently blocks fish access to upper reaches, so removing it will expand available habitat. Just as importantly there will be an almost immediate beneficial effect from allowing stream sediments and wood to travel downstream naturally instead of being trapped behind the culvert. The culvert replacements on Keeler and the Chapman tributary will also immediately improve sediment and wood routing in those streams. Passage of amphibians and aquatic insects will also be improved through each culvert.

Along the one fishless perennial stream where small-diameter wood will be added as part of non-commercial thinning, sediment routing and channel conditions will be improved for this little stream – although the effects will be insignificant at larger spatial scales. This stream is located at 38s3w31sene and 38s3w32swsw.

Indirect **beneficial** effects to aquatic ecosystems

Indirect beneficial effects include reduced risk of culvert failure, reduced road-related fine sediment input, and improved tree growth in treated Riparian Reserves. The culverts to be removed or replaced are all too small to pass a 100-year flood event. Most are blocking the passage of sediment and wood. In the 1997 New Year's Day flood, many road failures across western Oregon were associated with culvert

failures: either plugging and losing their ability to route water, or being too small, forcing water over the tops of roads. Failed culverts can dump tons of fine sediments into downstream, fish-bearing reaches. Such huge fine sediment loads are well-known threats to fish and aquatic insect production. Removing or replacing these older culverts with properly sized culverts will remove this risk.

Road renovation and decommissioning will improve drainage on BLM roads –away from stream channels. This renovation will fix current water routing and sediment source problems as well as ensure that stable roads remain that way.

Removing small diameter trees around larger trees within some Riparian Reserves may improve the growth rate of these larger trees. If so, then trees may attain late-successional characteristics sooner, and provide larger wood to adjacent channels and riparian areas. Removing these small trees (almost all Doug-fir) will protect vegetative diversity in these sites. Regardless, the overstory canopy will not be reduced in these Riparian Reserves, so the humid characteristics of the riparian areas will be maintained, and water temperatures will remain the same. (See Hydrology section).

Cumulative Effects

The cumulative effects of the China Keeler Project to the aquatic ecosystem are primarily-addressed in the Hydrology section and appendices.

As described earlier in the document, the Middle Applegate River Watershed has experienced numerous anthropogenic disturbances at many spatial and temporal scales. In the last 100 years, fire exclusion, 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. The China Keeler Project would correct some of the problems in the watershed. The silvicultural prescriptions attempt to restore more "natural" forest, woodland, grassland, and riparian conditions with the goal 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.

The China Keeler Project is too small to ameliorate the conditions in the mainstem Applegate River. At such a large scale (HUC-5), there are no expected improvements to fish habitat condition (see Hydrology section).

Fisheries - Alternative C - Variable Prescriptions With No New Roads

Over the project area, effects of Alternative C would be the same for aquatic systems as Alternative B.

Wildlife

Alternative A - No Action

Because, no projects are planned under this alternative, the effects to wildlife that are discussed in the action alternatives would not occur. The Middle Applegate Watershed Analysis (1995), however, addresses several elements of habitat decline in the watershed that the action alternatives are designed to improve. Restoration of these habitat elements, therefore, would not take place. Specifically, under the action alternatives, the non-commercial treatments would rejuvenate decadent shrublands, which would improve forage conditions for herbivores. Also, the encroachment of shrubs into the oak-woodlands would be slowed. Additionally, thinning some of the closed-canopy pole-sized conifer stands would facilitate establishment of herbaceous and shrub components thus improving intra-stand habitat complexity and diversity.

Alternative B - Variable Prescriptions With Proposed Road Construction

Direct/Indirect Effects

Timber Management

An overview of the effects of timber management on wildlife/wildlife habitat is provided in Chapter 4, pages 51-65, of the BLM Medford District Resource Management Plan (RMP). Additional site-specific impacts are addressed in the following discussion.

In order to accomplish the timber management objectives in the proposed project area, existing habitat conditions would be modified on approximately 2,160 acres of commercial conifer forest stands. Due to the variety of stand conditions in the proposed project area, numerous prescriptions/marking guidelines have been developed. With the exception of the regeneration prescription, all prescriptions have the stated objective of improving existing tree/stand vigor and growth. Conifer stands that have been selected for treatment are primarily in the large pole/mature condition classes.

All prescribed treatments would reduce canopy closure and remove snags. These are important stand features for a variety of wildlife species associated with large pole/mature conifer stands. The proposed harvest would adversely affect these species, e.g., northern spotted owl, and several woodpecker species (impacts to northern spotted owls are addressed below, and guidelines for snag retention for the snag-dependent species are addressed in the project design features of this document). Conversely, species preferring or adaptable to open canopies and/or early seral conditions would benefit from the harvest since the reduction in canopy closure should stimulate growth of herbaceous and other early seral vegetation, e.g., American robin and dark-eyed junco.

Research on the response of passerine birds to thinning provide examples of an “adverse impact”/”beneficial impact” scenario as described above. Janes (1998) found that abundance of breeding and wintering passerine birds declined in some functional groups and increased in others following timber harvest similar to that proposed in the China-Keeler project. Janes (1998) noted population declines in bark and foliage gleaners, and increases in terrestrial insectivores following harvest. The declines were attributed to decreases in canopy foliage, stem density, and snags, and the increases were attributed to the presence of more woody debris on the forest floor. Overall, bird abundance declined, but species richness remained relatively unchanged. Similarly, Hayes et al (2003) found that detections of 9 breeding bird species decreased and detections of 8 species increased relative to controls following thinning in young Douglas fir stands. Species richness remained unchanged.

Approximately 4 miles of new roads are proposed to be built under Alternative B. The proposed roads traverse a variety of habitat types, and would eliminate approximately 42 acres of habitat. In relation to the size of the proposed project, the loss of this small amount of habitat (<0.5% of BLM managed land within the project area) would be a minor impact to wildlife. A greater impact could be the disturbance that might occur to wildlife if the barricades/gates proposed for the roads are breached on a regular basis. The proposed project would decommission approximately 6 miles of road, and this would benefit wildlife by reducing vehicular disturbance.

Within the proposed project area, the distribution and abundance of many species would change. However, species richness is expected to remain unchanged, i.e., species are not expected to be extirpated from the proposed project area.

Threatened/Endangered Species

The northern spotted owl is listed as a threatened species under the auspices of the Endangered Species

Act of 1973, as amended (Act). Alternative B would remove or downgrade approximately 1,200 acres of suitable northern spotted owl habitat (i.e., nesting/roosting/foraging habitat). Approximately 210 acres would be removed, and 990 acres would be downgraded to dispersal habitat. Additionally, approximately 260 acres of dispersal-only habitat would be removed. The table below shows the estimated pre- and post-project spotted owl habitat situation in the proposed project area. It should be noted that the 990 acres of suitable habitat that will be downgraded to dispersal habitat could again be suitable habitat in 10-30 years if no further harvesting occurs during this time period.

Table 4-16 – Spotted Owl Habitat in China Keeler Project Area

Spotted Owl Habitat Within the Project Area			
Pre-Project		Post-Project	
Suitable (acres)	Dispersal-only (acres)	Suitable (acres)	Dispersal-only (acres)
3,295	1,630	2,095	2,360

The habitat modification described above would occur within portions of the median home range radius of 8 northern spotted owls sites. Five sites are known to have been occupied within the last 5 years (1999–2003). Three of these sites have produced young during this 5-year period. It is expected that the ability of the owls associated with these sites to breed, feed or shelter would be adversely affected by the removal and downgrading of this habitat. The ultimate fate of the owls is unknown due to the variability in individual owl response to habitat modification.

Four of these sites are within the boundary of the proposed project. Three sites were found before January 1994, and are protected with 100-acre core areas as directed by the NFP. The other site was discovered after January 1994; therefore, it is not protected with a 100-acre core. Riparian reserves and reserves for other species provide reasonable protection for the core of this site.

Northern Spotted Owl Critical Habitat

The proposed project area encompasses approximately 3,500 acres of Critical Habitat Unit (CHU) OR-74. The proposed timber harvest would remove or downgrade approximately 340 acres of suitable spotted owl habitat in the CHU. Approximately 95 acres would be removed, and 245 acres would be downgraded to dispersal habitat. If not subjected to further harvesting, the downgraded habitat could again function as suitable habitat in 10-30 years. Approximately 160 acres of dispersal-only habitat would also be removed. The table below shows the estimated pre- and post-project spotted owl habitat situation in CHU OR-74 within the proposed project area.

Table 4-17 – Spotted Owl Habitat in CHU OR-74 in China Keeler Project Area

CHU OR-74 Spotted Owl Habitat Within the Project Area			
Pre-Project		Post-Project	
Suitable (acres)	Dispersal-only (acres)	Suitable (acres)	Dispersal-only (acres)
1,900	760	1,560	845

Three of the six spotted owl sites that would be affected by the proposed project are located in CHU OR-74. It is expected that the ability of all of these owls to breed, feed or shelter would be adversely affected by the removal of this habitat.

CHUs OR-74 and OR-75 together provide an east-west connection along the southern portion of the Klamath Mountains Province (USDI/USDA 2003). Although the reproductive capability of the owls in CHU OR-74 would likely be adversely affected, the proposed harvest is not expected to preclude the connectivity function of CHU OR-74 (USDI/USDA 2003).

Because the northern spotted owl and designated critical habitat for the spotted owl would be adversely affected by the proposed timber harvest, formal consultation with the U.S. Fish and Wildlife Service is required. The consultation was completed through a programmatic consultation with the Service for timber sales and other projects in the Rogue River/South Coast basin that are to be sold (timber sales) or implemented (other projects) in fiscal years 2004 through 2008. The biological opinion concluded that the programs consulted on would not jeopardize the continued existence of the northern spotted owl, or destroy or adversely modify critical habitat for the northern spotted owl. The Biological Assessment for Rogue River/South Coast FY 04/08 Timber Sale Projects, and the Biological Opinion (Log # 1-14-03-F-511) issued by the Service are available for review at the Medford District Office. The mandatory terms and conditions of the BO require the implementation of project design criteria. These criteria would be incorporated in the design of the China-Keeler project (see PDFs).

Special Status Species (SSS)

Four SSS (for management purposes) are known to currently be present in the proposed project area or have been detected in the project area in the past. These species are northern spotted owl (addressed above), northern goshawk, Siskiyou Mountains salamander (addressed below in Survey and Manage species) and Townsend's big-eared bat.

Northern Goshawk

A northern goshawk nest site was located in the China Gulch area of the proposed project in 1980. This site has been monitored yearly since 1995, and there have been no goshawk detections. The site is considered to be abandoned.

The proposed action will remove approximately 1,200 acres of habitat considered to be suitable for the northern goshawk. The removal of this habitat would likely adversely affect goshawks within the project area if any were present. The standards and guidelines of the NWFP accommodate the habitat requirements of the northern goshawk within the NWFP area (BLM 1997). The project is in compliance with the NWFP; therefore, the proposed action meets the requirements of the Oregon-Washington BLM Special Status Species policy, i.e., the proposed action would not lead to listing the species as threatened or endangered.

Townsend's Big-Eared Bat

Townsend's big-eared bats are present in 2 mine adits within the proposed project area. No timber harvest or other activities are planned within approximately 600 feet of one of the adits. Due to the distance from this adit, these activities would not affect the microclimatic conditions in and around the adit or disturb the bats. The other known occupied adit is within a unit prescribed for treatment. This adit would be protected with a 250-foot buffer as required by the NWFP to maintain microclimatic conditions. Appropriate seasonal restrictions would be implemented if needed to reduce disturbance.

Two other adits are located within the project area. These adits have not been surveyed for bat use; however it would be assumed they are occupied and they would be protected with a 250-foot buffer.

Survey and Manage Species

Protocol surveys for great gray owls, molluscs, red tree voles and Siskiyou Mountains salamanders were

conducted in the proposed project area. The S&M species found in the proposed project area during surveys are the great gray owl, Siskiyou Mountains salamander, and red tree vole. All of these species will be protected in accordance with the NWFP Standards and Guidelines and/or the Management Recommendations for the species. During the analysis and preparation of the China Keeler Environmental Assessment, a new Supplemental Environmental Impact Statement and Decision updating the Northwest Forest Plan was issued. This document, *Record of Decision To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* reduced the need to survey and buffer certain S&M species. The China Keeler project is still implementing the more stringent conservation practices in place prior to the issuance of the new Record of Decision and SEIS.

Great Gray Owl

One great gray owl nest site is located within the proposed project area. This site has been protected with a 100-acre buffer in accordance with the Standards and Guidelines of the NWFP. A seasonal restriction would be implemented within ¼ mile of the nest site to reduce disturbance if the owls are nesting.

Siskiyou Mountains Salamander (SMS)

Numerous SMS sites were found during surveys in the proposed project area. Occupied habitat has been delineated and would be protected in accordance with the NWFP Standards and Guidelines and Management Recommendations. Approximately 1,390 acres of occupied habitat were identified in the proposed project area.

Red Tree Vole

Two red tree vole nests were located in the proposed project area. One nest tree is within habitat protected by the protection requirements for the SMS. The other site would be protected in accordance with the Management Recommendations for the red tree vole.

Connectivity

The Middle Applegate Watershed Analysis (USDI 1996) identified one inter-watershed connectivity corridor in the proposed project area. This corridor is encompassed by occupied SMS habitat and will not be treated. Existing connectivity will be maintained.

Non-Commercial Treatments

Fuel/hazard reduction treatments are planned on approximately 600 acres of shrubland and oak-woodland. The treatments are designed to reduce fire hazard by reducing the density of both shrubs and hardwoods. As with the timber management portion of the proposed project, the fuel reduction treatments would adversely affect some species and benefit others.

The China Gulch area, where the fuel treatments are planned, has been nominated as an Oregon Important Bird Area due to the number of bird species associated with the shrubland/oak-woodland habitat complex that reach their northern breeding limits in southwest Oregon. Species specifically mentioned in the nomination include blue-gray gnatcatcher, California towhee and oak titmouse. The proposed fuel reduction program would likely adversely affect these species due to their preference for areas that are densely vegetated. The proposed treatments are expected to rejuvenate decadent shrubland and improve the growth of the remaining oaks. This would benefit some herbivores (black-tailed jackrabbit and black-tailed deer) and acorn-eating species (acorn woodpecker and silver gray squirrels).

Threatened/Endangered Species

The proposed non-commercial fuel treatment would not adversely affect the northern spotted owl or designated critical habitat for the owl. The fuel treatments are not proposed for areas of suitable habitat or

in designated critical habitat. Also, the treatments would not take place proximate to (i.e., within ¼ mile) known northern spotted owl sites; therefore, disturbance during the nesting season would not be an issue.

Special Status Species

The only special status species associated with habitat to be treated in the non-commercial units is the Lewis's woodpecker. Opportunistic observations have not detected this species in the project area. Lewis's woodpeckers are associated with open oak-pine woodland habitat. The treatments prescribed for the oak-woodlands would potentially improve habitat conditions for this species in the long term by improving acorn production.

Survey and Manage Species

The target Survey and Manage species are not associated with the type of habitat to be treated.

Cumulative Effects

Cumulative effects are defined as the collective environmental impact of all past, present, and reasonably foreseeable future actions in the affected area. For this analysis the affected or assessment area is defined as the 5th Field Middle Applegate watershed. Watershed Analyses were conducted at the 5th field scale, and this is an appropriate scale for the cumulative effects analysis.

Timber Harvest

Until implementation of the NWFP began in 1994, timber harvest on both BLM and private land in the analysis area focused primarily on the harvest of large-diameter trees due to the economic benefit derived from the sale of larger trees. Since 1995 the focus on BLM-managed land in the Ashland Resource Area, has been thinning/density management in overstocked commercial-sized pole stands (8 to 11 inches DBH), large-pole stands (11 inches to 21 inches DBH), and mature timber stands (21+ inches DBH). A silvicultural goal for density management is to accelerate the development of late-successional characteristics. Exceptions to this type of harvest are on pine sites and in fuel modification zones. On pine sites, pine is retained and much of the encroaching Douglas-fir is removed. In fuel modification zones tree density is reduced to lower levels than in density management stands in order to moderate fire behavior when fires reach these areas.

On private land, timber harvest continues to focus primarily on larger diameter timber stands. In the analysis area few acres of large diameter timber remain on private land. For analysis purposes it will be assumed that all large-diameter timber stands have been removed from private land in the analysis area or will be removed in the reasonably foreseeable future.

It is estimated that in the 1950s there may have been approximately 35,500 acres of commercial sized conifer timber stands on BLM-managed land in the analysis area. Approximately 7,100 acres of commercial sized conifer stands were removed from BLM-managed land prior to 1994. This is a gross estimate based on the acres of Early, Seedling/Sapling, and Small Pole stand conditions currently present on BLM-managed land in the analysis area. The assumption is that these stand conditions developed from the regeneration harvest of commercial-sized trees. Data from the Middle Applegate Watershed Analysis were used to calculate the estimates above. There was obviously additional harvest, but this was accomplished using partial-cut prescriptions, not regeneration harvest prescriptions. It is not known how many acres were harvested using the partial-cut prescriptions in the analysis area; however, it is presumed that these stands remain in the commercial-sized timber baseline.

Since 1995 approximately 8,400 acres of BLM managed timberland in the analysis area have been treated or are under contract to be treated. As discussed above, the treatments in these projects have primarily

consisted of three types; density management, pine restoration, and fuel modification zones. The bulk of the treatment has been density management of the pole and mature stands as described above. It is not known how the acres treated or to be treated are distributed among the various stand types. Similar prescriptions are proposed for similar stands throughout the watershed in the future.

Projects have been projected through fiscal year 2008. For this analysis, 2008 is considered the "reasonably foreseeable future". Through this period it is estimated that an additional 6,800 acres of commercial-sized timber will be treated or be under contract for treatment. This estimate is based on the amount of commercial timber stands in the proposed project area and the percentage of commercial timber stands that were treated in similar projects. It is not known how this harvest will be distributed among the various stand conditions.

The discussion above indicates that approximately 22,300 acres of the commercial conifer stands on BLM-managed land in the analysis area will have been treated or under contract to be treated by the end of 2008. This represents approximately 63 percent of the commercial conifer stands on BLM managed land in the analysis area. Based on the type of harvest on BLM managed land since 1994, and that projected through 2008, it is estimated that approximately 10,600 acres could again provide a high degree of canopy closure and probably function as late-successional habitat in 10-30 years.

Commercial conifer lands (treated and untreated stands as described above) comprise approximately 73 percent of the BLM-managed lands in the Middle Applegate Watershed. Assuming this is representative of the private lands, approximately 25,000 acres (100 percent) of commercial conifer forest will have been treated on private lands by 2008. In total, approximately 47,300 acres (78 percent) of the commercial sized conifer stands in the watershed will have been treated, or under contract to be treated, by the end of 2008.

As discussed previously, the treatments adversely affect those wildlife species preferring a high degree of canopy closure, large snags, large down woody material and multilayered canopies. However, also as discussed earlier, other species benefit from the habitat conditions created by the treatments. Due to the scale of the treatments, the distribution and abundance of the many wildlife species present in the watershed obviously have changed. The overall magnitude and implications of this change are not known since many wildlife species are habitat generalists.

The species that are more closely associated with the habitat structures described above are more likely to be adversely affected, e.g., northern spotted owl. The primary focus of the NWFP is the northern spotted owl so emphasis is placed on this species. The recent Biological Opinion (Log # 1-14-03-F-511) for timber sales and other projects in the Rogue River/South Coast basins concluded that the timber sales and other projects from 2004 through 2008 are not likely to jeopardize the northern spotted owl or destroy or adversely modify critical habitat for the northern spotted owl. The environmental baseline, cumulative effects, and the effects of the proposed actions analyzed by the Service included the China-Keeler project and the Middle Applegate Watershed.

Non-Commercial Treatments

The goals of the treatments for the non-commercial lands are to reduce fire hazard and facilitate establishment of early seres in the mountain shrubland and chaparral plant community. The prescribed treatments would provide a greater abundance of early seral shrubs within the proposed project area and benefit those species preferring these habitat conditions, e.g., black-tailed deer. On the other hand, species that prefer dense, mature to over-mature shrubland conditions (e.g., wrentit) would be adversely affected by the proposed project. Prior to the advent of intensive fire suppression activities, there was a

greater abundance of early seral vegetation in the mountain shrubland/chaparral plant community as a result of natural and human-set fires.

Based on data in the Middle Applegate Watershed Analysis (1995), there is approximately 21,000 acres of oak-woodland and shrubland habitat in the watershed. Approximately 12,400 acres are on BLM-managed land, and 8,500 acres are on private land. Treatment of non-commercial (oak/woodland and shrubland) land was uncommon until implementation of the NWFP. Since 1994 it is estimated that approximately 1,500 acres of non-commercial BLM-managed lands have been treated in the Middle Applegate Watershed. It is not known how much private non-commercial land has been treated, but it is considerably less than that treated on BLM-managed land.

In the "reasonably foreseeable future"; i.e., from the present until 2008, it is estimated that approximately 4,000 acres of BLM-managed non-commercial land will be treated in the watershed. Due to the emphasis on fire hazard reduction the, the treatments on private land will increase, but probably not to the extent that will be treated on BLM-managed land. For the purpose of analysis, it is estimated that 2,000 acres will be treated on private lands.

By 2008,
BLM may have treated approximately 5,500 acres (44 percent) of the 12,400 acres on BLM-managed land. Private landowners may have treated approximately 2,500 acres (29 percent) of the 8,500 acres on private land – this assumes that approximately 500 acres have been treated to date. Overall 8,000 acres (28 percent) of the oak-woodland/shrubland habitat in the watershed could be treated by 2008.

The treatments will cause a change in the distribution and abundance of species. As discussed previously, some herbivores would benefit from the proposed treatments, and some species would be adversely affected, e.g., wrentit and blue-gray gnatcatcher. However, species richness is expected to remain unchanged in the watershed.

Alternative C - Variable Prescriptions With No New Roads

No Road Construction

Direct/Indirect/Cumulative Effects
Under Alternative C there would be no new road construction and the harvest and other treatments would change only minimally. The effects would be essentially the same as those addressed in Alternative B.

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, Clarkia heterandera, Cryptantha milobakeri, Cypripedium fasciculatum, Mimulus bolanderi,* or *Pellaea mucronata ssp. mucronata* within the confines of the China Keeler Timber Sale harvest units or the proposed fuels 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 *Tripterocladium*

leucocladulum or *Crumia latifolia* within the confines of the China Keeler Landscape Project. 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 four noxious weed species, *Centaurea solstitialis* (12 sections), *Cirsium arvense* (1 section), *Cirsium vulgare* (3 sections), and *Cytisus scoparius* (1 section) occur within the project area in open disturbed sites. Adjacent private lands in the Applegate drainage are also known to harbor many populations of noxious weeds. BLM is not authorized to survey private lands and as a consequence, the extent of these populations is currently unknown. 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.

Alternative B - Variable Prescriptions With New Road Construction

Direct, Indirect, and Cumulative Effects

Fritillaria gentneri: The three known occurrences within the following sections; T38S, R3W, SEC 16 (1 site), T38S, R3W, SEC 21 (1 site) and 38S, 3W, SEC 22 (1 site) will be buffered with a 150 ft radius buffer. This species 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 three sites in question or within its currently known range. None of the three 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 construction.. 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 18 known occurrences of the Bureau Special Status vascular plants *Camissonia graciliflora, Clarkia heterandera, Cryptantha milobakeri, Cypripedium fasciculatum, Mimulus bolanderi,* and *Pellaea mucronata ssp. mucronata*, will be buffered with a 150 ft radius buffer. The three occurrences of the Bureau Special Status nonvascular plant species *Tripterclad*ium *leucocladulum* and the two occurrences of the Bureau Special Status nonvascular plant *Crumia latifolia* 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 Alternative B, there would be no direct affect to any Bureau Special Status or Northwest Forest Plan plants.

Vascular Plant Species indirect and cumulative effects:

Camissonia graciliflora, Clarkia heterandera, Cryptantha milobakeri, Mimulus bolanderi, and Pellaea mucronata ssp. mucronata 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 timber harvest and thinning activities, would be minimal to nonexistent.

There are nine 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 reduce the possibility that this species will spread to other parts of the stand in the near future. When stand conditions develop and canopy closure become high, more favorable conditions for this species will also return.

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. The proposed road construction may also lead to an increase in noxious weeds which can out-compete the native flora for water, nutrients, and space. Any or all of these factors could lead to damage or loss of sites in the vicinity of the proposed road.

Noxious Weeds indirect and cumulative effects

The proposed road construction may increase or accelerate the spread of noxious weeds by providing additional, open, disturbed habitat for colonization and by introducing weed seeds transported in road construction materials (rock). Increased vehicular use, including road construction equipment and OHV's, may also accelerate the spread of noxious weeds by transporting seeds from one location to another. Approximately 15% of the new road construction will be in areas already identified as having a high to very high expansion probability for yellow starthistle (Chapter 3).

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.

Many of the fuels units within the project area are to be treated via mechanical means (slashbuster). The ground disturbance, reduced competition, and increased light levels associated with slashbuster treatments and logging activities significantly increase habitat suitability for noxious weed infestation. The potential for weed infestation will be minimized by the PDF's outlined in Appendix C.

Nonvascular Plant Species indirect and cumulative effects:

Tripterocladium leucocladulum is found in a range of site conditions from shady to almost total exposure on rock surfaces. 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.

Crumia latifolia is restricted to rock faces in creek beds or in the splash zone adjacent to creek beds. Existing riparian buffers will provide adequate protection for this species and as a consequence indirect and cumulative effects to this species, from the proposed action, would be minimal to nonexistent.
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 construction. Additionally, the proposed road could lead to the spread of noxious weeds.

However, it is unlikely that noxious weeds would have much of an effect on the continued persistence of any currently known *Tripterocladium leucocladulum* site as it occurs on rock outcrops. The potential effects will be minimized by the stipulation that all new road construction will be closed to public access.

Alternative C - Variable Prescriptions With No New Roads

Direct, Indirect, and Cumulative Effects

Under Alternative C there would be no new road construction and the harvest and other treatments would change only minimally. The effects would be essentially the same as those addressed in Alternative B. No new roads would lessen the potential for spread of noxious weeds to some degree.

Cultural Resources

The China Keeler 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 China Keeler project area was also resurveyed by BLM in FY02. The locations of any historic and prehistoric sites discovered, along with any artifacts found, are sensitive and are not revealed to the public.

Social Concerns

The Jackson County zoning within the planning area is predominately forest resource (77%). 19 % is zoned farm use, 3% is zoned rural residential and 1% is zoned suburban. It is expected that forest management activities will be occurring on the lands zoned forest resource.

During the implementation of the China Keeler 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 Highway 238. 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 Adaptive Management Area was established to test. Helicopter logging typically reduces the number of miles of road construction required to reach a given piece of ground.

The China Keeler project is expected to provide several small timber sale contracts along with one or more large timber sale contracts. The small sales would provide opportunities for small local companies to bid on and perform work. In addition to small timber sale contracts, fuel hazard reduction projects will allow opportunities for local forestry contractors to bid on contract work in the China Keeler project area. It is expected that the total package of proposed work on this project will take 4-8 years to complete. The forest products harvested from the project would help in part to provide some of wood products used by the local community.

Off Highway Vehicle (OHV) use is common on public lands in portions of the China Keeler analysis area. OHV use is permitted on BLM lands that are not specifically closed to this activity. Lands closed include fragile soils and riparian reserves (stream side areas). The Project Design Features (PDFs) provided in this document and project plan are put forth to balance the legitimate, allowed use of OHVs and prevent resource damage that may be associated with that use.

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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		Y **	T & E Species		Y **
ACECs		Y	Wastes, Hazardous/Solid		Y
Cultural Resources		Y	Water Quality		Y **
Farmlands, Prime/Unique		Y	Wetlands/Riparian Zones		Y **
Floodplains		Y	Wild & Scenic Rivers		Y
Nat. Amer. Rel. Concerns		Y	Wilderness		Y
Invasive, Nonnative Species		Y**	Energy Resources (EO 13212)		Y
			Environmental Justice		Y

*****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 beyond those already analyzed and disclosed by the above mentioned documents.

CHAPTER V
Public Outreach, EA Distribution, Agencies Consulted

SUMMARY OF PUBLIC INVOLVEMENT

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

2001 – 2004	Announcement of the project in the *Medford Messenger* and the Medford District BLM web page - updated quarterly. Project also known as Appleseed
January 16, 2003	"Scoping" Letter to residents and groups asking for comments and concerns about China Keeler Project
February 22, 2003	Ruch Library meeting for interested neighbors to explain about project and answer questions.
March 23, 2003	Article on China Keeler project and invitation to field trip in *China Gulch Neighborhood Newsletter.*
March 29, 2003	Field Trip to discuss project goals and examples of treatments
July, 2003	China Gulch Neighborhood Picnic to discuss China Keeler Project and answer questions.
October, 2003	Walked property boundaries with three residents adjacent to the project area to hear concerns

Upon completion of this EA, a legal notification was placed in the Medford Mail Tribune announcing a 30-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
In addition to numerous private citizens, this EA was distributed to the following agencies and organizations.

Applegate Library
Applegate Partnership & Watershed Council
Association of O&C Counties
Audubon Society
Headwaters
Jackson County Commissioners
Jackson County Soil & Water Conservation Dist.
Klamath Siskiyou Wildlands Center
Ruch Library
Northwest Environmental Defense Center
Oregon Department Forestry
Oregon Natural Resources Council
Oregon Department of Fish and Wildlife
The Pacific Rivers Council
Rogue River National Forest
Southern Oregon University
Southern Oregon Timber Industry Assoc.

TRIBES

Cow Creek Band of Umpqua Indians
Confederated Tribes of Siletz
Confederated Tribes of the Rogue-Table Rock and Associated Tribes

AGENCIES CONSULTED
U.S. Fish and Wildlife Service
NOAA Fisheries

China Keeler Landscape Project
Appendix A

Silvicultural method/Yarding systems/Fuels management

CHINA KEELER
TABLE 1
Proposed Action – Alternative B

UNIT	UNIT ACRES	SILVI. METHOD 1/	YARDING SYSTEM 2/	FUELS MGT 3/	VOLUME CUT/ACRE (range)(MBF)	VOLUME CUT/UNIT (range)(MBF)
1	10	DDF	CR/PS	HP/UB/SL	3 - 6	30 - 60
2	3	P	H	HP/UB/SL	2 - 4	6 - 12
3	14	P	H	HP/UB/SL	2 - 4	28 - 56
4	126	DDF/P	CR/PS/H	HP/UB/SL	3 - 5	378 - 630
5	136	DDF	CR/PS/H	HP/UB/SL	2 - 4	272 - 544
6	172	DDF/P	CR/PS/H	HP/UB/SL	3 - 5	516 - 860
7	49	DDF/P	CR/H	HP/UB/SL	1 - 3	49 - 147
8	28	DDF	CR/H	HP/UB/SL	2 - 4	56 - 112
9	3	P	H	HP/UB/SL	1 - 2	3 - 6
10	3	P	H	HP/UB/SL	1 - 2	3 - 6
11	5	DDF	H	HP/UB/SL	1 - 3	5 - 15
12	1	DDF	H	HP/UB/SL	1 - 3	1 - 3
13	5	P	H	HP/UB/SL	2 - 4	10 - 20
14	15	DDF	H	HP/UB/SL	3 - 6	45 - 90
15	27	DDF/P	H	HP/UB/SL	3 - 6	81 - 162
16	3	DDF	H	HP/UB/SL	2 - 4	6 - 12
17	16	DDF	H	HP/UB/SL	4 - 7	64 - 112
18	53	DDF	CR/PS/H	HP/UB/SL	5 - 8	265 - 424
19	6	DDF	PS	HP/UB/SL	5 - 8	30 - 48
20	54	DDF	PS/H	HP/UB/SL	5 - 8	270 - 432
21	25	DDF	H	HP/UB/SL	3 - 6	75 - 150
22	44	DDF/P	CR/PS	HP/UB/SL	2 - 5	88 - 220
23	23	DDF	H	HP/UB/SL	4 - 7	92 - 161
24	15	DDF	CR/H	HP/UB/SL	4 - 7	60 - 105

UNIT	UNIT ACRES	SILVI. METHOD 1/	YARDING SYSTEM 2/	FUELS MGT 3/	VOLUME CUT/ACRE (range)(MBF)	VOLUME CUT/UNIT (range)(MBF)
27	5	P	H	HP/UB/SL	3 - 5	15 - 25
28	21	DDF/P	CR/H	HP/UB/SL	4 - 7	84 - 147
29	108	DDF/P	CR/PS/H	HP/UB/SL	2 - 5	216 - 540
30	1	P	H	HP/UB/SL	2 - 5	2 - 5
31	25	DDF	PS	HP/UB/SL	3 - 6	75 - 150
32	1	MDF	H	HP/UB/SL	5 - 8	5 - 8
33	2	MDF	H	HP/UB/SL	5 - 8	10 - 16
34	3	MDF	H	HP/UB/SL	5 - 8	15 - 24
35	7	DDF	H	HP/UB/SL	5 - 8	35 - 56
36	7	MBF	H	HP/UB/SL	5 - 8	35 - 56
37	80	DDF	CR/PS	HP/UB/SL	5 - 8	400 - 640
38	271	DDF/P/ REG/Po	CR/PS/H	HP/UB/SL	3 - 6	813 - 1626
39	6	DDF	H	HP/UB/SL	1 - 3	6 - 18
40	9	DDF	H	HP/UB/SL	2 - 5	18 - 45
41	22	DDF/P	H	HP/UB/SL	2 - 5	44 - 110
42	16	DDF/P	H	HP/UB/SL	2 - 5	32 - 80
43	48	DDF/MDF	CR/PS/H	HP/UB/SL	3 - 6	144 - 288
44	96	DDF	CR/PS/H	HP/UB/SL	2 - 5	192 - 480
45	3	MDF	PS	HP/UB/SL	3 - 6	9 - 18
46	1	MDF	PS	HP/UB/SL	3 - 6	3 - 6
47	7	DDF	H	HP/UB/SL	3 - 6	21 - 42
48	71	DDF/P	H	HP/UB/SL	2 - 5	142 - 355
49	6	Po	H	HP/UB/SL	4 - 7	24 - 42
50	2	DDF	H	HP/UB/SL	2 - 4	4 - 8
51	44	DDF/MDF	PS/H	HP/UB/SL	3 - 6	132 - 264

UNIT	UNIT ACRES	SILVI. METHOD 1/	YARDING SYSTEM 2/	FUELS MGT 3/	VOLUME CUT/ACRE (range)(MBF)	VOLUME CUT/UNIT (range)(MBF)
52	6	M	H	HP/UB/SL	3 - 6	18 - 36
53	19	M	PS/H	HP/UB/SL	5 - 8	95 - 152
54	9	DDF	PS	HP/UB/SL	4 - 7	36 - 63
55	151	DDF/M	CR/PS/H	HP/UB/SL	3 - 6	453 - 906
56	3	M	H	HP/UB/SL	3 - 6	9 - 18
57	11	M	CR/PS	HP/UB/SL	3 - 6	33 - 66
58	18	MDF	PS/H	HP/UB/SL	3 - 6	54 -108
59	31	MDF/M	PS/H	HP/UB/SL	4 - 7	124 - 217
60	2	MDF	H	HP/UB/SL	4 - 7	8 - 14
61	5	DDF	PS	HP/UB/SL	2 - 4	10 - 20
62	30	MDF	CR/PS	HP/UB/SL	3 - 6	90 - 180
63	82	DDF/MDF	CR/PS/H	HP/UB/SL	2 - 5	164 - 410
64	13	MDF	H	HP/UB/SL	3 - 6	39 - 78
65	9	M	H	HP/UB/SL	1 - 3	9 - 27
66	8	DDF	CR/PS	HP/UB/SL	3 - 6	24 - 48
67	24	DDF/P	CR/H	HP/UB/SL	3 - 6	72 - 144
69	11	M	PS	HP/UB/SL	3 - 6	33 - 66
70	3	DDF	CR	HP/UB/SL	5 - 8	15 - 24
71	29	DDF/REG/ M	PS/H	HP/UB/SL	2 - 5	58 - 145
	2162					6253 - 12158

1/Silvicultural Methods:
DDF = Dry Douglas-fir;
MDF = Moist Douglas-fir; P = pine;
M = Mistletoe;
REG = Douglas-fir Regeneration Cut
Po=Douglas-fir poles

2/Yarding Systems:
CR = Crawler (195 ac.)
PS = Cable (992 ac.)
H = Helicopter (975 ac.)
SL = Slashing

3/Fuels Management:
HP = Handpile& burn
UB = Underburn
;

CHINA KEELER
TABLE 1
No New Road Construction Alternative C

UNIT	UNIT ACRES	SILVI. METHOD 1/	YARDING SYSTEM 2/	FUELS MGT 3/	VOLUME CUT/ACRE (range)(MBF)	VOLUME CUT/UNIT (range)(MBF)
1	10	DDF	CR/H	HP/UB/SL	3 - 6	30 - 60
4	126	DDF/P	CR/H	HP/UB/SL	3 - 5	378 - 630
5	136	DDF	CR/PS/H	HP/UB/SL	2 - 4	272 - 544
6	172	DDF/P	H	HP/UB/SL	3 - 5	516 - 860
7	49	DDF/P	CR/H	HP/UB/SL	1 - 3	49 - 147
8	28	DDF	CR/H	HP/UB/SL	2 - 4	56 - 112
9	3	P	H	HP/UB/SL	1 - 2	3 - 6
10	3	P	H	HP/UB/SL	1 - 2	3 - 6
11	5	DDF	H	HP/UB/SL	1 - 3	5 - 15
12	1	DDF	H	HP/UB/SL	1 - 3	1 - 3
13	5	P	H	HP/UB/SL	2 - 4	10 - 20
14	15	DDF	H	HP/UB/SL	3 - 6	45 - 90
15	27	DDF/P	H	HP/UB/SL	3 - 6	81 - 162
16	3	DDF	H	HP/UB/SL	2 - 4	6 - 12
17	16	DDF	H	HP/UB/SL	4 - 7	64 - 112
18	53	DDF	H	HP/UB/SL	5 - 8	265 - 424
19	6	DDF	H	HP/UB/SL	5 - 8	30 - 48
20	54	DDF	H	HP/UB/SL	5 - 8	270 - 432
21	25	DDF	H	HP/UB/SL	3 - 6	75 - 150
22	44	DDF/P	CR/PS	HP/UB/SL	2 - 5	88 - 220
23	23	DDF	H	HP/UB/SL	4 - 7	92 - 161
24	15	DDF	CR/H	HP/UB/SL	4 - 7	60 - 105
27	5	P	H	HP/UB/SL	3 - 5	15 - 25
28	21	DDF/P	CR/H	HP/UB/SL	4 - 7	84 - 147

UNIT	UNIT ACRES	SILVI. METHOD 1/	YARDING SYSTEM 2/	FUELS MGT 3/	VOLUME CUT/ACRE (range)(MBF)	VOLUME CUT/UNIT (range)(MBF)
29	108	DDF/P	CR/PS/H	HP/UB/SL	2 - 5	216 - 540
30	1	P	H	HP/UB/SL	2 - 5	2 - 5
31	25	DDF	H	HP/UB/SL	3 - 6	75 - 150
32	1	MDF	H	HP/UB/SL	5 - 8	5 - 8
33	2	MDF	H	HP/UB/SL	5 - 8	10 - 16
34	3	MDF	H	HP/UB/SL	5 - 8	15 - 24
35	7	DDF	H	HP/UB/SL	5 - 8	35 - 56
36	7	MBF	H	HP/UB/SL	5 - 8	35 - 56
37	80	DDF	PS/H	HP/UB/SL	5 - 8	400 - 640
38	271	DDF/P/ REG/Po	CR/PS/H	HP/UB/SL	3 - 6	813 - 1626
39	6	DDF	H	HP/UB/SL	1 - 3	6 - 18
40	9	DDF	H	HP/UB/SL	2 - 5	18 - 45
41	22	DDF/P	H	HP/UB/SL	2 - 5	44 - 110
42	16	DDF/P	H	HP/UB/SL	2 - 5	32 - 80
43	48	DDF/MDF	CR/PS/H	HP/UB/SL	3 - 6	144 - 288
44	96	DDF	CR/PS/H	HP/UB/SL	2 - 5	192 - 480
45	3	MDF	PS	HP/UB/SL	3 - 6	9 - 18
46	1	MDF	PS	HP/UB/SL	3 - 6	3 - 6
47	7	DDF	H	HP/UB/SL	3 - 6	21 - 42
48	71	DDF/P	H	HP/UB/SL	2 - 5	142 - 355
49	6	Po	H	HP/UB/SL	4 - 7	24 - 42
50	2	DDF	H	HP/UB/SL	2 - 4	4 - 8
51	44	DDF/MDF	PS/H	HP/UB/SL	3 - 6	132 - 264
52	6	M	H	HP/UB/SL	3 - 6	18 - 36
53	19	M	PS/H	HP/UB/SL	5 - 8	95 - 152

UNIT	UNIT ACRES	SILVI. METHOD 1/	YARDING SYSTEM 2/	FUELS MGT 3/	VOLUME CUT/ACRE (range)(MBF)	VOLUME CUT/UNIT (range)(MBF)
54	9	DDF	PS	HP/UB/SL	4 - 7	36 - 63
55	151	DDF/M	CR/PS/H	HP/UB/SL	3 - 6	453 - 906
56	3	M	H	HP/UB/SL	3 - 6	9 - 18
57	11	M	CR/PS	HP/UB/SL	3 - 6	33 - 66
58	18	MDF	PS/H	HP/UB/SL	3 - 6	54 -108
59	31	MDF/M	PS/H	HP/UB/SL	4 - 7	124 - 217
60	2	MDF	H	HP/UB/SL	4 - 7	8 - 14
61	5	DDF	PS	HP/UB/SL	2 - 4	10 - 20
62	30	MDF	CR/PS	HP/UB/SL	3 - 6	90 - 180
63	82	DDF/MDF	CR/PS/H	HP/UB/SL	2 - 5	164 - 410
64	13	MDF	H	HP/UB/SL	3 - 6	39 - 78
65	9	M	H	HP/UB/SL	1 - 3	9 - 27
66	8	DDF	CR/PS	HP/UB/SL	3 - 6	24 - 48
67	24	DDF/P	CR/H	HP/UB/SL	3 - 6	72 - 144
69	11	M	PS	HP/UB/SL	3 - 6	33 - 66
70	3	DDF	CR	HP/UB/SL	5 - 8	15 - 24
71	29	DDF/REG/ M	PS/H	HP/UB/SL	2 - 5	58 - 145
	2145					6219 - 12090

1/Silvicultural Methods:
DDF = Dry Douglas-fir;
MDF = Moist Douglas-fir; P = pine;
M = Mistletoe;
REG = Douglas-fir Regeneration Cut
P = pine;
Po=Douglas-fir poles

2/Yarding Systems:
CR = Crawler (172 ac.)
PS = Cable (664 ac.)
H = Helicopter (1309 ac.)

3/Fuels Management:
HP = Handpile, cover, and burn;
UB = Underburn;
SL = Slashing

China Keeler Landscape Project
Appendix B

SILVICULTURAL PRESCRIPTION
(FY - 2004)

SILVICULTURAL PRESCRIPTION
CHINA KEELER PROJECT TIMBER SALE (FY- 2004)

TABLE OF CONTENTS

FIGURES AND TABLES

Silvicultural Prescription
China Keeler Project Timber Sale
(FY- 2004)

I. Management Direction and Objectives

The prescribed vegetation treatments in this document are designed to comply with both the Medford District Approved Resource Management Plan (RMP) (USDOI, 1994) and the Record of Decision (ROD) within the Final Supplemental Environmental Impact Statement (FEIS - the President's "Forest Plan for a Sustainable Economy and Environment") on Management of Habitat of Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA, 1994). This prescription also complies with the April 1994 interagency ROD and Standards and Guidelines for the Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA, USDOI, 1994), the Western Oregon Program-Management of Competing Vegetation Record of Decision (ROD)(USDOI, 1989), and the Middle Applegate Watershed Analysis (USDA, 1995).

The Ashland Resource Area ID team and area manager developed and considered certain objectives for this silvicultural prescription. The objectives are as follows:

A. Reduce the density of all vegetation condition classes across the landscape to improve vegetation vigor and reduce the fire hazard while creating desired vegetation structural characteristics.

B. Maintain and restore natural functions and processes necessary for the stability of ecosystem health and productivity.

C. For the commercial forest stands, create stands with trees of varying size and age (diverse stand structure), and with various seral patterns across the landscape to promote mature/old-growth stand characteristics.

D. Manage mature/old-growth timber stands to maintain their existence, structure, and function.

E. Increase the species composition of pine species and incense cedar into forest stands where appropriate (these species are more fire and drought tolerant than Douglas-fir or true fir).

F. Create a favorable microenvironment for the natural establishment of seedlings (especially pine species and incense cedar) by providing adequate available growing space and woody material of various size classes.

G. Reduce timber stand basal area to increase individual tree vigor, growth, and

quality.

H. Minimize impacts to the northern spotted owl and other sensitive species and their habitat.

I. Maintain stream condition and stability in effected watersheds by maintaining appropriate stream buffers, by leaving trees in nonbuffered draw bottoms, and by avoiding slumps or slide areas.

J. Maintain the stability and productivity of the soils in the sale area.

K. Maintain the integrity and functions of oak woodlands and shrublands and increase early seral stages of vegetation within.

L. Minimize the negative affects of vegetation competing with conifer establishment and growth.

II. Site/Stand Description

A. General Description of the Site

1. Legal Description

The China Keeler landscape design project area is comprised of 4 full and 26 partial sections within Townships 38 and 39 South, Ranges 3 and 4 West of the Willamette Meridian. The project area is approximately 5 miles southwest of Medford, Oregon and is in the Chapman Creek, China Gulch, and Keeler Creek subwatersheds within the Middle Applegate Watershed. The project area is located within the north central edge of the Applegate Adaptive Management Area.

2. Drainage/Watershed

The three major drainage areas (Chapman Creek, China Gulch, and Keeler Creek) and small frontal drainage sites within the project area are delineated by a series of inter-connecting ridges. The Applegate River runs through the center and divides the north from the south half of the project area.

B. Abiotic Conditions

1. Soil Type

Tree height growth and the quantity of wood grown on any site is determined by the soil characteristics and properties. The characteristics and properties of soils are determined by physical and chemical processes that result from the interaction of five factors: climate, plants and animals, parent material, topography, and time. Parent material, climate, and topography account for most of the differences among soils in our area.

During the Paleozoic and Triassic periods, sediment and limestone forming-material was deposited on the floor of an inland sea. This sediment was metamorphosed, folded and faulted, then uplifted which created the mountains. During the Jurassic and mid-Cretaceous periods, granitic material was intruded into the overlying rock. Minor intrusions of ultramafic rock (peridotite and serpentine) also occurred earlier in the Triassic period. Because of the intense geologic deformation of the Klamath Mountains, the metamorphic rock structures have been weakened. Mountains at high angles have been further weakened by faulting and shearing. Steep, unstable topography, in conjunction with intense weathering and time, has resulted in the formation of Typic Xerochrepts (Caris series). Soils formed in material derived from ultramafic rock are Mollic Haploxeralfs (Vannoy series).

The most common upland soils series in the project area include Vannoy, Voorhies, Caris, Offenbacher, Tallowbox, Manita and Ruch. The Caris (Typic Xerochrepts - soils formed in a dry climate with thin or light colored surface horizons and little organic matter) /Offenbacher series is widespread and commonly occurs on steep to very steep slopes (50 to 80%). Both soils are well drained colluvium. Typically the soils range from 20 to 40 inches in depth and overlay fractured metamorphised volcanic bedrock. Caris contains a dark brown gravelly loam over dark, very gravelly clay loam subsoil. Offenbacher has a grayish brown gravelly loam over reddish brown loam subsoil. Both soils are stable and permeable (.6 to 2.0 inches/hour). The available water capacity ranges from .03 to .19 inches/inch of soil and the site index ranges from 65 to 75 depending upon the aspect (Douglas-fir 50-year base).

Vannoy (Mollic Haploxeralfs - thick, dark colored, high base saturation, and strong structure, formed in a warm and continuously dry summer for long periods, moist in winter but with a minimum horizon), another widespread series, developed on moderate to steep slopes from metamorphic material. It is well drained and ranges from 20 to 40 inches in depth. Vannoy has a dark brown silt loam surface over yellowish red clay loam subsoil. Permeability is only moderate due to the dense subsoil (B horizon; .2 to .6 inches/hour). Surface protection is warranted due to the slow infiltration rate. The available water capacity ranges from .12 to .20 inches/inch of soil and the Douglas-fir site index ranges from 75 to 80 depending upon the aspect (50-year base).

The Vannoy-Voorhies complex occurs in approximately 18% of the Middle Applegate Watershed. The Voorhies series has a dark brown gravelly loam over brown gravelly clay loam subsoil. Permeability ranges from .6 to 2.0 inches/hour. The available water capacity ranges from .07 to .12 inches/inch of soil and the Douglas-fir site index ranges from 65 to 75 (50-year

base).

The Tallowbox series is a moderately deep, somewhat excessively drained soil found on hillslopes and ridges. It formed in colluvium derived from granitic rock. The slope ranges from 30 to 80%. The surface layer is dark brown gravelly sandy loam about 6 inches thick. The upper 6 inches of the subsoil is dark brown sandy loam. The lower 11 inches is brown gravelly sandy loam. Weathered bedrock is at a depth of 23 inches. Permeability is moderately rapid and ranges from 2.0 to 6.0 inches/hour. Available water capacity is about .07 to .1 inches/inch of soil. The site index for Douglas-fir ranges from 70 to 90 (50-year base).

The Manita series is a deep, well drained soil found on alluvial fans and hillslopes. It formed in alluvium and colluvium derived from metamorphic rock. Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is about 50 inches thick. Weathered bedrock is found at a depth of about 58 inches. Permeability ranges from .6 to 2.0 inches/hour. The available water capacity ranges from .13 to .18 inches/inch of soil and the site index for Douglas-fir is 75 (50-year base).

The Ruch series is another very deep, well drained soil found on alluvial fans and foot slopes. It formed in alluvium derived from metamorphic rock. Typically, the surface layer is dark brown gravelly silt loam about 7 inches thick. The subsoil is about 63 inches deep and the upper horizon is reddish brown in color. Bedrock is found at about 70 inches. Permeability ranges from .6 to 2.0 inches/hour. The available water capacity ranges from .13 to .17 inches/inch of soil and the site index for Douglas-fir is 70 (50-year base).

2. Geomorphology/Topography/Elevation/Aspect

The project design area lies within the Klamath Mountains physiographic province. Widespread great soil groups in the province include Haplohumults and Haploxerults. Less abundant great groups include Haplumbrepts, Haploxeralfs (Vannoy series), Xerochrepts (Caris series), Dystrochrepts, Hapludalfs, Haploxerolls, and Chromoxererts.

The lower mountain slopes, adjacent to and above the stream terrace, are highly dissected with gentle to moderate slopes, 2% to 45%. The lower soils formed in alluvium and colluvium. The upper slopes are moderately dissected and very steep, 46% to 80% slopes. The upland soils developed in colluvium derived dominantly from metamorphic rock. Elevations range from 5,023 feet at Tallowbox Mt. to approximately 1,380 feet above sealevel near the town of Ruch.

3. Precipitation/Snowfall/Temperature Extremes

The Applegate Valley is one of the driest areas west of the Cascade Mountains. Average annual precipitation in the Middle Applegate Watershed ranges from 24.67 inches near Applegate (30 year average) to 60 inches at Humpy Mountain. Tallowbox Mountain receives approximately 40 inches of precipitation annually. Precipitation usually occurs in the form of rainfall except in the transient snow zone (elevation level between 3,500 and 5,000 feet) where a mixture of snow and

rain occurs. Sixty-eight percent of the yearly precipitation falls during November through March.

Buncom, OR (a town at the south end of the Buncom/Sterling Creek Watershed) has experienced below normal precipitation during nine of the last ten years (based on the 3-year cumulative surplus/deficit records). During three of the nine years deficits were below normal by more than 50%. Extrapolations from Williams, OR rainfall data show that the 3-year, 5-year, and 10-year cumulative precipitation surplus/deficits for 1995 at Buncom are +2 inches, -8 inches, and -23 inches respectively.

Summer temperatures are predominantly hot and dry and accompanied by low humidity of the Mediterranean-type climate. The maximum mean temperature at Ruch, OR averaged 89° F during July and August in 1961-1996.

Prevailing winds during the summer are from the north or northwest and are usually light. Summer thunderstorms can have winds in excess of 50 mph from any direction, but most of the storms enter the area from the south or southwest.

C. Biotic Conditions

1. Tree Series/Plant Associations

There are three tree series in the China Keeler project area: Douglas-fir, ponderosa pine, and white oak. Plant association descriptions within these series can be found in Preliminary Plant Associations of the Siskiyou Mountain Province (Atzet and Wheeler, 1984) and Field Guide to the Forested Plant Associations of Southwestern Oregon (Atzet et.al., 1996; see Table 1).

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), PSME-ABCO(white fir)-HODI(Creambrush oceanspray), and PSME/BENE (dwarf Oregongrape).

Table 1. Tree Series/Plant Associations Common to the China Keeler Project Area.

Douglas-fir Series/Plant Associations	**Ponderosa Pine Series/Plant Associations**	**White Oak Series/Plant Associations**

Douglas-fir Series/Plant Associations	Ponderosa Pine Series/Plant Associations	White Oak Series/Plant Associations
PSME (Douglas-fir)/BENE (dwarf Oregon grape)	PIPO (Ponderosa pine)-PSME (Douglas-fir)	QUGA (Oregon white oak)/CYEC (Hedgehog dogtail)
PSME/RHDI (Poison oak)-BEPI (Piper's Oregongrape)	PIPO -QUKE (California black oak)	QUGA-PSME/RHDI
PSME/RHDI		
PSME/CECU (Wedgeleaf ceanothus)		
PSME-PIPO (Ponderosa pine)		
PSME-ABCO (White fir)		
PSME/Depauperate		
PSME/ABCO-HODI (Creambrush oceanspray)		
PSME-QUGA (Oregon white oak)/RHDI		

2. Stand History

From 1350 A.D. through the mid-nineteenth century the landscape pattern had a high degree of variation in vegetation condition class, structure, arrangement and composition of plant species. Natural disturbance such as lightning fires, windstorms and drought contributed to the variation. After pioneer settlement, the density of endemic tree and shrub species was reduced as a result of anthropogenic disturbances (human-caused fires for land clearing, hunting, mining, grazing, protection and food; mining, logging, and other factors related to urbanization). Due to the frequent disturbance regime, historic forest lands were generally more open, had fewer trees per acre, trees of larger diameter, and a different species composition. These stands generally had more large diameter ponderosa pine, oak species, incense cedar, and native grasses. Only in the moist micro sites where Douglas-fir is better adapted did it reach the climax stage, but only in small patches. Disturbances were probably as frequent as every 1 to 25 years (Agee, 1993). The historic fire regime was low severity frequent fire. In the project area, many of the commercial forest stands originated between 1864 and 1900 following 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 the last fires were forest-

replacing in nature, individual timber stands tend to be fine grained. This means that there are many trees of the same age class and almost equal in height with few older trees scattered throughout the stand. The majority of the trees in the project area are between 80 and 130 years old or younger, however, there are 130 to 170 year old trees in fewer numbers. The oldest trees found were 302 and 345 years old. The age classes greater than 170 years are the least frequently found.

3. Structure Description

The next level of dichotomy from tree series/plant associations is vegetation condition class. The Medford District Watershed Analysis Committee (1994) has designated the following classes: Grass, Forbs, Herbaceous; Shrubs, Non-forest Land; Hardwood/Woodland; Early (0 to 5 years) and Seedlings/Saplings (0 to 4.9 inches DBH); Poles (5 to 11 inches DBH); Mid (11 to 21 inches DBH); and Mature/Old-growth (21 inches + DBH). The following is a description of the stand development and structure of each vegetation condition class:

a. Grass, Forbs, Herbaceous

During the nineteenth century the area of open grassland was also more extensive because of frequent disturbance. Since that time the ecological processes of relay and initial floristics have occurred and areas that may have been grasslands have given way to shrubs and tree species. There are 40 acres of grassland in the project area. The grasslands near Wellington Butte, Squires Peak and Old Blue Mountain are limited to areas with severe environmental conditions such as south to west aspects with shallow, rocky soils. Mixtures of grasses, shrubs, and multi-layered tree stands can occur here. Common grasses include California fescue, blue wildrye, and hedgehog dogtail.

Common herbs in moist areas include western twinflower, woods strawberry, Oregon fairybell, star flower, pathfinder, catchweed bedstraw, rattlesnake plantain, miner's lettuce, wild ginger, columbine, trillium, starry false solomon's seal, and bleeding heart. In the dry Douglas-fir and pine sites, hairy honeysuckle, lupine, Pacific hound's tongue, thicket milk-vetch, common yarrow, and hedge parsley are the common herbs.

b. Shrubs/Non-forest Land

The shrublands (626 acres) have been influenced by a lack of fire disturbance. As a result, extremely dense stands of shrubs and tree species are common. Most of the shrublands are heterogeneous in species composition, arrangement of species, and structure. The vegetation tends to be late seral with a lack of early seral stages.

Whiteleaf manzanita is the most abundant species and is tree-like in form. Scattered throughout the manzanita patches are clumps of wedgeleaf ceanothus, deerbrush ceanothus, poison oak, mountain mahogany, hardwood trees, and various size classes of conifer species. Conifer tree species migrate into the shrublands during wet climatic cycles but retreat when harsh climatic

conditions occur. Five layers of vegetation are possible. Other dry land shrubs include Piper's Oregongrape and silk tassel. Moist microenvironment shrubs, most frequently found on northerly aspects, include snowberry, California hazel, creambrush oceanspray, dwarf Oregongrape, serviceberry, Indian plum, thimbleberry, black raspberry, trailing blackberry, ribes species, vine maple, and Pacific yew.

c. Hardwood/Woodland

Oak woodlands (1,037 acres) are the lower elevation limit for forest vegetation and are transitional to savanna and grasslands. Oregon white oak occupies sites where available soil moisture is between that supporting grass or ponderosa pine and the greater amount required to support Douglas-fir. The floristic composition and structure of the woodlands have also been disturbed by fire suppression, livestock grazing, the introduction of exotic species, and firewood harvest. Common plant associations include QUGA/CYEC (hedgehog dogtail) and QUGA-PSME/RHDI. Other plant species common to the associations include Pacific madrone, California black oak, ponderosa pine, whiteleaf manzanita, wedgeleaf and deerbrush ceanothus, poison oak, snowberry, hairy honeysuckle, woodland strawberry, wild carrot, and *Torilis arvensis*.

The oak woodlands commonly have 3 to 4 layers of vegetation; the mature oaks, dominate ponderosa pine or Douglas-fir, grass, and the fourth layer sometimes being conifer or oak regeneration. When shrubs are present, the stands can have 5 or more layers of vegetation. It is common for whiteleaf manzanita to be tree-like in form.

d. Early (0 to 5 years) and Seedlings/Saplings (0 to 4.9 inches DBH).

These two condition classes are grouped together because both classes are usually tree plantations established after logging. The predominant species in the plantations are Douglas-fir or ponderosa pine. Douglas-fir is planted on cool, moist sites with northwest to northeast aspects. Ponderosa pine and incense cedar are planted on low elevation sites and on areas with hot, dry aspects (northwest, west, southwest, south, and southeast aspects). Many plantations are a mixture of species including hardwoods, with Pacific madrone being the most abundant. If residual conifer trees from the previous stand were left standing, as many as 4 layers of vegetation can exist: newly planted seedlings, hardwood sprouts overtopping the planted seedlings, residual saplings to poles, and residual overstory trees. Most often just two layers are present, the seedlings and overtopping hardwoods. There are 409 acres of plantations in the project area and these plantations are in the stand initiation stage of development. This is simply the time period after a disturbance in which new individual plants and species continue to appear.

e. Poles (5 to 11 inches DBH)

There are 435 acres of pole size trees in the project area and most of these stands are under 100 years of age and very suppressed in regard to diameter growth. These stands originated after

fires or logging activity. Some pole size trees may be found on ridge tops or on poor sites and are over 100 years of age. There is a wide range of stand densities and it is common to find stands with over 1,000 trees per acre. In some stands, crown ratios (length of tree crown divided by total tree height) are less than 30% and released trees would probably not respond to thinning. Trees of the smallest diameter classes have stem diameters less than one percent of the total tree height (tall and skinny appearance) subjecting these trees to snow, ice, and wind damage. Healthy pole stands will often be found on northerly aspects, are in the stem exclusion stage (the time period when new plants do not appear and some of the existing ones die) and are predominantly single layered. Sometimes older residual overstory trees are scattered throughout the pole stands and no understory vegetation is usually present except for scattered forbs.

f. Mid (11 to 21 inch DBH)

The majority of the commercial timber stands in the project area, 2,790 acres, are in the mid-condition class. Douglas-fir and ponderosa pine dominate the stands, with small amounts of sugar pine, incense cedar and white fir in the overstory. Pacific madrone and California black oak are often found in the understory. These stands became established over a 10 to 30 year period following a disturbance and most of the stands are now between 75 and 115 years of age. Many of these stands are beginning to enter the understory reinitiation stage (later when a disturbance creates an opening in the forest canopy layer, forest floor herbs, shrubs, and trees again appear and survive in the understory). As mortality from wind damage, bark beetles, and pathogens create small openings in the crown canopy of the trees, regeneration begins to occur in the cleared area below. Although single story stands do exist, two to three canopy layers are present in most of the stands and four layers are present when old-growth trees are found in the overstory. Commonly found in these stands are suppressed and intermediate crown class conifers, suppressed hardwood trees, dominant and codominant crown class conifers, and old-growth trees. Douglas-fir dwarf mistletoe occurs in stands throughout the project area. This pathogen reduces vigor and makes the trees susceptible to bark beetles and other pathogens. Although many of the heavily infested trees are still alive at this time, small patches of 100% mortality can be found and future mortality will probably increase. Douglas-fir that invaded the dry pine sites are experiencing moisture stress and are also being killed by Douglas-fir bark beetle. Pine series stands have experienced high levels of tree mortality due to stress caused by the competition from Douglas-fir trees and subsequent attacks by the western pine beetle.

g. Mature/Old-growth (21 inches + DBH)

In the project area, small timber stands in this condition class are usually found in cool, moist microenvironments at higher elevations. Most of these stands are south of the Applegate River. The oldest trees are found along streams and in topographic areas with favorable north to east aspects where protected from fire. According to stand inventory data, there are 2,293 acres of large sawlogs stands (21 inches DBH+) in the sale area. Most of these stands are in the mature seral stage with multiple canopy layers. Dominant crown class trees 300 years of age and younger, large diameter and large diameter limbed trees are present with a variety of other age class trees beneath (vertical structure, multi-cohort stand). A minimum of 4 canopy layers are

present. Many of the mature stands in the project area have been infected by Douglas-fir dwarf mistletoe. In these stands, where many of the trees have a dwarf mistletoe rating (DMR) of 5 or 6 (see page 24a for an explanatory diagram), mortality is beginning to create openings in the canopy.

The ROD and RMP define the mature seral stage as the point when stand growth slows to the time when the forest develops structural diversity; approximately age 80 to 200. Old-growth is defined as the stage which constitutes the potential plant community capable of existing on a site given the frequency of natural disturbance events. This stage exists from approximately age 200 until stand replacement occurs and secondary succession begins again. For purposes of inventory, old-growth stands on BLM-administered lands are identified if they are at least 10% stocked with trees of 200 years or older and are 10 acres or more in size. For purposes of habitat or biological diversity, the BLM uses the appropriate minimum and average definitions as provided by PNW publications 447 (USDA, 1986) and GTR-285 (Franklin, 1981). GTR-285 states that the size of old-growth units should be at least 300 acres in size to function as old-growth forests, and that the working definition emphasizes structural and compositional characteristics rather than the conceptually important functional features that are difficult to measure (objective C, page 4).

The landscape pattern of the project area can be considered "coarse-grained" because of varying topography, aspect, elevational differences, soils and the respective effects on vegetation. Natural disturbances processes and timber harvesting patterns along with the highly dissected topography also influence the structure of the vegetation. However, at the stand level, the landscape pattern can be considered more fine-grained when compared to historic stands for all vegetation condition classes.

Subtle changes in species composition and stand structure are occurring over the landscape. Many trees with old-growth characteristics are dying as a result of increased competition with second growth trees for limited resources . Mortality is also occurring in mid to mature vegetation classes due to heavy Douglas-fir dwarf mistletoe infection. Douglas-fir, the climax species for the majority of the forested area, is replacing ponderosa pine, sugar pine and incense cedar because of its more shade-tolerant nature. In some areas white fir is migrating to lower elevations and encroaching upon the Douglas-fir tree series. Douglas-fir is also encroaching upon the edges of the oak woodlands, although mortality of Douglas-fir along these edges has been noticeable during the last few years. Whiteleaf manzanita and ceanothus species are migrating into the oak woodlands and replacing the oaks, pines, and native grass species. In the mid-size vegetation condition class, suppressed shrubs and hardwood trees beneath the dominant tree canopy layer are dying. To some degree 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 trend also indicates that whiteleaf manzanita is probably the species that will pioneer the site following future disturbance. Other shrub species dying out of the conifer stands include deerbrush and wedgeleaf ceanothus, creambrush oceanspray, and serviceberry.

It must be recognized that we are observing the landscape vegetation of today at one single point in time. Although current vegetation stem densities are high and are mostly in the late seral stage, the vegetation condition classes of today are atypical when compared to historic vegetation. This is due primarily to the effects of fire suppression on the landscape. It must also be recognized that with or without silvicultural management, the vegetation will be changing continuously because of natural succession. There is no single state of a forest that is the only natural state. The recommended prescriptions in this document will be cultivating late-successional characteristics such as variable stand structure and more vigorous growth within the stands. Ten to forty years from now most of the mature stands will be composed of trees larger than 20 inches DBH, although even-aged, mid size stands without residual old-growth trees may still require an additional 150 years to develop mature/old-growth characteristics.

4. Coarse Woody Debris

Many ecological processes have created the even and uneven-aged forest stand structure over the last century. These same processes are responsible for the variable amounts of coarse woody material (CWM) across the landscape. The Guidelines for Snag and Down Wood Prescriptions in Southwestern Oregon (White 2001) states that amounts of coarse woody material across landscapes are highly variable and should vary over time with stand development. Amounts of CWM are influenced by forest stand history, soils and respective plant associations, climate, and topography. A Memorandum of Understanding was signed on January 19, 2001 with the Provincial Interagency Executive Committee (PIEC) to implement the guidelines on a trial basis in southwest Oregon for 5 years.

Historically, much of the project area was very open with few old conifer trees per acre. Only on northerly aspects with moist environments were uniform forest stands found. The forests of today originated from the late 1800 and early 1900 fires and fire suppression. As a result of fire suppression the present day forests are now overstocked. Tree vigor began to decline as early as 1900. The overstocked stands along with the drought conditions of the 1980's through 1995 have allowed for extensive tree mortality. Severe drought in 2001 and a dry 2002 in combination with forest overstocking also caused a decline in tree vigor. Trees mainly over 100 years of age, but younger trees also, are dying because of decreasing tree vigor. In many places there may be more snags today than in historic times.

Bark beetles have killed large diameter pine and Douglas-fir trees when stressed for water in forest stands where tree stocking levels have been high. There have been patches of Douglas-fir mortality adjacent to oak woodlands and shrublands. Wind also blows down an occasional tree, or small groups of trees, when the shallow soil profile becomes saturated with water. In the dry Douglas-fir prescription areas, overstocked stands have been subject to small scale bark beetle attack and suppression tree mortality in the understory. On moist Douglas-fir sites, tree mortality has occurred because of wind and Douglas-fir dwarf mistletoe. Where Douglas-fir dwarf mistletoe is abundant, tree mortality results on a larger scale. Patches of mature Douglas-fir that have been killed by dwarf mistletoe create canopy gaps as large as 2-acres. These pockets of mortality are scattered across the landscape. Dwarf mistletoe reduces tree vigor and

bark beetles can be a secondary cause of mortality. Most of the tree mortality has occurred in the pine tree series and dry Douglas-fir sites where stands are overstocked.

Approximately eight-thousand nine-hundred feet (1.68 miles) of woody material transects were sampled in all of the prescription types across the Applegate Valley landscape. The average amount of coarse woody material is 8.3 tons per acre (decay classes 1 through 5; 5-inch intercept minimum; 8-foot length minimum). This may well reflect average conditions for mature seral stands on harsh sites. The coarse woody material large end stem diameters ranges from 3 to 31 inches and averaged 841 feet per acre for all decay and diameter classes. Coarse woody material was most often found to be in decomposition classes 3 and 4. Tons per acre of CWM ranges from 1.9 to 29.7. As a general rule, the amount of CWM increases with stand age. According to White's data (2001), the Douglas-fir - Poisonoak plant association group (PAG) has an average of 8.9 tons per acre and the Douglas-fir - Oak - Poisonoak PAG has an average of 12.4 tons per acre. These PAGs are most common in the lower elevations of the Applegate Valley. In addition to CWM on the ground, the average number of live damaged (trees with physical defects and pathogens) trees per acre is 40, and ranges from 0 in some young pole stands to 152 damaged trees per acre in older, mature forest stands. The average number of snags (3 inch DBH trees and larger) per acre is 54 and ranges from 0 to 227 (2.9 to 27.6 inches DBH).

The present amounts of CWM fall within the ranges discussed in White's (2001) publication for respective plant association groups (PAG).

D. Insects, Disease, Forest Health

Douglas-fir dwarf mistletoe (*Arceuthobium douglasii*) is a significant pathogen throughout the project area with approximately 132 acres infected to some degree. The most heavily infected trees are found in the mature and mid vegetation classes but the smaller diameter classes are also becoming infected. Infections are usually systemic and form massive globose brooms. Heavy infections result in growth loss, wood quality reduction, top-killing and mortality. Although the spread of the infection is slow, as the trees lose vigor from the mistletoe infection the susceptibility to attack from insects and pathogens increases. Mortality is evident in all infected stands.

Bark beetle infestations are prevalent in the project area. Western pine beetles (*Dendroctonus brevicomis*) are attacking the pines while flatheaded fir borers (*Melanophila drummondi*) and Douglas-fir beetles (*Dendroctonus pseudotsugae*) are killing Douglas-fir. Drought conditions and high stocking levels are severely stressing the trees physiologically, enabling the beetles to enter and kill the trees. The average tree vigor rating as measured by leaf area index is 47. Trees with vigor ratings below 30 will succumb to attack from bark beetles of relatively low intensity. Trees with vigor between 30-70 can withstand progressively higher attacks but are still in danger of mortality from the insect attacks. Trees with a vigor rating of between 70-100 can generally survive one or more years of relatively heavy attacks and trees with ratings above 100 cannot be killed by bark beetles.

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

Trees in the project area are growing at the lowest levels since stand establishment in the 1800s. Ten year radial growth is approximately .45 inches, considerably less than 1 inch of diameter growth every 10 years (Fig. 1). Entomologists have found that at least 1.5 inches of tree diameter growth per decade decreases the risk of bark beetle attack. Stand vigor is decreasing because timber stands are significantly overstocked. Relative density index ratings indicate that stands are at the point of imminent mortality and suppression (RDI of .55; crown closure occurs at a RDI of .15). Relative density index is the ratio of actual stand density to the maximum stand density attainable in a stand with the same mean tree volume. Many stands in the project area have a relative density of over .70, so in regard to stand growth and vigor the forest is not healthy (see attached figure which illustrates 10-year diameter increment tree growth). It should also be pointed out that even if some of the stands are thinned in the near future, mortality of trees may continue because of the loss of tree sapwood (cavitation). Decreases in tree vigor and growth have contributed to an overall decline in forest health. During the drought year 2001, the radial growth of dominant trees was less than 1 millimeter. During 2002, radial growth averaged 1 millimeter.

Due to the past drought conditions, cavitation of the tree sapwood may have occurred in the codominant and dominant tree classes. This, in combination with overstocked stand conditions, has resulted in severely stressed trees with small live crown ratios. Therefore, more tree mortality may occur before these trees can be released and some stand mortality may occur after timber harvesting. Some of the treated timber stands may only experience improved tree vigor with increased precipitation and time.

Forest health is quantified by assessing the physical environment itself, the forest's resistance to catastrophic change, tree mortality, changes in tree growth and vigor, changes in species composition, erosion, water drainage, stream flow, and nutrient cycling. According to the Applegate Adaptive Management Area Ecosystem Health Assessment (USDA, 1994c), the physical, biotic, and trophic networks (natural functions and processes) are intact and working in the Applegate Adaptive Management Area except where soil erosion or raveling occurs, where certain stream reaches are aggraded, or where high elevation clearcuts are still non-reforested. These eroded, aggraded, and non-reforested areas represent a small portion of the adaptive management area and none of these areas are known to be within the project area.

A healthy forest ecosystem has the physical environment, biotic resources, and trophic networks necessary to sustain processes and viable populations of indigenous species. When these criteria are met, the ecosystem is able to maintain its productivity and resilience over time when exposed to drought, wildfire, insect attack, or human-induced changes. The China Keeler project area may not be resilient to catastrophic change. As mentioned earlier, vegetation densities are very

high and ladder fuels are abundant. Tree mortality is already occurring because of dwarf mistletoe infection, plant competition and expanding bark beetle populations, so the stage is being set for catastrophic stand replacement fires. Stand species composition and structure shifts previously discussed in the vegetation class description sections could also be considered unhealthy. The replacement of ponderosa pine by Douglas-fir increases the percentage of drought-susceptible trees in a stand, therefore, the risk of beetle infestation and/or wildfire also increases.

E. Specific Stand Data

ORGANON (a computer growth model) was used to analyze data from 210 plots distributed throughout the Middle Applegate watershed. For individual stands, trees per acre ranged from 77 to 1,227; basal area per acre (BA/AC), 137 to 338 ft^2; and relative density index .398 to 1.065. Table 2 presents stand information for some of the Operations Inventory (OI) units sampled in the Middle Applegate watershed.

Currently, the stocking levels of stands throughout the project area are high. This is primarily due to the lack of large-scale natural disturbance and fire suppression. The overall average for the project area is 378 trees per acre. Average radial growth for the past ten years is .45 inches. The average relative density for the area is .75 and indicates that physiologically the trees are at the point of suppression and mortality.

F. Maps of Proposed Project
(See Attached Maps)

III. Analysis In Support of Prescription

A. Desired Future Condition

A "coarse grained" landscape pattern should be the broad goal of forest management. Over time a wide range of stand densities, stand structural characteristics, age classes, species composition, and arrangement of stand components should be developed to create stands with late-successional characteristics (this implies uneven-aged management). A variety of species in various seral stages of development is necessary to provide for a variety of habitats and perhaps ecosystem functions. The landscape must be managed so that connectivity of mature/old-growth stands is maintained where possible after considering anthropogenic influences. Ten to forty years from now most of the thinned stands will be composed of trees greater than 20 inches DBH. It must be reemphasized that the present day even-aged, single storied stands without residual mature/old-growth trees may still require an additional 150 years to develop the desired characteristics. These stands must be shifted from the stem exclusion stage, to the understory reinitiation stage, and finally to the old-growth stage.

Stand densities should not be allowed to reach the point of imminent mortality and suppression. This point is reached when the relative density index is .55 or greater. The relative density index

of Douglas-fir stands should range between .25 and .55. Table 3 shows the recommended stocking levels necessary to lower stand relative densities to an acceptable level. Harvesting greater amounts of basal area per acre would result in the removal of more trees than necessary.

Stand densities should be lower on pine sites, ridges, and droughty areas in order to maintain maximum health and stand resiliency. The Applegate Adaptive Management Area Ecosystem Health Assessment recommends 60 to 120 ft^2 BA/AC as an acceptable level of basal area in these areas. On these sites the relative density index may be below .35 because there is evidence that heavy thinning to a relative density index of .25 is necessary for the development of the understory and vertical diversity (Hayes et.al., 1997). In contrast, this is considered to be a heavy thinning in Douglas-fir stands and landscape designing should be used for locating the desired areas for heavily thinned stands.

Dense pole and mid-sized trees should be harvested from around the crowns of trees with old-growth characteristics to ensure their survival. Resulting stand densities should be lower than present levels though the stand densities will still be higher than historic levels as discussed in a previous section of the prescription. The ROD and RMP directs that stands must not have fewer than 16 trees per acre. Biologically, moist sites in the Applegate Valley may support approximately 20 healthy, 50-inch DBH trees per acre. At this stocking level there is likely to be a rich understory.

On harsh sites the species composition of stands should contain at least 25% ponderosa pine, which is a drought resistant species. These species exhibit characteristics that allow them to avoid and tolerate desiccation. Hydration of the protoplasm and stomatal closure characteristics effect the rate of photosynthesis. Stomatal closure occurs at higher water stress levels in ponderosa pine than in Douglas-fir, grand fir or sugar pine. As stomata close, resistance to CO_2 transfer increases and rates of photosynthesis decrease. Closure of the stomata allows trees to conserve water. Ponderosa pine can maintain higher levels of photosynthesis as foliar stress builds up to -12 atmospheres and then drops as stress increases. On these harsh sites, hardwood species, especially large diameter trees, should also be maintained in stands. In some conifer stands, where Pacific madrone is the predominant species in the understory, prescribed fire will be needed to control the sprouts. Variety in the arrangement of species is also important.

Diverse stand structure (horizontal and vertical) is also necessary to support a wide variety of species. Wildlife species respond to ecological characteristics of trees regardless of forest age. Future stands should be multi-cohort stands with as many vertical layers of vegetation as the endemic species permits. Trees should develop large crowns, large diameter limbs, and deep fissures in the bark. A variety of seral stages will also add to the diversity. The end result should be a healthy forest ecosystem that has the physical environment, biotic resources, and trophic networks capable of sustaining processes and viable populations of indigenous species. An ecosystem that, when exposed to drought, wildlife, insect attack, and human-induced changes, remains productive and resilient over time.

Table 2. Diameter Growth in Thinned vs. Unthinned Stands Grown For 20 Years

O.I.# POLES MID MATURE	STAND AGE (BREAST HEIGHT AGE)	PRESENT BA/AC (ft^2)	PRESENT TREES PER ACRE	PRESENT 10-YEAR INCREMENT (INCHES)	PRESENT AVG. DBH	PROJECTED DBH IN 20 YEARS (INCHES)	PROJECTED DBH IN 20 YEARS (INCHES) THINNED
POLES							
154504	49	165	1227	0.70	5.0	7.1	12.1
155967	56	193	458	0.70	8.8	11.9	16.1
MID							
154779	114	197	613	0.45	7.7	10.5	26.2
157670	112	221	360	0.60	10.6	15.6	23.8
156175	82	201	384	0.40	9.8	13.4	19.1
157660	119	252	323	0.25	12.0	14.9	21.5
156588	104	203	417	0.45	9.5	12.6	21.9
156174	89	218	362	0.45	10.5	13.2	18.6
MATURE							
158428	142	220	369	0.30	10.5	12.8	31.1
157979	130	227	154	0.45	16.4	19.5	27.7
157474	127	269	222	0.30	14.9	16.7	25.0
154508	123	228	102	0.40	20.2	22.6	28.4
154523	197	339	384	0.6	12.7	14.2	28.1

Table 3. Recommended BA/AC (ft^2) In Order to Lower Stand Relative Density to an Acceptable Level.

O.I.#	PRESENT BA/AC (ft^2)	PRESENT RELATIVE DENSITY	RECOMMENDED BA/AC (ft^2)	RESULTING RELATIVE DENSITY
POLES				
154504	165	.753	101	.349
155967	193	.703	109	.349
MID				
154779	197	.757	142	.350
157670	221	.747	134	.349
156175	201	.701	123	.349
157660	252	.813	131	.350
156588	203	.719	129	.349
MATURE				
158428	220	.750	153	.349
157979	227	.646	145	.349
156174	218	.740	122	.349
157474	269	.797	139	.349
154523	338	1.065	146	.349
154508	228	.599	147	.349

B. Silvicultural Options Considered

The environmental assessment for the China Keeler Project lists 3 Alternatives for the project:

Alternative I. No Action.

Alternative II. Treat the entire landscape with a variety of silvicultural prescriptions, leaving various numbers of trees per acre, in diverse structures, based on distinct tree series and plant association requirements. Treat the oak woodlands with an appropriate prescription. New roads can be built and the road plan would conform with the no net increase guide for this watershed.

Alternative III. Same as alternative II but no new roads would be built.

C. Recommended Treatment or Action

In order to reduce the density of all vegetation over the landscape, reduce fuel loading, support ecosystem based management, and create structurally diverse forest stands, Alternative II of the environmental assessment is recommended to be the proposed action. A combination of 3 silvicultural methods will be used to treat the landscape vegetation. Because of the extreme stand variability and low stand basal area, crown spacing guidelines are being used for heterogeneous stands and basal area requirements for homogeneous stands.

The recommended prescriptions can be considered conservative because only 2 OI units in the Douglas-fir tree series will be regeneration harvested, and a minimum number of group selection areas will be created across the landscape. More regeneration harvesting will be performed on ponderosa pine sites, but most commonly in small patches. All of the recommended prescriptions are designed to retain the largest tree DBH classes, restore the vigor of the forest lands, and keep silviculture options open for the future. The selection harvest treatments will help to promote vertical stand structure and encourage species diversity .

1. Commercial Thinning of the Mid and Mature/Old-growth Condition Classes

The majority of the commercial acreage to be treated would be commercially thinned. The areas to be thinned will have the highest stocking densities and will be located between the group selection and selection areas. The treatment will be a combination of crown spacing and basal area thinning. Homogeneous Douglas-fir stands with constant amounts of basal area that fall within the range of 180 to 300 ft^2 per acre will be treated using basal area guidelines to reduce basal area to between 80 and 160 ft^2 per acre. Heterogeneous stands with a wide range of basal areas when trees tend to be clumped will be treated using crown spacing guidelines. Crown spacing will be used to release old-growth trees and desired early seral species.

Moist commercial Douglas-fir timber stands will be thinned to a 3 to 15-foot crown spacing. On dry Douglas-fir and pine sites, trees will be thinned to a 10 to 25-foot crown spacing. In areas where tree mortality is occurring because of bark beetles, stands will be thinned to a 15 to 35-foot crown spacing. Trees recommended for harvest include suppressed, intermediate, and some codominant crown class trees with live crown ratios of less than 30%, trees lacking branches on one or more sides of the bole that are not conical in shape, dying trees with pitch tubes, and trees with broken or forked tops. Second growth trees will also be thinned from around trees with old-growth characteristics to assure the survival of the dominant, structurally unique, old-growth trees. Table 4 shows the benefits of commercial thinning in regard to the capture of future tree mortality and an increase in tree growth. Two OI units were chosen to represent the mid and mature vegetation classes and were modeled in ORGANON to provide the data for Table 4. The stands resulting from thinning more closely resemble historical stands in that they have larger and fewer trees per acre.

Table 4. Description of O.I. Units 154779 and 158428 With and Without Silvicultural Treatment.

Existing Stand: 154779 (Mid stand)

Stand Age	Trees/ Acre	Basal Area	Scribner Volume	5 Year Change in Volume
114	613	197	39,909	---------
Future Growth of Stand if Not Treated (note the decrease in trees/acre through natural mortality):				
124	466	209	44,726	2,278
134	367	220	49,416	2,250
144	295	231	53,690	2,043
154	240	241	57,822	2,089
Future Growth if Stand is Thinned to a Relative Density Index of .35 (142 ft^2 Basal Area/Acre):				
124	45	156	39,793	2,122
134	45	169	44,037	2,134
144	45	183	48,253	2,087
154	45	197	52,399	2,065

Existing Stand: 158428 (Mature stand)

Stand Age	Trees/ Acre	Basal Area	Scribner Volume	5 Year Change in Volume
142	369	220	52,260	------
Future Growth of Stand if Not Treated (note the decrease in trees/acre through natural mortality):				
152	316	232	55,019	2,377
162	272	243	59,571	2,247
172	235	254	64,010	2,165
182	202	263	68,059	1,994
Future Growth if Stand is Thinned to a Relative Density Index of .35 (153 ft^2 Basal Area/Acre):				
152	34	165	47,946	2,108
162	34	178	52,149	2,119
172	34	190	56,204	2,010
182	34	202	60,080	1,913

Note: To calculate the Scribner volume of timber cut, subtract the thinned stand volume from the non-treated stand volume for each corresponding stand age.

2. Group Selection Openings

On dry ponderosa pine or Douglas-fir sites, 1/5 to1-acre group selection areas (106 to 236-foot diameter openings) will be harvested adjacent to suitable pine and seed trees creating openings arranged in a random, natural pattern. These openings are needed to increase the stocking level of ponderosa pine (ponderosa pine needs 25% full sunlight to grow) and incense cedar. Old-growth yellow bark pine can be centered in the group selection openings. Eighty ft^2 BA/AC of timber will be left standing around the group selection areas to allow more light to enter the openings and to create spatial variability. In areas with a cool, moist micro environment 1/7 to 1/6-acre group selection areas (90 to 96-foot diameter openings) around suitable Douglas-fir seed trees will be created to establish Douglas-fir seedlings.

3. Selection Harvesting for the Purpose of Creating Vertical Stand Structure

Two Douglas-fir stands will be regeneration harvested (154515 and 157668). One stand is 150-years of age or older (157668) and the other stand is younger but heavily infected with dwarf mistletoe. There is also a dense understory of Douglas-fir regeneration which can be released with the heavier thinning. The RMP discusses the objectives of this prescription. Treatment is needed to release natural regeneration and to create multiple-canopied stands. Treatment within these stands will be variable as stand conditions are not homogeneous. Three treatment situations are described in the marking guidelines depending upon the age class of trees found in the OI units.

Another type of selection harvest prescription to be applied in areas (approximately 1/5 to 1 acre in size) where 3 or more trees with old-growth characteristics are encountered is as follows: second growth trees will be selectively harvested from around them for a distance of 200-feet. An average of 16 to 25 trees per acre will be left in the 200-foot radius area. The purpose of this is to ensure the survival of the old-growth trees and to create vertical stand structure over time. The leave trees should be healthy and composed of all crown classes with live crown ratios of 30% or more, straight boles and full, conical shaped crowns. This technique will help to develop stands that are multi-species and uneven-aged.

Pine series sites with oak species and whiteleaf manzanita present will be selection harvested in order to reduce stocking levels of undesired species, thus improving their vigor. This will also create diverse stand structure when a new age class of pine trees is established below the existing vegetation. 16 to 25 of the largest conifer trees per acre would remain as well as an additional 10 to 20 ft^2 BA/AC of 7 to 11 inch DBH trees. All hardwood trees would also remain on site.

Ponderosa pine/native grass plant associations are also present. These areas will be treated so that pine regeneration can be established beneath the existing pine trees. All of the Douglas-fir trees that have encroached upon the pine sites will be removed, except for 60 to 80 ft^2 BA/AC that will be left standing around these areas for a radius equal to the average height of the existing stand.

4. Selection Harvesting for the Purpose of Releasing Natural Douglas-fir Seedlings and Saplings

In areas where closely spaced Douglas-fir seedlings and saplings are found beneath an overstory of mature trees, selection harvesting can be employed to remove some of the mature trees. It is recommended that no less than 10 of the largest, healthiest trees per acre of various crown classes be left over the Douglas-fir regeneration. The areas of regeneration must be 1/7-acre in size or larger. By removing overstory trees, the seedlings will be released to grow and vertical stand structure will be enhanced over time.

5. Commercial Thinning of Pole Stands

Three situations are common: 1.) There are dense, decadent pole stands on northeast aspects that receive sun for most of the day. The Douglas-fir is short in height and poison oak and grasses are common in the understory; 2.) Decadent patches of trees may be found with the majority of the trees having crown ratios of 30% or less; and 3.) There are thrifty, young stands with good crown ratios (30% or more) on cool, moist sites.

For the first two situations only trees with crown ratios of 30% or more will be marked to leave to a 3 to 15-foot crown spacing. Trees with crown ratios of less than 30% will be harvested. Sometimes openings less than 1-acre in size may result.

Thrifty stands should also be marked to a 3 to 15-foot crown spacing but due to better site conditions and trees with high crown ratios, more basal area per acre will probably remain.

Table 5 shows the benefits of commercial thinning in regard to the capture of future tree mortality and an increase in tree growth. OI unit 154504 was modeled in Organon to provide data for the table.

Table 5. Description of O.I. Unit 154504 With and Without Silvicultural Treatment.

Existing Stand: 154504 (Pole stand)

Stand Age	**Trees/ Acre**	**Basal Area**	**Scribner Volume**	**5 Year Change in Volume**
49	1227	165	11,055	-------

Future Growth of Stand if Not Treated (note the decrease in trees/acre through natural mortality):

59	900	182	11,724	1,468
69	714	199	14,940	1,709
79	585	212	18,327	1,591
89	486	223	22,220	1,994

***Future Growth if Stand is Thinned to a Relative Density of .35 (101 ft^2 Basal Area/Acre):**

59	175	116	10,392	1,384
69	167	134	13,543	1,781

79	161	155	17,534	2,094
89	154	176	22,140	2,360

*** Note: Treated stands grow larger for the last 3 decades than untreated stands.**

6. Selection Harvesting of Dwarf Mistletoe Trees

The objective of treating these stands is twofold. One objective is to insure the future health and growth of the existing regeneration and to prevent the spread of dwarf mistletoe to uninfected mature trees. The second objective is to increase the species composition of early seral species such as pine and incense cedar thus enhancing species diversity and species resistance to mistletoe.

These areas will be divided into three zones with different treatments in each. The first zone is within 150 feet of a ridge top. All trees with visible dwarf mistletoe shall be removed with the largest openings being created no greater than 1 acre. If areas of 100% infection greater than 1 acre are found, infected trees with the lowest DMR ratings, or trees with broom types 2 and 3 will be left. ZONE 2 prescriptions will then apply. Openings shall not exceed one-third of this zone. For example, there should be at least 295 feet of timber between 1-acre openings.

Zone 2 starts past 150 feet from the ridge top and extends to the draw bottom. In this zone the mistletoe will be managed in clumps. All trees with visible mistletoe shall be removed without creating openings larger than 1-acre. Uniform patches of mistletoe infected trees will be removed by the group selection method. Where possible, group selection areas up to 1-acre in size will be created by marking infected trees around or adjacent to resistant species. If resistant species are not present, the group selection areas will be created where the highest concentrations of dwarf mistletoe are found. Openings shall not exceed one-fifth of this zone. The remaining patches of uninfected trees will be thinned to no more than a 15-foot crown spacing.

In areas of 100% infection greater than 1 acre, infected trees with the lowest DMR ratings will be left, or trees with broom types 2 and 3. **One ½-acre patch of infected trees will remain for every 20-acres.** A 30-foot crown spacing shall be created around remaining infected patches removing all susceptible species. If there is more than one patch in the 20 acres, the remaining infected trees will be thinned to a 15-foot crown spacing. Uniform patches of dwarf mistletoe trees up to ½-acre in size will be left every 660 feet. An effort will be made to create the leave patches around infected old-growth trees.

The third zone is in the riparian areas. If possible, infected areas adjacent to riparian zones (ZONE 3) will be left. **Between all infected areas, a 30-foot crown spacing will be created with adjacent uninfected forest stands.** Resistant species will not be removed in this canopy opening area and throughout all zones.

In all zones, all infected old-growth trees, and all trees 34 inches DBH and larger with a DMR rating of 1 and 2 shall remain. A 30-foot crown spacing will be created around these trees, by removing susceptible species. **One ½-acre patch of infected trees will remain for every 20-acres.** When infected trees remain, trees with broom types 2 or 3 will be favored. .

It is recognized that Douglas-fir dwarf mistletoe is a necessary and often beneficial part of a healthy landscape. Mistletoe brooms provide a unique micro environment and tree mortality resulting from infection creates

natural openings in the stands. These prescriptions are an effort to confine the mistletoe to the areas where it is most desirable.

7. Shrubland and Woodland Treatments

Selected noncommercial treatment areas (shrub lands and woodlands) will be treated by intermediate treatments (precommercial and commercial thinning), the individual tree selection method, and prescribed burning.

The objectives for treating the woodlands are as follows: reduce the fire hazard by thinning all vegetation and eliminating all ladder fuels; restore oak/native grass plant associations; enhance the vigor and quality of the hardwood species (mainly oak to induce acorn crops); use the coppice method to introduce another age class of hardwood species; and decrease the abundance of Douglas-fir and shrub species.

Individual, merchantable Douglas-fir trees can be harvested if ponderosa pine trees are also present (this saves the possible habitat and woody debris component of the ecosystem). Strips or patches of merchantable conifers and hardwoods within the woodlands, where favorable aspects and microenvironments exist, should be thinned to approximately 36 trees per acre (1 to 10 of these trees being conifers). Douglas-fir seedlings through the pole timber size classes should be cut. An occasional Douglas-fir tree may be left if no pine or incense cedar are available to leave. All trees with old-growth characteristics should remain and all the vegetation beneath these trees should be cut to ensure their survival. Cut suppressed and intermediate crown class oak trees to establish stump sprouts. Tall, healthy whiteleaf manzanita shrubs with wide crowns should remain that produce large berry crops. Wedgeleaf ceanothus is also desired, but should be thinned to stimulate sprouting. The wedgeleaf ceanothus shrubs should be cut to heights varying from 6 inches to 3 feet.

The objectives for treating the shrub lands are as follows: increase wildlife forage production and quality, decrease fire hazard by reducing the stocking levels and ladder fuels of the shrub species, eliminate or reduce the abundance of noxious weeds, and prevent the encroachment of Douglas-fir.

Individual, merchantable Douglas-fir trees can be harvested if ponderosa pine trees are also present. Douglas-fir seedlings through the pole timber size classes should be cut. All trees with old-growth characteristics should remain and all the vegetation beneath these trees should be cut to ensure their survival. All ponderosa pine and incense cedar trees should be retained. All oak trees except for trees less than 6 inches DBH with crown ratios of less than 10% shall remain. Leave tall, healthy whiteleaf manzanita shrubs with wide crowns (but prune the lower ladder fuel branches) that produce large berry crops at a 15 to 25-foot crown spacing. All other whiteleaf manzanita should also be cut to the 15 to 25-foot crown spacing. Wedgeleaf ceanothus should also be left, but cut the shrubs to various heights to stimulate sprouting. The wedgeleaf ceanothus shrubs should be cut to heights varying from 6 inches to 3 feet. Small patches of starthistle should be burned by piling slash on top of the patches and then burning them.

Dense manzanita patches can be thinned by cutting a series of trails to desired vegetation such as oak trees. Prescribed burning will also be used where understory fuels are light in the shrub lands and woodlands.

D. Prevention/Avoidance Strategies

Competing vegetation can be shrub, tree, or herbaceous species. When the land management objective is timber production, hardwood tree, shrub and herbaceous species are considered as "competing" for the available growing space. When the land management objective is forage production, tree species may be considered as the undesirable species. Because of the large area and the variable site conditions of the proposed project area, a variety of competing plant species are likely in all of the vegetation condition classes.

Competing vegetation may become a problem in the areas harvested by the single tree selection method. Here large openings in the crown canopy layer will be created. Openings as large as 20 to 35 feet between tree crowns may be created and heavy slash accumulations are anticipated. In the PSME/BENE plant association, California hazel, dwarf Oregongrape, thimbleberry, and creambrush oceanspray may become established, or resprout, at the same time as the conifer regeneration. Gravelly soils can compound this problem. It is recommended that prescribed fire (cool underburning) be used in these areas to alleviate the fire hazard and for establishing Douglas-fir regeneration. As an alternative, slash could be handpiled on top of existing patches of shrubs and burned.

In the PSME/RHDI-BEPI or PSME/RHDI plant associations, poison oak, deerbrush ceanothus, whiteleaf manzanita and grass species are likely to invade. Prescribed burning may suppress these species long enough for conifers to become established, but fire will stimulate the growth of grass and ceanothus species. Fire may also kill desired tree species if their roots are too close to the soil surface (this may occur where the organic matter on the soil surface is 2 inches deep or greater). Prescribed underburning is appropriate for reducing areas of dense grass, shrubs, and herbaceous species for the purpose of reducing competition for available soil water. In the pine series forests, prescribed fire is also essential for preparing suitable seedbeds for the pine seed. Scalping is also an alternative for reducing the competing grass and ceanothus species. Deerbrush ceanothus and hardwood stump sprouts may also become a problem in these plant associations after the use of fire. Therefore, in the area harvested by the single tree selection method it is recommended that logging slash be handpiled and burned where the regeneration of deerbrush ceanothus would be a severe problem. Prescribed burning can then be used at a later time (5 to 10 years) to control competing vegetation. From an economics standpoint, prescribed underburning is less expensive than mechanical removal.

The same problems will probably be experienced in the group selection harvest areas and the same treatment is prescribed.

After timber harvesting in the commercial thinning areas, shrub and grass species may become established after harvest, but this vegetation will again become suppressed when the crown canopy layer begins to close. Pacific madrone and oak tree species should not be a problem in regard to competing for available growing space in the thinned areas. The majority of these species are suppressed, well below the height of the codominant and dominant conifer trees and will probably not release. The number of these small diameter trees in the understory (30 to 50 trees per acre) is not perceived to be a problem. Prescribed underburning would be appropriate where dense mats of grass and other herbaceous vegetation will compete for soil water with the tree species.

No competing vegetation problems are anticipated in the hardwood/woodlands and shrub lands if future maintenance of these areas is performed with prescribed fire as planned. In some oak woodlands, whiteleaf manzanita and Douglas-fir will probably encroach again, but cool underburning every 3 to 10 years after the

first manual treatment should control these species. The oak woodlands will also be seeded with native grass species and the grasses may out- compete the manzanita, Douglas-fir, and even noxious weed and non-native grass species. The same philosophy applies to the shrub lands.

IV. Implementation Plan

A. Marking Guidelines

The most controversial topic in the prescription and marking guidelines is the harvesting of trees with old-growth characteristics. Franklin et.al. (1981) states that a minimum of 300 acres of old-growth forest is necessary for it to function as such. At the present time there is not 300 acres of continous old-growth forest in the project area. Most of the project area is below 3,200 feet elevation and is composed of dry Douglas-fir, pine, and white oak plant associations. The forests were created by fires in the nineteenth and early 20th centuries and only small patches (approximately 60 acres) or clumps of trees with old-growth characteristics can be found. In most of the area there is less than one old-growth tree per acre. One old-growth tree per acre does not necessarily make an old-growth forest. The sites are dry and not conducive to high stocking levels of old trees.

The intent of this forest health project is to maintain biological diversity and sustain productivity of the forests within the adaptive management area. We intend to do this by improving or maintaining forest structure (species composition, a variety of tree size classes and tree heights, genetic diversity, age classes, dead wood, and the heterogeneous forest pattern at various scales of space and time) and natural processes in the ecosystem. We recognize that large diameter second growth trees and trees with old-growth characteristics are an important part of the forest structure needed for a variety of natural processes. Therefore, low thinning is recommended (which always selects the smallest tree size classes first for harvest) and the saving of trees with old-growth characteristics that are described in the marking guidelines. There is no way to quantitatively measure the characteristics. The characteristics are somewhat subjective, but are reliable guidelines for trained foresters and forest technicians. Low thinning and the description of old-growth tree characteristics will save the majority of large diameter trees that are over 150 years of age in the forest. A small percentage of large diameter trees with old-growth characteristics will be harvested, but only for stated objectives as described in the prescription and marking guidelines (For the Buncom Project only 1.4 percent of all the trees harvested were 29 inches DBH and larger). Some of the large trees are being harvested in planned road right-of-ways. The number of large diameter trees harvested will be monitored for this project also. By abiding by the marking guidelines and prescription, there will be no ecological processes or components of the ecosystem that would be threatened, leading to the destabilization of the forest ecosystem.

See the attached Appendix A (Marking Guidelines) which describes how the silvicultural methods will be applied to the various vegetation condition classes and designated areas for treatment.

B. Recommended Design Features

The following treatments should be applied to respective EA units:

1. Commercial Timber Harvest Units

a. In units where the single tree and group selection methods were used and after the non-merchantable trees have been felled, logging slash should be handpiled and burned (swamper burning). This site preparation treatment should also be used in the areas marked for heavy beetle mortality and in areas where madrone is harvested so that early seral species can be planted.

b. In units where only commercial thinning was performed, logging slash should be lopped and scattered if the tree tops are removed. If tops are not removed the slash should be handpiled and burned (swamper burning). Prescribed, cool underburning in the fall would benefit some Douglas-fir timber stands that have dense mats of grass and shrub species. Prescribed fall underburning is also recommended in the pine series forest stands in order to prepare suitable seedbeds.

c. After timber harvest, non-merchantable trees with undesirable silvicultural characteristics should be slashed. In areas where precommercial thinning is prescribed, all non-merchantable trees should be cut except the largest live conifer trees that meet the following criteria:

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

2) Non-chlorotic, light or dark green with very little or no yellowish tint.

3) Undamaged top.

4) Free of visible disease, cankers, fire damage, or blister rust.

5) Demonstrates good form and vigor.

6) No multiple tops or ramiforms.

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

In the absence of conifer trees, hardwoods will be considered acceptable crop trees. The order of preference will be bigleaf maple, any oak species, Oregon ash and Pacific madrone. Space the acceptable conifer and hardwood trees at a variable spacing (12 to 30 feet depending on the DBH class).
In all prescription areas, 1/7-acre in size and larger, where overstory trees were marked to release healthy, Douglas-fir seedlings through saplings, the natural regeneration would be precommercially thinned. Seedlings (0-2 inches DBH) should be thinned to a 12 x 16-foot spacing; saplings (2.1 to 4 inches DBH) to an 20 x 25-foot spacing; and poles (4.1 to 7 inches DBH) to a 30 x 30-foot spacing.

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

2. Noncommercial Hardwood/Woodland Units

a. Seed native grasses after treatment.

b. Leave a 350 x 125-foot untreated area for every 10 acres in every unit.

c. Harvest and yard specified merchantable conifer timber within shrub lands and woodlands where stand densities are too high.

C. Coarse Woody Debris

The majority of the prescription areas will have the intermediate (commercial thinning) silviculture method applied to them. The selection silviculture method will also be used on a small portion of the commercial forest lands. Information Bulletin No. OR-97-064 for the implementation of coarse woody debris standards and guidelines (1996) states that, "prescriptions should account for current habitat conditions and the timing and development of subsequent snags and coarse woody material (CWM) until the next stand once again begins to contribute CWM. Leaving green trees and felling to provide a source for CWM should be part of the partial harvest prescription." All of the intermediate harvest method forest stands will have no less than 25 live trees (**largest diameter trees available**) per acre remaining after harvest. Many of these trees will be available to supply future CWM or snags to the sites. The present amounts of CWM fall within the ranges discussed in White's (2001) publication for respective plant association groups (PAG). In the Douglas-fir - Oak - Poisonoak PAG, total CWM of all decay and size classes is 12.4 tons per acre on the average, and 8.9 tons per acre for the Douglas-fir - Poisonoak PAG. Harvesting trees will also provide additional organic matter to the soil in the form of leaves, branches, and cull logs. The BLM information bulletin also states that 15 to 20% groundcover of downed woody debris or 4.5 to 10 tons of fresh downed woody debris is adequate for site productivity after timber harvest (6,500-feet of post-harvest CWM transects has shown an average of 5.21 tons per acre of decay class 1 and 2 CWM after commercial thinning; the range of CWM is 2.2 to 8.1 tons per acre ; BLM 2002, unpublished data). Therefore, the debris created by partial harvesting in combination with existing CWM and the green trees retained is sufficient to maintain CWM levels as described in the bulletin and White's (2001) publication.

Because of the unique habitat created by the large coarse wood and the surrounding vegetation it is recommended that the existing micro environment remain intact. Where coarse woody material is found that is 20 inches in diameter at the small end, and a minimum of 8 feet long, all trees immediately surrounding this wood shall be left standing to provide shade. This recommendation will apply to all prescription areas.
The majority of the project area will receive intermediate type harvest methods (commercial thinning). It is suggested that all Stage 1 snags be left in the interior of homogeneous conifer stands. Homogeneous conifer stands should be inventoried after harvesting by wildlife biologists to see if snag requirements have been met. If not, damaged or diseased trees should be designated for girdling. In areas adjacent to shrub lands and woodlands where tree mortality has been high, all snags are being retained.

D. Subsequent Treatment Planned

The proposed silvicultural methods of Alternative II suggests uneven-aged management over very long periods

of time (over 100 years) to create structurally diverse, multi-cohort timber stands as proposed in the Medford District RMP.

After the proposed treatments are performed, the options for future treatment are many. Future management objectives will determine when the commercial forest lands are harvested again. Landscape analysis and design should also determine which types of silvicultural treatments are applied and in what pattern across the landscape. ORGANON analysis shows that if the objective is to perform a regeneration harvest when there are 16 trees per acre, 20 inches DBH and larger available to leave, the mid-sized and mature vegetation condition classes should be entered in 10 to 40 years. For pole stands to reach this condition it would take approximately 35 years. If the management objective is to manage strictly by density levels (high RDI), pole stands through mature stands can be entered in 30 to 60 years.

At the time of the next stand entry, existing group selection areas can be released and additional group selection areas can be created.

The single tree selection, group selection, and stands with severe beetle mortality/damage could be planted with the appropriate planting stock. The pine group selection areas could be planted with (16-foot spacing) 1-0 or 1-1 ponderosa pine stock. The 1/6 and 1/7-acre Douglas-fir group selection areas should not have to be planted. Initial surveys will be conducted within 1 year after harvest to determine planting needs.

The single tree selection harvest areas around the patches of mature/old-growth trees could be planted also. These areas should be mapped as pine or Douglas-fir sites and planted accordingly. Two year old or older planting stock should be used. The pine sites should be planted with 90% ponderosa pine and 10% incense cedar at a 16-foot spacing. Douglas-fir sites would be planted with 100% Douglas-fir at the same rate of stocking. The planted sites should have stocking surveys and maintenance performed as recommended by BLM standards.

After manually treating the hardwood/woodlands, shrub lands, and defensible fuel profile zones prescribed fire should be used for the maintenance of these areas. In the oak woodlands where the production of frequent acorn crops is desired, cool, prescribed burning should be performed every 3 to 5 years. The shrub lands can be burned as necessary to develop the desired seral stages of vegetation over time on a specified percentage of the non-commercial land base.

E. Avoidance Strategies for Animal Damage and Forest Health

At this time no problems with animals are anticipated. After performing density management, more early seral stage vegetation will become established and blacktail deer populations may increase. Unburned slash piles may create habitat for rabbit species and isolated pockets of seedling damage may result. Tree tubing may be required at a later date.

After the trees respond to release, they should be more resilient to pathogens and insects. Density control of the forest stands is essential to prevent the occurrence of these biotic agents. Any heavily infected dwarf mistletoe stands should be managed over time to lower the rate of infection. In the group selection areas seedlings and

saplings with mistletoe should be thinned out.

F. Monitoring Recommendations

The monitoring plan for the China Keeler Project has been expatiated by an interdisciplinary team during the environmental analysis process. Monitoring will be focused on selected study areas. In general, site characteristics and trends will be described and measured before and after activities take place. Monitoring is necessary to validate proposed prescriptions and assumptions made about the prescriptions to see that stated objectives are attained. The following disciplines will be monitored as described:

1. Silviculture/Forest Health

The forest stands being monitored are not in the China Keeler Project area. They are stands representative of the stand vigor and commercial thinning issues commonly found in the Applegate Adaptive Management Area and are located in the Lower Thompson Creek vicinity.

a. Forest stands are being monitored for vigor by using relative density as an index, leaf area index and sapwood.

b. Individual tree growth is being measured over time in representative stands on permanent plots in a releasability study. Large and old-growth ponderosa pine and Doug-fir are of particular interest.

c. Occurrence of natural regeneration and survival of planted seedlings in established group selection and regeneration harvest areas.

d. Oak woodlands will be monitored for vegetational response to fire and thinning.

2. Fuel Hazard and Risk

Fuel characteristics (loading) will be measured before and after treatments in all vegetation types. Size and composition of fuel related to structure will be assessed at regular intervals. The potential fire hazard and rate of spread will be evaluated for treated and untreated areas.
Particulate matter generation will be measured during selected prescribed burning episodes.

3. Soils

Soils will be monitored for erosion and compaction by type and location before and after prescribed treatments.

4. Wildlife

Wildlife populations and habitat will be inventoried on both treated and untreated areas. In addition, the layout of protection buffers, Siskiyou salamander habitat, spotted owl sites, great grey owl sites, and mines used by

bats will be monitored.

5. Riparian Areas

As part of implementation monitoring, stream channels, fish habitat, and riparian conditions will be surveyed. The effects of thinning on riparian humidity and air temperature will be monitored. A cooperative research team composed of CFER, USFS-PNW Research Stn., Applegate AMA Forest Service (Star RD), and BLM specialists (Ashland and Grants Pass RAs) are beginning to implement a riparian study in the AMA.

6. Air Quality

Particulate matter and air opacity are being monitored at the Provolt Seed Orchard air quality facility as part of the Rogue River Basin Interagency Smoke Monitoring Plan.

7. Contracts

Contract work will be developed and performed to meet watershed analysis objectives. Contract work results will be monitored.

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China Keeler Landscape Project
Appendix C

Project Design Features

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

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

A. Applicable Harvest and Logging Project Design Features (PDFs)

1. Reducing or Eliminating Surface Soil Erosion

•When operationally feasible, all units would be yarded in such a way that the coarse woody debris remaining after logging would be maintained at or greater than current levels in order to protect the surface soil and maintain productivity.*
•Wherever trees are cut to be removed, directional felling away from Riparian Reserves, dry draws and irrigation ditches would be practiced. Maximum operational suspension would be practiced to alleviate gouging and other disturbance on draw side slopes and headwalls. Trees would be felled to the lead in relation to the skid trails. *
•All skid trail locations would be approved by BLM. Maximum area in skid trails would be less than 12%. Existing skid trails would be utilized when possible. Tractors would be equipped with integral arches to obtain one end log suspension during log skidding. Skid trail locations would avoid ground with slopes over 35 percent and areas with high water tables. The intent is to minimize areas affected by tractors and other mechanical equipment (disturbance, particle displacement, deflection, and compaction) and thus minimize soil productivity loss. *
•All skid trails would be water barred according to BLM standards. Main tractor skid trails would be blocked with an approved barricade where they intersect haul roads. The intent is to minimize erosion and routing of overland flow to streams by decreasing disturbance (e.g. unauthorized use by OHVs).*
•Tractor yarding would occur between May 15 to October 15 or on approval by the Contract Administrator. Some variations in these dates would be permitted dependent upon weather and soil moisture conditions. The intent is to minimize off-site erosion and sedimentation to local waterways.*
•For all cable yarding, maximum operational suspension would be maintained on slopes greater than 50 percent. Minimum corridor widths *(*generally less than 15 feet in width) would be utilized to assure silvicultural prescriptions and objectives are met.
•Skyline and tractor yarding would be avoided up and down dry draws. The intent is to minimize the occurrence of erosion and compaction in existing areas of concentrated surface or substrate flow.
•Helicopter landings would be constructed during the dry season (May 15th to October 15th).
•Helicopter landings would be treated to reduce soil erosion. Treatment of the running surface would be dependent on site conditions and would include one of the following: subsoil, till, or rip, then mulch and seed with native grasses or other approved seed; surface with durable rock material; or leave "as is" where natural rock occurs.
•Fill slopes of helicopter landings would be seeded with native grasses or other approved seed mixes and mulched, except where rock occurs.

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

2. *Protecting Riparian Reserves*
•No use of skid trails in Riparian Reserves.
•No yarding corridors in Riparian Reserves.
•No construction of new landings or expansion of old landings would be allowed in Riparian Reserves.
•Directionally fell away from Riparian Reserves.

3. *Maintaining Forest Stands*

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

1) Minimum 4-inch terminal leader with at least the top 40 % of the tree containing live limbs.
2) Non-chlorotic, light or dark green with very little or no yellowish tint.
3) Undamaged top.
4) Free of visible disease, cankers, fire damage, or blister rust.
5) Demonstrates good form and vigor.
6) No multiple tops or ramiforms.

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

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

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

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

B. <u>Applicable Non-Commercial Silvicultural Project Design Features (Uplands Only)</u>

1. Reducing or Eliminating Surface Soil Erosion

•Vegetation would be thinned using mechanical and manual techniques of cutting and chipping, such as the Slashbuster, and/or using hand crews with chain saws. Slash created by the project would be chipped on site (if using slashbuster), or hand piled and burned if cut by hand crews. No piling in dry draws would be allowed.
•To minimize loss in soil productivity and surface erosion, the average unit slope for mechanical operations ("Slashbuster") would be less than 35%. The maximum slope for the "Slashbuster" would be 45%, but only on short pitches less than 300 feet where slopes both above and below the steepest section are less than 35%. Any mechanical operations on fragile soils (as shown on the BLM GIS Soils mapping or identified by the Soil Scientist) would be limited to slopes of 25% or less.
•Old skid trails would not be opened or driven on without the approval of the authorized officer. Cut material or slashbuster material would be placed on the running surface of old skid trails or jeep roads that are authorized to be used.
•Old skid roads would not be treated near the intersections with system roads in order to provide a visual screen and discourage vehicular access.

2. Protecting Riparian Reserves
•No off road machinery would be driven through riparian areas or stream channels. Where this limitation inhibits access to mechanical treatment units, these units would be treated manually.

C. <u>Applicable Non-commercial Silvicultural Project Design Features (Riparian Reserves)</u>

1. Protecting Function and Character of Riparian Reserves
•Treatments would only take place in Riparian Reserves adjacent to pre-commercial treatments (PCT) and non-commercial treatments (NCT) units.
•*Manual* vegetation treatments would *not occur* in the following portion of Riparian Reserves: within 50 feet of fish-bearing and perennial streams; within 50 feet from the edge of springs, seeps, and wetlands; within Riparian Reserves for unstable and potentially unstable areas; and within 25 feet of long-duration intermittent streams (Table 1). *
•*Mechanical* vegetation treatments would *not occur* within any part of Riparian Reserves on fish-bearing and perennial streams, springs, seeps, and wetlands, and unstable and potentially unstable areas (Table 1) *
•Mechanical vegetation treatments *would not occur* on the following portion of Riparian Reserves: the machine would not be allowed within 55 feet from short- and long-duration intermittent streams; however, its arm would be allowed to reach within that buffer to thin trees and brush (no more than an additional 25') (Table 1). *

•Riparian hardwood species such as willow, ash, maple, alder, and black oak would not be thinned.
•Down large woody debris over 16" diameter would not be damaged, driven over, or used for fire wood.

2. *Reducing or Eliminating Surface Soil Erosion*
•Thinned material may be lopped and scattered in specific areas where pile burning is not desirable.
•Crossing channels with vehicles or equipment, including ATVs and slashbuster, would be limited to existing system roads shown on EA maps. *
•Piles would not be placed in channel bottoms.
•The "Slashbuster" would enter the Riparian Reserves perpendicular to the stream channel, to avoid creating a parallel track path along an edge of untreated vegetation (/\/\/\ not ==). *

Table 1. Riparian Reserve buffer distances – non-commercial treatment areas

	Manual treatments	**Mechanical treatments**	**Pile burning**
Fish-bearing	50' buffer	Not allowed in RR	50' buffer
Perennial	50' buffer	Not allowed in RR	50' buffer
Long-duration intermittent	30' buffer	55' buffer for machine; can reach in to extent of cutter	30' buffer
Short-duration intermittent	Where necessary (treating through is OK, as prescribed)	55' buffer for machine; can reach in to extent of cutter	No piles in the channel or draw bottoms
Springs/seeps/wetlands	50' buffer	Not allowed in RR	50' buffer
Unstable areas	Not allowed in RR	Not allowed in RR	50' buffer

D. <u>Applicable Road Construction- and Renovation-Related Project Design Features</u>

1. Reducing or Eliminating Surface Soil Erosion
•Road and landing construction and renovation would not occur during the winter months (October 15th to May 15th) when the potential for soil erosion and water quality degradation exists. This restriction could be waived under dry conditions and a specific erosion control plan (e.g. rocking, water barring, seeding, mulching, barricading). All construction activities would be stopped during a rain event of 0.2 inches or more within a 24-hour period or if determined by the administrative officer that resource damage would occur if construction is not halted. If on-site information is inadequate, measurements from the nearest Remote Automated Weather Station would be used. Construction activities would not occur for at least 48 hours after rainfall has stopped and on approval by the Contract Administrator. *

•Bare soil due to road construction/renovation would be protected and stabilized prior to fall rains. *
•Fill slopes on all new roads would be seeded with native or approved seed, fertilized and mulched. *
•Slash would be windrowed at the base of newly-constructed fill slopes to catch sediment. *
•Temporary roads would be obliterated at the completion of log haul and site preparation. The roads would be water barred and barricaded if use is not completed by October 15th. *

•In order to reduce the amount of road-related soil disturbance occurring in one season, decommissioning would occur the final dry season (usually May 15 to October 15) of the contract, while road construction and renovation would occur the first year of the contract.

2. Protecting Natural Discharge Patterns
•Where possible, rolling grades and out sloping would be used on road grades that are less than 8%. These design features would be used to reduce concentration of flows and minimize accumulation of water from road drainage.

3. Eliminate Chemical Water Pollution
•No fertilizer would be spread within Riparian Reserves. *

4. Protecting Riparian Reserves
•No new temporary or permanent roads would be constructed within Riparian Reserves.

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

1. Reducing or Eliminating Surface Soil Erosion

•Preservation of Existing Vegetation - Some road sections proposed for decommissioning have significant amounts of naturally generated trees, brush and debris on them that is beneficial for long-term erosion control. This material would be preserved as much as possible but the priority would still be to convert all existing man-made drainage structures such as ditches, culverts and dips to a long-term no maintenance drainage configuration such as large dips, outsloping road surface, and well drained, high-capacity waterbars. Barricades, additional planting, seeding, and mulching would be done as needed to reduce erosion. Open areas would be ripped where feasible.*
•Full Rip Decommission – The primary objective is to establish a stable, long term drainage configuration that would be self-maintaining. Existing road drainage structures such as ditches, culverts and dips would be replaced with a long-term no maintenance drainage configuration such as large dips, outsloping road surface, and well drained, high-capacity waterbars. Barricades, additional planting, seeding, and mulching would be done as needed to reduce erosion. The road surface would be ripped to the extent feasible without compromising the cross drainage.*
•Mechanically-decommissioned roads usually include ripping, removing drainage structures, seeding and/or planting, mulching, constructing water bars and barricades.
•In order to reduce the amount of road-related soil disturbance occurring in one season, decommissioning would occur the final dry season (usually May 15 to October 15) of the contract, while road construction and renovation would occur the first year of the contract.
•Areas of disturbed ground on all decommissioned roads would be seeded with native or approved seed and mulched. No fertilizer would be spread within Riparian Reserves.
•Excavated material from (removing) stream crossings would be removed to at least bankfull width. Stream side slopes would be reestablished to natural contour then seeded (with native or approved seed) and mulched.
•Decommissioned roads would be water barred on each side of stream crossings in order to adequately filter road surface runoff and minimize sediment transport to streams.
•All natural surface roads would be closed during the wet season.
• Unless specifically designated, OHV use on decommissioned roads would be discouraged by placement of debris or other appropriate barriers.
•Treatment would depend upon the existing vegetation on the particular road segment.*

2. Protecting Stream Banks and Stream Channel Integrity

•Stream crossings would be reestablished to the natural stream gradient. This would be accomplished by removing the culvert and the road fill within the stream crossing areas.

F. <u>Applicable Culvert Installation/Replacement and Ford Installation Project Design Features</u>

1. Protecting Stream Banks and Stream Channel Integrity

•Road approaches at all stream crossings would be as near a right angle to the stream as possible to minimize disturbance to streambanks and riparian habitat.
•Road crossings on all fish-bearing streams would be designed to maintain natural streambed substrate and site gradient where feasible, while minimizing long-term maintenance needs.
•On fish-bearing streams the bottom of stream crossing structures may be lined with 1-3 foot diameter boulders to restore streambed habitat complexity inside new crossing structures. Boulders that are placed in replacement pipes must be large (high) enough so that they are not buried by streambed substrate that may have been deposited immediately upstream of the inlet of the original pipe. A prediction model would be used to determine the size of boulder needed to ensure stability at the estimated 100 year peak flow.

2. Protecting Natural Discharge Patterns

•Stream crossing culverts that are replaced would be sized to accommodate 100-year flood events. The width of a crossing structure on fish bearing streams would be at least as wide as the mean bankfull width at the crossing site. Deviation to this general rule would be approved by the Hydrologist and Fisheries Biologist on a case-by-case basis.

3. Reducing or Eliminating Surface Soil Erosion

•Instream work period would be from July 1 - September 15 for all fish-bearing streams and for non-fish-bearing streams that are flowing during this work period.
•During instream work, all perennial streams would be diverted around the work area in a manner (e.g. a pipe or lined ditch) that would minimize stream sedimentation, unless the Field Office biologist approves a deviation from this practice (i.e. if the stream is just a trickle and too small to physically divert). The contractor would be required to submit a plan for water diversion before instream work begins. The diverted stream would not be returned to the channel through the project area until all instream work had been completed. If it is impractical to dewater a stream channel, the work would be scheduled toward the end of the instream work period.
•The use of settling ponds, straw bales, geotextile fabric or coconut fiber logs/bales would be used to reduce movement of sediment downstream from the project site.
•Fill material over stream crossing structures would be stabilized as soon as possible after construction has been completed, before October 15. Exposed soils would be seeded and mulched. Work would be temporarily suspended if rain saturates soils to the extent that there is potential for environmental damage, including movement of sediment from the road to the stream.
•Waste stockpile and borrow sites would not be located within Riparian Reserves.

4. Aquatic Fauna Protection

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•Fish screens would be used on all temporary diversions (for culvert replacement) on all fish-bearing streams.
•Stream crossing structures would be designed to ensure upstream and downstream movement of aquatic species.

5. *Eliminating Water Pollution from Contaminants*

•During construction of instream structures the contractor would be responsible for meeting all state and federal requirements for maintaining water quality. Standard contract stipulations would include the following:

• Heavy equipment would be inspected and cleaned before moving onto the project site in order to remove oil and grease, noxious weeds and excessive soil.

• Hydraulic fluid and fuel lines on heavy mechanized equipment must be in proper working condition in order to avoid leakage into streams.

• Waste diesel, oil, hydraulic fluid and other hazardous materials and contaminated soil would be removed from the site and disposed of in accordance with DEQ regulations. Areas that have been saturated with toxic materials would be excavated to a depth of 12 inches beyond the contaminated material or as required by DEQ.

• Equipment refueling would be conducted within a confined area outside Riparian Reserves.

• Use spill containment booms or other equipment as required by DEQ.

• Equipment containing toxic fluids would not be stored in or near (within 300') a stream channel anytime.

G. Noise Reduction Project Design Features

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

Quarries

Rock would be used to stabilize and minimize erosion on selected roads and landings.* Rock would be obtained from the existing quarry located in E1/2SW1/4 Section 25, and SE1/4NE1/4 Section 34, T.39S., R.3W. Rock encountered during construction activities could be used for road stabilization.

H. Protection of Terrestrial Wildlife Project Design Features

Threatened/Endangered Wildlife

Northern Spotted Owl

Disturbance

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

Type of Activity	Zone of Restricted Operation
Blast of more than 2 pounds of explosive	1 mile

Blast of 2 pounds or less of explosive	360 feet
Impact pile driver, jackhammer, or rock drill	180 feet
Helicopter or single-engine airplane	360 feet
Chainsaws	195 feet
Heavy Equipment	105 feet

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

Habitat

For projects that remove habitat, work activities such as tree felling, yarding, etc, will not occur within 0.25 miles of any **known** nest site or activity center from March 1- September 30, unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in a nesting attempt. Waiver of the seasonal restriction is valid until March 1 of the following year.

Golden Eagle

Provide a 30 acre no cut buffer around the golden eagle nest site. Also no disturbance March 1 – July 15 within ¼ mile for all activities and ½ mile for helicopter operations.

Survey and Manage Species

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

I. Protection of Botanical Resources Project Design Features

Federally Endangered Species

Fritillaria gentneri: The three known occurrences within the following sections; T38S, R3W, SEC 16 (1 site), T38S, R3W, SEC 21 (1 site) and 38S, 3W, SEC 22 (1 site) will be buffered with a 150 foot radius buffer.

Bureau Special Status Vascular plant species

Camissonia graciliflora:. The one known occurrence within the project area, T38S, R3W, SEC 15, will be buffered with a 150 foot radius buffer.

Clarkia heterandera: The five known occurrences within the project area, T38S, R3W, SEC 31, will be buffered with a 150 foot radius buffer.

Cryptantha milobakeri
The one known occurrence in T38S, R4W, SEC 35 will be buffered with a 150 foot radius buffer.

Cypripedium fasciculatum: The nine known occurrences of this species within the project area; T38S, R3W, SEC 18 (1 site), T38S, R3W, SEC 31 (1 site), T39S, R3W, SEC 5 (1 site), T39S,

R3W, SEC 6 (3 sites), T38S, R4W, SEC 13 (1 site), T38S, 4W, SEC 25 (1 site), and T39S, 4W, SEC 1 (1 site), will be buffered with a 150 foot. radius buffer.

Mimulus bolanderi: The one known occurrence in T38S-R3W-SEC 20 will be buffered with a 150 foot radius buffer.

Pellaea mucronata var mucronata:. The one known occurrence in T39S, R4W, SEC 1 will be buffered with a 150 foot radius buffer.

Hieracium greenei, Lithophragma heterophyllum, Mimulus douglasii, and Smilax californica are Bureau "tracking" species and *Mimulus congdonii* and *Zigadenus exaltatus* are Medford Watch species. Bureau "tracking" species and Medford watch species do not require mitigation.

Nonvascular plant species

Tripterocladium leucocladulum is a Bureau "assessment" species, *Hedwigia stellata* and *Tortula subulata* are Bureau "tracking" species and do not require mitigation.

China Keeler Landscape Project
Appendix D

Road Construction, Renovation, Decommission

Alternative B - Variable Prescriptions With New Road Construction

Table D-1: Proposed improvements on existing roads that access the project area.

Road Number	Approximate Length (miles)	Existing Surface: Depth (inches) and Type[1]	Control[2]	Possible Improvements: Depth (inches) And Type[3]	Seasonal Restriction[4] (for log hauling)
38-3-5A-B1	0.81	BST	BLM	-	1
38-3-5.1	2.60	6”ASC	BLM	-	1
Jeep Rd T38S R3W Sec. 9, 15, 16, 21, 22	4.00	NAT	BLM	8” ASC / 0.5 miles	1
38-3-5.2A	1.19	6”ASC	BLM	-	1
38-3-7.0	0.92	6”ASC	BLM	4”ASC	1
38-3-7.1	2.00	NAT	BLM	-	1
38-3-8.0A	0.57	6”ASC	BLM	-	1
38-3-8.1	1.35	6”ASC	BLM	-	1
38-3-14.0A1	0.23	6”ASC	BLM	-	1
38-3-15.0	0.57	6’ASC	BLM	-	1
38-3-15.1	1.25	6”ASC	BLM	-	1
38-3-15.2	0.16	6’ASC	BLM	-	1
38-3-16.0	0.50	6”ASC	BLM	-	1
38-3-31.0	5.14	4”ASC	BLM	4” ASC	1
38-3-32.1	8.17	4”ASC	BLM	4”ASC	1
38-3-33.0A-E	5.10	BST	BLM	-	1
38-3-33.0F	3.90	8”PRR	BLM	-	1
38-4-25.0A	0.44	NAT	BLM	-	1
38-4-25.0B	0.26	NAT	PVT	-	1
38-4-25.0C	0.05	NAT	BLM	-	1
38-4-25.0D	0.09	NAT	PVT	-	1
38-4-25.0E	0.16	NAT	BLM	-	1
38-4-28.0	2.90	12”ASC	BLM	-	1
38-4-33.0	1.19	8”PRR	BLM	-	1
38-4-34.0	0.25	4”ASC	BLM	4” ASC / Gate	1
38-4-34.2	0.20	NAT	PVT	Barricade	1

Road Number	Approximate Length (miles)	Existing Surface: Depth (inches) and Type[1]	Control[2]	Possible Improvements: Depth (inches) And Type[3]	Seasonal Restriction[4] (for log hauling)
38-4-35.3A-B1	1.20	NAT	BLM	-	1
38-4-35.3B2	0.16	NAT	PVT	-	1
38-4-35.3B3-E	2.62	NAT	BLM	8” ASC on Seg C	1
38-4-35.4	1.20	6”ASC	BLM	-	1
38-4-36.0	1.11	NAT	PVT	4” ASC	1
38-4-36.1	1.47	NAT	PVT	4” ASC / Gate	1
39-3-5.4	0.48	4”ASC	BLM	-	1
39-3-6.0	1.83	NAT	BLM	-	1
39-3-6.1	0.96	NAT	BLM	-	1
39-4-1.0	0.46	6”ASC	BLM	-	1
39-4-3.0	1.17	6” ASC	BLM	-	1
Total Mileage:	54.28				

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

Table D2: Proposed new road construction in the project area.

Road Number	**Approximate Length (miles)**	**Existing Surface: Depth (inches) and Type[1]**	**Control [2]**	**Possible Improve-ments: Depth (inches) and Type[3]**	**Seasonal Restriction[4] (for log hauling)**
38-3-7.0	1.1	-	BLM	8” ASC	1
38-4-13.0	0.1	-	BLM	Barricade	1
38-4-34.0	0.9	-	BLM	8” ASC	1
38-4-34.1	0.7	-	BLM	8” ASC	1
38-4-34.2	0.2	-	BLM	-	1
38-4-36.1	0.6	-	BLM	4” ASC	1
39-4-11.1	0.3	-	BLM	Barricade	1
Total Mileage:	3.9				

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

Table D3: Proposed road decommissioning in the project area.

Road Number	Approximate Length (miles)	Existing Surface: Type[1]	Control[2]	Treatments[3]	Seasonal Restriction[4] (for log hauling)
38-3-16.0	0.8	ASC	BLM	MD remove 7 culverts	1
38-3-16.1	0.6	ASC	BLM	MD remove 6 culverts	1
39-4-1.0	1.5	ASC	BLM	MD remove 11 culverts	1
39-4-1.1	0.4	NAT	BLM	ND remove 1 culvert	1
39-4-12.0	1.9	NAT	BLM	MD/ND No Culverts	1
Jeep Rd. T39S R4W N1/2 Sec.12	0.9	NAT	BLM	ND No Culverts	1
Total Mileage:	6.1				

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

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

1) NAT = natural, ASC=Aggregate Surface Coarse
2) BLM = Bureau of Land Management.
3) ND=Natural Decommission, MD=Mechanical Decommission
4) 1 = hauling restricted between 10/15 and 5/15.

Alternative C - Variable Prescriptions With No New Roads

Table D4: Proposed improvements on existing roads that access the project area.

Road Number	Approximate Length (miles)	Existing Surface: Depth (inches) and Type[1]	Control[2]	Possible Improvements: Depth (inches) And Type[3]	Seasonal Restriction[4] (for log hauling)
38-3-5A-B1	0.81	BST	BLM	-	1
38-3-5.1	2.60	6”ASC	BLM	-	1
Jeep Rd T38S R3W Sec. 9, 15, 16, 21, 22	4.00	NAT	BLM	8” ASC / 0.5 miles	1
38-3-5.2A	1.19	6”ASC	BLM	-	1
38-3-7.0	0.92	6”ASC	BLM	4”ASC	1
38-3-7.1	2.00	NAT	BLM	-	1
38-3-8.0A	0.57	6”ASC	BLM	-	1
38-3-8.1	1.35	6”ASC	BLM	-	1
38-3-14.0A1	0.23	6”ASC	BLM	-	1
38-3-15.0	0.57	6’ASC	BLM	-	1
38-3-15.1	1.25	6”ASC	BLM	-	1
38-3-15.2	0.16	6’ASC	BLM	-	1
38-3-16.0	1.17	6”ASC	BLM	-	1
38-3-16.1	0.60	6”ASC	BLM	-	1
38-3-31.0	5.14	4”ASC	BLM	4” ASC	1
38-3-32.1	8.17	4”ASC	BLM	4”ASC	1
38-3-33.0A-E	5.10	BST	BLM	-	1
38-3-33.0F	3.90	8”PRR	BLM	-	1
38-4-25.0A	0.44	NAT	BLM	-	1
38-4-25.0B	0.26	NAT	PVT	-	1
38-4-25.0C	0.05	NAT	BLM	-	1
38-4-25.0D	0.09	NAT	PVT	-	1
38-4-25.0E	0.16	NAT	BLM	-	1
38-4-28.0	2.90	12”ASC	BLM	-	1
38-4-33.0	1.19	8”PRR	BLM	-	1
38-4-34.0	0.25	4”ASC	BLM	4” ASC / Gate	1

Road Number	Approximate Length (miles)	Existing Surface: Depth (inches) and Type[1]	Control[2]	Possible Improvements: Depth (inches) And Type[3]	Seasonal Restriction[4] (for log hauling)
38-4-34.2	0.20	NAT	PVT	Barricade	1
38-4-35.3A-B1	1.20	NAT	BLM	-	1
38-4-35.3B2	0.16	NAT	PVT	-	1
38-4-35.3B3-E	2.62	NAT	BLM	8” ASC on Seg C	1
38-4-35.4	1.20	6”ASC	BLM	-	1
38-4-36.0	1.11	NAT	PVT	4” ASC	1
38-4-36.1	1.47	NAT	PVT	4” ASC / Gate	1
39-3-5.4	0.48	4”ASC	BLM	-	1
39-3-6.0	1.83	NAT	BLM	-	1
39-3-6.1	0.96	NAT	BLM	-	1
39-4-1.0	0.46	6”ASC	BLM	-	1
39-4-3.0	1.17	6” ASC	BLM	-	1
Total Mileage:	57.93				

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

Table D5 : Proposed road decommissioning in the project area.

Road Number	Approximate Length (miles)	Existing Surface: Type[1]	Control[2]	Treatments[3]	Seasonal Restriction[4] (for log hauling)
39-4-1.0	1.5	ASC	BLM	MD remove 11 culverts	1
39-4-1.1	0.4	NAT	BLM	ND remove 1 culvert	1
39-4-12.0	1.9	NAT	BLM	MD/ND No Culverts	1
Jeep Rd. T39S R4W N1/2 Sec.12	0.9	NAT	BLM	ND No Culverts	1
Total Mileage:	4.7				

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

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

3) NAT = natural, ASC=Aggregate Surface Coarse
4) BLM = Bureau of Land Management.
5) ND=Natural Decommission, MD=Mechanical Decommission
4) 1 = hauling restricted between 10/15 and 5/15.

China Keeler Landscape Project
Appendix E

Analysis Of How The China Keeler Landscape Project Implements The Northwest Forest Plan Aquatic Conservation Strategy (ACS) Objectives

Relationship Between This Action and the Aquatic Conservation Strategy

The Northwest Forest Plan's (NWFP) Aquatic Conservation Strategy (ACS) has four components: Riparian Reserves, Key Watersheds, Watershed Analysis, and Watershed Restoration. It is guided by nine objectives which are meant to focus agency actions to protect ecological processes at the 5th-field hydrologic scale, or watershed[57]. How the four components of ACS relate to the Keeler Creek land sale is explained below:

1. Riparian Reserves: Riparian Reserve widths for streams, springs, wetlands, and unstable soils have been determined according to the protocol outlined in the NWFPs Aquatic Conservation Strategy. The Riparian Reserve width along each reach of stream is determined based on site potential tree. The height of a site potential tree is determined by soil type as outlined in the Jackson County soil survey. Riparian Reserve widths for shrublands defer to the minimum ROD widths: 150' for perennial streams and 100' for intermittent streams. Riparian Reserve widths for springs, wetlands and unstable soils also defer to the ROD. Riparian Reserve widths for streams in the following drainages are listed below.

Riparian Reserve widths for streams in the Chapman Keeler project area.

AM Number	Stream Name	Riparian Reserve widths	Riparian Reserve widths
		Fish-bearing	Non-fish-bearing
#0303	unnamed	not applicable	160'
#0306	China Gulch	not applicable	150', 140', 100'
#0309	unnamed	not applicable	160', 140'
#0315	unnamed	not applicable	200', 180', 160'
#0318	Chapman Creek	360'	180', 160', 140'
#0321	unnamed	not applicable	160', 140'
#0324	Keeler Creek	360'	180', 160'
#0327	unnamed	not applicable	160'
#0330	unnamed	not applicable	180'
#0336	unnamed	not applicable	160'
#0418	Lower Thompson	not applicable	150'
--	Applegate River	360'	not applicable

2. Key Watersheds: The Middle Applegate is not a Key Watershed.

3. Watershed Analysis: BLM completed a watershed analysis (Middle Applegate) in 1997.

4. Watershed Restoration: Most of the restoration activities in the Middle Applegate Watershed have focused on restoring fish passage to better habitat on federal lands and dealing with irrigation ditch issues. Projects by the local watershed council, ODFW and/or BLM include culvert removal and replacement, road decommissioning, irrigation ditch fish screens, flood berm removal, and riparian planting.

[57] November 9, 1999 Regional Ecosystem Office memorandum concerning NWFP requirements for ACS consistency determination.

Evaluation of This Action's Consistency with Northwest Forest Plan Aquatic Conservation Strategy Objectives

1. Maintain and restore the distribution, diversity, and complexity of watershed and **landscape-scale features** to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Topography, slope, forest fire regime, climate, and the distribution of soil types and plant communities are some of the landscape-scale features affecting aquatic systems in the Soda Creek watershed. One of the primary treatment objectives of the China-Keeler project is to compensate for an altered fire regime and restore certain plant communities. The intent of this objective is to try restore the function of landscape-scale processes like wildfire in order to protect the complexity and distribution of plant communities (including riparian areas) across the landscape.

2. Maintain and restore **spatial and temporal connectivity** within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

In the Middle Applegate watershed, BLM-managed land is concentrated in the steep slopes along the Applegate River. Here, connectivity along streams is the primary issue for aquatic species. Planned culvert removal and improvements in the China-Keeler project will restore or improve migration corridors within streams for fish or other aquatic species, improving their ability to thrive in these small streams, despite the alteration along the Applegate River. At the spatial scale of the watershed, these improvements may only affect those species that utilize both the mainstem river and these upstream areas, specifically cutthroat trout and steelhead.

3. Maintain and restore the **physical integrity** of the aquatic system, including shorelines, banks, and bottom configurations.

Removing or improving culverts will remove some artificial constraints on the shape of small streams in the China-Keeler project area. This will help restore the physical integrity of these streams. Otherwise, the activities in the China Keeler project have no influence on the physical integrity of streams: roads are not being constructed across channels, and vegetation management actions (thinning, burning, etc.) are not sufficient to change peak flows. BLM's actions, however, will be unnoticeable at the 5th field watershed scale, due to the extensive channel modification along the Applegate River, Thompson Creek, and Forest Creek.

4. Maintain and restore **water quality** necessary to support healthy riparian, aquatic and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

There would be no effect on water temperature, because shade would be maintained along all stream channels. There may be some small amount of fine sediment entering stream channels at culvert removal or replacement locations; however, this small amount of fine sediment should not be above normal turbidity levels if project BMPs and PDFs are implemented properly. Upland work will have no effect on fine sediment levels, due to the filtering action of Riparian Reserve buffers, extensive PDFs designed to prevent overland sediment movement, and normal BMPs. In addition, the road renovation and decommissioning will reduce fine sediment at many locations across the project area, reducing the cumulative amount of fine sediments reaching stream channels downstream. Culvert removal and improvement will reduce the risk of large sediment input from culvert "blow-outs." Any sediment increases resulting from the proposed road work would be minor relative to existing sediment levels and would be offset by the substantial sediment decreased resulting from road renovation and decommissioning. This will ultimately benefit aquatic systems. The beneficial effects of these actions would be unnoticable at the large spatial scale of the Middle Applegate watershed, due to continuing water quality problems from historical and present-day activities.

5. Maintain and restore the **sediment regime** under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Improved roads and culverts would decrease fine sediment input to the system. Improved or removed culverts would also restore natural sediment routing at those locations. These improvements are too minor to be noticed at the watershed scale. Also see ACS Objective #4.

6. Maintain and restore **instream flows** sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Peak flows and summer low flows are unlikely to be affected by the China Keeler project. Please see the Hydrology report for details. Any effects on stream flow from the China Keeler project would be too insignificant to be noticeable at the watershed scale. Water withdrawals for agriculture and residential use and the Applegate Dam have the most significant impacts to mainstem river flows.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in **meadows and wetlands**.

Most of the Riparian Reserves remain untreated in the China Keeler project, therefore, any additional water released would likely be used by these trees and riparian vegetation along channels. It is very unlikely that the few riparian meadows and wet areas will experience any restoration of water table inundation. The few (~160) Riparian Reserve acres planned for non-commercial understory thinning are along steep-gradient streams. Any extra water in the soil would be used by the remaining trees and shrubs and would not be measurable in the adjacent streams. At the watershed scale, the adverse impacts from over a century of road network development, agricultural irrigation, and settlement in the Applegate River's floodplain dwarf any impacts from the China Keeler Project.

8. Maintain and restore the species composition and structural diversity of **plant communities in riparian areas** and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of **coarse woody debris** sufficient to sustain physical complexity and stability.

For the most part, Riparian Reserves will be left completely alone; therefore, their current condition will be maintained. The non-commercial thinning and/or underburning (in shrub communities) in Riparian Reserves is designed to restore the species composition and structural diversity of riparian plant communities. This includes forbs, grasses, shrubs and trees; snags, "old-growth," and thickets of young trees; rotten logs and newly-downed wood of various sizes. Thinning competing small-diameter Doug-fir from larger riparian trees may improve the long-term supply of coarse woody debris at a few sites. However, the mainstem Applegate River will remain unaffected by these improvements.

9. Maintain and restore **habitat** to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

The treated Riparian Reserves were chosen carefully to restore habitat and riparian function at those sites. Otherwise, Riparian Reserves remain untreated. Untreated Reserves include those with special plant and animal protected areas. The intent is to provide habitat for both species with small home ranges as well as those with large home ranges. Species that must move across the highly developed Applegate River floodplain may not be benefitted by riparian condition in the China Keeler area.

Evaluation of This Action's Consistency with Northwest Forest Plan Standards and Guidelines

The Northwest Forest Plan contains standards and guidelines designed to reduce the impacts of various management activities on aquatic organisms. All of these Standards and Guidelines were reviewed and applied to the proposed actions as appropriate.

Evaluation of This Actions' Consistency with NMFS' March 18, 1997 RMP Biological Opinion (RMP BO)

Conservation Recommendations

The Middle Applegate Watershed Analysis (USDI 1995) included assessments of the aquatic ecosystem which, by nature addresses salmonid conservation as a main issue. This is consistent with the RMP BO Conservation Recommendation #3, page #47. The completed WA also included recommendations for restoration projects, such as road decommissioning. This is consistent with the RMP BO Conservation Recommendations #5 and #6. Priority roads were identified and proposed for decommissioning under the China Keeler Landscape Project. This is consistent with Conservation Recommendation #11. Based on the China Keeler's consistency with ACS objectives, Conservation Recommendation #13 is also met. No other Conservation Recommendations apply to the China Keeler Landscape Project.

Reasonable and Prudent Measures

During the Watershed Analysis and project design project the interdisciplinary teams ensured that the proposed actions are fully consistent with applicable Northwest Forest Plan Standards and Guidelines and ACS objectives. This is consistent with Reasonable and Prudent Measure (RPM) #1. The proposed project has been evaluated using the Matrix of Pathways and Indicators and was reviewed by the Rogue/South Coast Level 1 Team. This is consistent with RPM #2. All road work (roads, spurs, landings, road decommissioning, and culvert replacements) would take place during the dry season, utilize Best Management Practices, and would be limited to stable areas to minimize or eliminate adverse effects to the aquatic system. This is consistent with RPM #8. No other RMPs apply to this proposed action.

Terms and Conditions

All ground-disturbing activities in the China Keeler Landscape Project are limited to stable areas. This is consistent with Term and Condition #8b. No other Terms and Conditions apply to the this proposed action.

China Keeler Landscape Project
Appendix F

Non Commercial Fuel Reduction Prescriptions

General Prescription Guidelines for China Keeler Non Conifer Treatments

The lower reaches of the planning area are dominated by Chaparral plant communities dominated by buckbrush (*Ceanothus cuneatus*) and whiteleaf manzanita (*Arctostaphylos viscida*). White oak, black oak and pacific madrone are also found within the communities and in more mesic sites, but are not as common. The higher south facing nonforest communities are a mosaic of white oaks, pacific madrone, manzanita, poison oak and mahogany. Some grass meadows are found interspersed as well. Occurrence of young Doug-fir that have moved into non-forest plant communities due to fire exclusion is common. Currently, many of these young trees are dying due to prevalent Douglas fir twig weevil (*Cylindrocopturus furnissi*) that is a manifestation of drought stressed conifers occurring on non-conifer sites. Pondrosa pine will be retained where found. All variants of non-forest communites are found throughout China Keeler. However, species composition tends to change with increasing elevation.

Retention of hardwoods will be an important priority in prescription development. Hardwoods will generally not be cut. Most of these species are sprouters and removal of the tree form would promote increased densities. Slashing of shrubs will occur to reduce ladder fuels and competition around hardwoods. Small leave clumps of untreated vegetation will be interspersed and varied spatially with treated areas and large 3-5 acre leave islands for wildlife habitat cover. Riparian buffers will be retained in either an untreated or reduced treatment state. Upper steeper non conifer communities will usually be slashed and burned manually while flatter more accessible terrain, generally found at the lower elevations in China Keeler will be slashbusted. Slashbusting occurring on sensitive soils will take place only when soil moisture is low to prevent compaction. Chaparral communities with little or no hardwood component will be control burned when possible in order to mimic historic conditions. Fall would be the preferred time for burning provided the location and other weather factors allow for safety. Regardless of treatment method, areas with a native grass component will be avoided in order to reduce impact and retain seed banks.

Native Bunchgrasses.

After treatment, seeding with native perennial bunchgrasses will be considered and implemented if necessary regardless of treatment method. Observations of several previously treated units indicates that the presence of healthy bunchgrasse populations before treatment is a major determinant in whether post treatment sites will have native bunchgrasses. Because of this, priority for grass seeding is assigned to units with either no significant herbaceous understory or native seed bank (i. e. dense shrublands) or areas that have already been invaded by weedy species. Further research is needed to determine the effectiveness of seeding in these types of situations.

WOODLAND PRESCRIPTION - HIGH LEVEL THINNING

Target Plant Community: the full range of woodlands

Goal

1. reduce fuels and hence fire-hazard in close proximity to private property
2. prepare units for follow-up underburning

Description

This prescription is aimed at reducing fire-hazard within extended areas adjacent to fire-buffers, or public holdings. Depending on initial conditions, the resultant stands may be heavily thinned, and show a large reduction in shrub and tree canopy. This open structure, together with the use of pile burns for reducing slash, will induce germination of the shrub seedbank. Underburning will be required for maintaining these sites in a low-fuel condition.

Prescription Objectives

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

2. Slash all Douglas-fir trees less than 8 inches dbh

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

4. Areas selected for no-treatment shall be approximately 1-3 acres and shall be left throughout the unit at 1 acre per 5-10 acres of unit size. Areas for no-treatment shall be placed greater than 100 feet from the unit perimeter. These may be used for monitoring in the future.

5. Prune all conifers greater than 8 inches dbh up 10 feet in height.

6. No girdling shall be used.

7. Conifer, Hardwood and brush snags less than 6 inches dbh shall be felled. Larger snags shall only be felled for crew safety reasons.

WOODLAND PRESCRIPTION - NO HARDWOOD / INTENSE SHRUB THIN

Target Plant Community: woodlands with at least 30% cover by shrubs

Goal

1. create low-fuel areas for protection of private property
2. restore herbaceous plant communities
3. increase vigor and acorn production of hardwoods
4. prepare the unit for maintenance under burning
5. restore balance of conditions within the project area
6. retain hardwood canopy cover for wildlife/native herbaceous component/aesthetic reasons

Description

Woodlands contain a range of herbaceous, shrub and tree plant species. Because of fire suppression, conifer and shrub species have encroached upon the woodlands, and have reduced the abundance of herbaceous species in the understory. Reproduction and vigor of the hardwoods (most noticeably oak species) has also declined.

Removal of the shrubs will reduce competition for nutrient and water resources. Together with increased sunlight, increased resources will improve the vigor of hardwoods and acorn production. The shrub component will maintained by germination of the seedbank, as well as resprouting from shrubs cut 2 feet above the ground.

Introduction of oak sprouts will be achieved by using future broadcast burn. Fire will kill some oak trees, especially those of low vigor. Together with sexual reproduction, coppicing from these stumps will reintroduce a new age class to the oak stand.

Prescription Objectives

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

2. Slash all Douglas-fir trees less than 8 inches dbh

3. Slash all manzanita less than 12 inches diameter (at ground level).

4. Slash all remaining brush species less than 12 inches main stem diameter (at ground level) under or within 10 feet of the crowns of conifers and hardwoods. Slash all brush beyond 10 feet of conifer and hardwood crowns to a 20 foot spacing. Beyond 10 feet from hardwood canopies, slash 1 in 5 ceanothus shrub species at 2 feet above the ground, instead of the usual ground-level. Favor deerbrush, wedgeleaf, silk tassel and other species, respectively, for slashing.

5. No-treatment zones shall be approximately 350 feet by 125 feet (approximately one acre) and shall be left throughout the unit at 1 per 10 acres of unit size. No zone shall be placed within 125 feet of the perimeter of the unit. These will be used for monitoring in the future.

7. Prune all conifers greater than 8 inches dbh up 10 feet in height.

8. No girdling shall be used.

9. Snags shall only be felled for crew safety reasons.

SHRUBLAND PRESCRIPTION - INTENSE PATCHY BROADCAST BURN

Target Plant Community: Manzanita/Ceanothus shrublands with less than 2% hardwood canopy cover in a non soil erosive setting.

Goals

1. Create ridgetop fire-buffers within dense manzanita or ceanothus stands

Description

Shrub stands with a low canopy cover by hardwoods can be converted to grassland by using a heli-torch, or conventional drip torch. This prescription will only be used on strategic ridgetops. A small return interval (3 to 7 years) will be required to maintain these areas as herbaceous dominated.

Prescription Objectives

- up to 90% canopy reduction over unit
- up to 100% canopy reduction of shrubs within 150 feet of ridgetops
- areas of long-term shrub domination may need post fire seeding with native plant species
- return fire interval of more historical character

GRASSLAND PRESCRIPTION - GRASSLAND MAINTENANCE

Target Plant Community: Herbaceous dominated (>50%) grassland/shrublands on non-erosive soils/topography

Goals

1. reduce shrub by up to 100% to create fire-safe areas
2. maintain grasslands

Description

Grasslands are continuously being lost to shrub encroachment. In pre-fire-suppression times, fire naturally kept such areas in a state of herbaceous (grass and forb) domination. In grasslands with native species, broadcast fire will be prescribed in the fall. In areas where the herbaceous component is dominated by annual grasses (cheatgrass and medusahead), broadcast fire will be prescribed in the early spring. Correct timing will reduce annual grasses, but maintain existing native perennial grasses. Treatments will be applied to ridgetop areas identified as suitable grassland areas. Seeding with native grasses and forbs may be necessary.

Prescription Objectives

-return interval of <5 years

Unit	Proposed Treatments for Woodland/Shrubland/Grass	Method	Acres
1	Mix of species - oak & madrone dominant	Slashbuster	33
2	Manzanita, buck brush ceanothus	Slashbuster/manual	188
3	Manzanita, buck brush ceanothus	Manual	8
4	China Gulch Meadow, star thistle, grass, OHV trails	Manual	23
5	Oak, madrone, manzanita, buck brush ceanothus	Broadcast burn/manual	45
6	Oak, madrone, buck brush ceanothus	Manual	126
7	Oak, buck brush ceanothus	Slashbuster	40
8	Oak, madrone, manzanita, buck brush ceanothus	Manual	33
9	Steep - manzanita, buck brush, grass - some oak & madrone	Broadcast burn/manual	42
10	Steep - manzanita, buck brush, grass - some oak & madrone	Broadcast burn/manual	70
	Total Proposed Treatments for Woodland/Shrubland		**607**

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China Keeler Landscape Project
Appendix G

Acronyms and Glossary

Appendix G
Acronyms and Glossary of Terms

Acronyms/Abbreviations

AMA - Adaptive Management Area
CT - Commercial thinning
CWD - Coarse Woody Debris
DBH - Diameter at breast height
GFMA - General Forest Management Area
IDT - Interdisciplinary team
LSR(s) - Late Successional Reserve(s)
LUA - Land Use Allocation
MBF - Thousand Board Feet
NEPA - National Environmental Policy Act
PCT - Precommercial thinning
RMP - Resource Management Plan
ROD - Record of Decision
T&E - Threatened and endangered (species)

Glossary

(From Medford District RMP)

Adaptive Management Areas - Landscape units designated for development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives.

Age Class - One of the intervals into which the age range of trees is divided for classification or use.

Allowable Sale Quantity (ASQ) - The gross amount of timber volume, including salvage, that may be sold annually from a specified area over a stated period of time in accordance with the management plan. Formerly referred to as "allowable cut."

Anadromous Fish - Fish that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce. Salmon, steelhead, and shad are examples.

Aquatic Ecosystem - Any body of water, such as a stream, lake, or estuary, and all organisms and nonliving components within it, functioning as a natural system.

Aquatic Habitat - Habitat that occurs in free water.

Biological Diversity - The variety of life and its processes.

Bureau Assessment Species - Plant and animal species on
List 2 of the Oregon Natural Heritage Data Base, or those species on the Oregon List of Sensitive Wildlife Species (OAR 635-100-040), which are identified in BLM Instruction Memo No. OR-91-57, and are not included as federal candidate, state listed or Bureau sensitive species.

Bureau Sensitive Species - Plant or animal species eligible for federal listed, federal candidate, state listed, or state candidate (plant) status, or on List 1 in the Oregon Natural Heritage Data Base, or approved for this category by the State Director.

Candidate Species - Those plants and animals included in Federal Register "Notices of Review" that are being considered by the Fish and Wildlife Service (FWS) for listing as threatened or endangered. There are two categories that are of primary concern to BLM. These are:
Category 1. Taxa for which the Fish and Wildlife Service has substantial information on hand to support proposing the species for listing as threatened or endangered. Listing proposals are either being prepared or have been delayed by higher priority listing work. Category 2. Taxa for which the Fish and Wildlife Service has information to indicate that listing is possibly appropriate. Additional information is being collected.

Canopy - The cover of branches and foliage formed collectively by adjacent trees and other woody species in a forest stand. Where significant height differences occur between trees within a stand, formation of a multiple canopy (multi-layered) condition can result.

Climax Plant Community - The theoretical, final stable, self-sustaining and self reproducing state of plant community development that culminates plant succession on any given site. Given a long period of time between disturbances, plant associations on similar sites under similar climatic conditions approach the same species mixture and structure. Under natural conditions, disturbance events of various intensities and frequencies result in succession usually culminating as sub-climax with the theoretical end point occurring rarely of at all.

Coarse Woody Debris - Portion of tree that has fallen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter.
FEMAT

Commercial Thinning - The removal of merchantable trees from an even-aged stand to encourage growth of the remaining trees.
Connectivity - A measure of the extent to which conditions between late-successional/old-growth forest areas provide habitat for breeding, feeding, dispersal, and movement of late-successional/old-growth-associated wildlife and fish species.
Cover - Vegetation used by wildlife for protection from predators, or to mitigate weather conditions, or to reproduce. May also refer to the protection of the soil and the shading provided to herbs and forbs by vegetation.
Critical Habitat - Under the Endangered Species Act, (1) the specific areas within the geographic area occupied by a federally listed species on which are found physical and biological features essential to the conservation of the species, and that may require special management considerations or protection; and (2) specific areas outside the geographic area occupied by a listed species when it is determined that such areas are essential for the conservation of the species.
Cultural Resource - Any definite location of past human activity identifiable through field survey, historical documentation, or oral evidence; includes archaeological or architectural sites, structures, or places, and places of traditional cultural or religious importance to specified groups whether or not represented by physical remains.
Cultural Site - Any location that includes prehistoric and/or historic evidence of human use or that has important sociocultural value.
Cumulative Effect - The impact which results from identified actions when they are added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.
Density Management - Cutting of trees for the primary purpose of widening their spacing so that growth of remaining trees can be accelerated. Density management harvest can also be used to improve forest health, to open the forest canopy, or to accelerate the attainment of old growth characteristics if maintenance or restoration of biological diversity is the objective.
Designated Area - An area identified in the Oregon Smoke Management Plan as a principal population center requiring protection under state air quality laws or regulations.
Developed Recreation Site - A site developed with permanent facilities designed to accommodate recreation use.
Diameter At Breast Height (DBH) - The diameter of a tree 4.5 feet above the ground on the uphill side of the tree.
Ecosystem Diversity - The variety of species and ecological processes that occur in different physical settings.
Ecosystem Management - The management of lands and their resources to meet objectives based on their whole ecosystem function rather than on their character in isolation. Management objectives blend long-term needs of people and environmental values in such a way that the lands will support diverse, healthy, productive and sustainable ecosystems.
Endangered Species - Any species defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range and published in the Federal Register.
Environmental Assessment (EA) - A systematic analysis of site-specific BLM activities used to determine whether such activities have a significant effect on the quality of the human environment and whether a formal environmental impact statement is required; and to aid an agency's compliance with National Environmental Protection Agency when no Environmental Impact Statement is necessary.
Environmental Impact - The positive or negative effect of any action upon a given area or resource.
Ephemeral Stream - Streams that contain running water only sporadically, such as during and following storm events.
Forest Canopy - The cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth.
Forest Health - The ability of forest ecosystems to remain productive, resilient, and stable over time and to withstand the effects of periodic natural or human-caused stresses such as drought, insect attack, disease, climatic changes,

flood, resource management practices and resource demands.

Forest Land - Land that is now, or is capable of becoming, at least ten percent stocked with forest trees and that has not been developed for nontimber use.

Forest Succession - The orderly process of change in a forest as one plant community or stand condition is replaced by another, evolving towards the climax type of vegetation.

General Forest Management Area - Forest land managed on a regeneration harvest cycle of 70-110 years. A biological legacy of six to eight green trees per acre would be retained to assure forest health. Commercial thinning would be applied where practicable and where research indicates there would be gains in timber production.

Genetic Diversity - The variety within populations of a species.

Habitat Diversity - The number of different types of habitat within a given area.

Historic Site - A cultural resource resulting from activities or events dating to the historic period (generally post AD l830 in western Oregon).

Impact - A spatial or temporal change in the environment caused by human activity.

Intact Old Growth Habitat - Older forest types that have not been entered for logging or are lightly entered such that structural and functional characteristics of the forest are essentially unchanged, except in relation to the size of the habitat island. Typically, forests of coniferous series with crown closure above 70 percent. Also includes low site lands lacking the ecological potential to produce older forest habitat characteristics.

Intermittent Stream - Any nonpermanent flowing drainage feature having a definable channel and evidence of scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two criteria.

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

Landing - Any place on or adjacent to the logging site where logs are assembled for further transport.

Landscape Diversity - The size, shape and connectivity of different ecosystems across a large area.

Landscape Ecology - Principles and theories for understanding the structure, functioning, and change of landscapes over time. Specifically it considers (1) the development and dynamics of spatial heterogeneity, (2) interactions and exchanges across heterogeneous landscapes, (3) the influences of spatial heterogeneity on biotic and abiotic processes, and (4) the management of spatial heterogeneity. The consideration of spatial patterns distinguishes landscape ecology from traditional ecological studies, which frequently assume that systems are spatially homogeneous.

Landscape Pattern - The number, frequency, size, and juxtaposition of landscape elements (patches) which are important to the determination or interpretation of ecological processes.

Late-Successional Forests - Forest seral stages which include mature and old-growth age classes.

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

Log Decomposition Class - Any of five stages of deterioration of logs in the forest; stages range from essentially sound (class 1) to almost total decomposition (class 5).

Long-Term - The period starting ten years following implementation of the Resource Management Plan. For most analyses, long-term impacts are defined as those existing 100 years after implementation.

Long-Term Soil Productivity - The capability of soil to sustain inherent, natural growth potential of plants and plant communities over time.

Matrix Lands - Federal land outside of reserves and special management areas that will be available for timber harvest at varying levels.

Mature Stand - A mappable stand of trees for which the annual net rate of growth has peaked. Stands are generally greater than 80-100 years old and less than 180-200 years old. Stand age, diameter of dominant trees, and stand structure

at maturity vary by forest cover types and local site conditions. Mature stands generally contain trees with a small average diameter, less age class variation, and less structural complexity than old-growth stands of the same forest type. Mature stages of some forest types are suitable habitat for spotted owls. However, mature forests are not always spotted owl habitat, and spotted owl habitat is not always mature forest.

Mining Claims - Portions of public lands claimed for possession of locatable mineral deposits, by locating and recording under established rules and pursuant to the 1872 Mining Law.

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

Monitoring - The process of collecting information to evaluate if objectives and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.

Multi-aged Stand - A forest stand which has more than one distinct age class arising from specific disturbance and regeneration events at various times. These stands normally will have multi-layered structure.

Multi-layered Canopy - Forest stands with two or more distinct tree layers in the canopy; also called multi-storied stands.

Multiple Use - Management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people. The use of some land for less than all of the resources; a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife, fish, and natural scenic, scientific and historical values.

Neotropical migrants - a wide variety of bird species, which breed in temperate North America but migrate to tropical habitats in Central and South America during winter.

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

Noncommercial Tree Species - Minor conifer and hardwood species whose yields are not reflected in the commercial conifer forest land ASQ. Some species may be managed and sold under a suitable woodland ASQ and, therefore, may be commercial as a woodland species.

Nonforest Land - Land developed for nontimber uses or land incapable of being ten percent stocked with forest trees.

Noxious Plant - A plant specified by law as being especially undesirable, troublesome, and difficult to control.

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

Off Highway Vehicle (OHV) - Any motorized vehicle capable of, or designed for, travel on land, water, or natural terrain. The term “Off Highway Vehicle” will be used in place of the term “Off Road Vehicle” to comply with the Purposes of Executive Orders 11644 and 11989. The definition for both terms is the same.

Old-Growth Conifer Stand - Older forests occurring on western hemlock, mixed conifer, or mixed evergreen sites which differ significantly from younger forests in structure, ecological function and species composition. Old growth characteristics begin to appear in unmanaged forests at 175-250 years of age. These characteristics include (a) a patchy, multi-layered canopy with trees of several age classes; (b) the presence of large living trees; (c) the presence of larger standing dead trees (snags) and down woody debris, and (d) the presence of species and functional processes which are representative of the potential natural community.

For purposes of inventory, old-growth stands on BLM-administered lands are only identified if they are at least ten percent stocked with trees of 200 years or older and are ten acres or more in size. For purposes of habitat or biological

diversity, the BLM uses the appropriate minimum and average definitions provided by Pacific Northwest Experiment Station publications 447 and GTR-285. This definition is summarized from the 1986 interim definitions of the Old-Growth Definitions Task Group.

Old-Growth Forest - A forest stand usually at least 180-220 years old with moderate high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground.

Old-Growth-Dependent Species - An animal species so adapted that it exists primarily in old growth forests or is dependent on certain attributes provided in older forests.

Operations Inventory Unit - An aggregation of trees occupying an area that is sufficiently uniform in composition, age, arrangement and condition to be distinguishable from vegetation on adjoining areas.

Optimal Cover - For elk, cover used to hide from predators and avoid disturbances, including man. It consists of a forest stand with four layers and an overstory canopy which can intercept and hold a substantial amount of snow, yet has dispersed, small openings. It is generally achieved when the dominant trees average 21 inches DBH or greater and have 70 percent or greater crown closure.

Overstory - That portion of trees which form the uppermost layer in a forest stand which consists of more than one distinct layer (canopy).

Partial Cutting - Removal of selected trees from a forest stand.

Peak Flow - The highest amount of stream or river flow occurring in a year or from a single storm event.

Perennial Stream - A stream that has running water on a year-round basis under normal climatic conditions.

Planning Area - All of the lands within the BLM management boundary addressed in a BLM resource management plan; however, BLM planning decisions apply only to BLM-administered lands and mineral estate.

Plant Association - A plant community type based on land management potential, successional patterns and species composition.

Plant Community - An association of plants of various species found growing together in different areas with similar site characteristics.

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

Prescribed Fire - A fire burning under specified conditions that will accomplish certain planned objectives.

Priority Habitats - Aquatic, wetland and riparian habitats, and habitats of priority animal taxa.

Probable Sale Quantity (PSQ) - Probable sale quantity estimates the allowable harvest levels for the various alternatives that could be maintained without decline over the long term if the schedule of harvests and regeneration were followed. “Allowable” was changed to “probable” to reflect uncertainty in the calculations for some alternatives. Probable sale quantity is otherwise comparable to allowable sale quantity (ASQ). However, probable sale quantity does not reflect a commitment to a specific cut level. Probable sale quantity includes only scheduled or regulated yields and does not include “other wood” or volume of cull and other products that are not normally part of allowable sale quantity calculations.

Proposed Threatened or Endangered Species - Plant or animal species proposed by the U.S. Fish & Wildlife Service or National Marine Fisheries Service to be biologically appropriate for listing as threatened or endangered, and published in the Federal Register. It is not a final designation.

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

Public Water System - A system providing piped water for public consumption. Such a system has at least fifteen service connections or regularly serves at least twenty-five individuals.

Reforestation - The natural or artificial restocking of an area with forest trees; most commonly used in reference to artificial stocking.

Regeneration Harvest - Timber harvest conducted with the partial objective of opening a forest stand to the point where favored tree species will be reestablished.

Resource Management Plan (RMP) - A land use plan prepared by the BLM under current regulations in accordance with the Federal Land Policy and Management Act.

Right-of-Way - A permit or an easement that authorizes the use of public lands for specified purposes, such as pipelines, roads, telephone lines, electric lines, reservoirs, and the lands covered by such an easement or permit.

Riparian Reserves - Designated riparian areas found outside Late-Successional Reserves.

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

Ripping - The process of breaking up or loosening compacted soil to assure better penetration of roots, lower soil density, and increased microbial and invertebrate activity.

Road - A vehicle route which has been improved and maintained by mechanical means to ensure relatively regular and continuous use. A route maintained solely by the passage of vehicles does not constitute a road.

Rotation - The planned number of years between establishment of a forest stand and its regeneration harvest.

Rural Interface Areas - Areas where BLM-administered lands are adjacent to or intermingled with privately owned lands zoned for 1 to 20-acre lots or that already have residential development.

Sanitation-Salvage Cuttings - Combination of sanitation and salvage cuttings. In sanitation cuts trees either killer or injured by fire, insects, disease, etc., are removed for the purpose of preventing the spread of insect or disease. Salvage cut remove trees that are either filled or severely injured before merchantable material becomes unmerchantable.

Scarification - Mechanical removal of competing vegetation or interfering debris prior to planting.

Seral Stages - The series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage. There are five stages:

Early Seral Stage - The period from disturbance to the time when crowns close and conifers or hardwoods dominate the site. Under the current forest management regime, the duration is approximately 0 to 10 years. This stage may be dominated by grasses and forbs or by sprouting brush or hardwoods. Conifers develop slowly at first and gradually replace grasses, forbs, or brush as the dominant vegetation. Forage may be present; hiding or thermal cover may not be present except in rapidly sprouting brush communities.

Mid-Seral Stage - The mid-seral stage occurs from crown closure to the time when conifers would begin to die from competition; approximately age 10 to 40. Stands are dense and dominated by conifers, hardwoods, or dense brush. Grass, forbs, and herbaceous vegetation decrease. Hiding cover for big game is usually present.

Late Seral Stage - Late seral stage occurs when conifers would begin to die from competition to the time when stand growth slows; approximately age 40 to 80. Forest stands are dominated by conifers or hardwoods; canopy closure often approaches 100 percent. Stand diversity is minimal; conifer mortality rates and snag formation are rapid. Big game hiding and thermal cover is present. Forage and understory vegetation is minimal except in understocked stands or in meadow inclusions.

Mature Seral Stage - This stage exists from the point where stand growth slows to the time when the forest develops structural diversity; approximately age 80 to 200. Conifer and hardwood growth gradually decline. Developmental change slows. Larger trees increase significantly in size. Stand diversity gradually increases. Big game hiding cover, thermal cover, and some forage are present. With slowing growth, insect damage increases and stand breakup may begin on drier sites.

Understory development is significant in response to openings in the canopy created by disease, insects, and windthrow. Vertical diversity increases. Larger snags are formed.
Old Growth - This stage constitutes the potential plant community capable of existing on a site given the frequency of natural disturbance events. For forest communities, this stage exists from approximately age 200 until when stand replacement occurs and secondary succession begins again. (Also see definitions of old-growth conifer stand and potential natural community.)
These definitions are used by BLM to separate age classes for analysis of impacts.

Short-Term - The period of time during which the RMP will be implemented; assumed to be ten years.

Silvicultural Prescription - A professional plan for controlling the establishment, composition, constitution and growth of forests.

Silvicultural System - A planned sequence of treatments over the entire life of a forest stand needed to meet management objectives.

Site Class - A measure of an areas relative capacity for producing timber or other vegetation.

Site Index - A measure of forest productivity expressed as the height of the tallest trees in a stand at an index age.

Site Preparation - Any action taken in conjunction with a reforestation effort (natural or artificial) to create an environment which is favorable for survival of suitable trees during the first growing season. This environment can be created by altering ground cover, soil or microsite conditions, using biological, mechanical, or manual clearing, prescribed burns, herbicides or a combination of methods.

Skid Trail - A pathway created by dragging logs to a landing (gathering point).

Slash - The branches, bark, tops, cull logs, and broken or uprooted trees left on the ground after logging.

Smoke Management - Conducting a prescribed fire under suitable fuel moisture and meteorological conditions with firing techniques that keep smoke impact on the environment within designated limits.

Smoke Management Program - A program designed to ensure that smoke impacts on air quality from agricultural or forestry burning operations are minimized; that impacts do not exceed, or significantly contribute to, violations of air quality standards or visibility protection guidelines; and that necessary open burning can be accomplished to achieve land management goals.

Smoke Sensitive Area - An area identified by the Oregon Smoke Management Plan that may be negatively affected by smoke but is not classified as a designated area.

Snag - Any standing dead, partially-dead, or defective (cull) tree at least ten inches in diameter at breast height (DBH) and at least six feet tall. A hard snag is composed primarily of sound wood, generally merchantable. A soft snag is composed primarily of wood in advanced stages of decay and deterioration, generally not merchantable.

Snag Dependent Species - Birds and animals dependent on snags for nesting, roosting, or foraging habitat.

Soil Compaction - An increase in bulk density (weight per unit volume) and a decrease in soil porosity resulting from applied loads, vibration, or pressure.

Soil Displacement - The removal and horizontal movement of soil from one place to another by mechanical forces such as a blade.

Soil Productivity - Capacity or suitability of a soil for establishment and growth of a specified crop or plant species, primarily through nutrient availability.

Special Forest Products - Firewood, shake bolts, mushrooms, ferns, floral greens, berries, mosses, bark, grasses etc., that could be harvested in accordance with the objectives and guidelines in the proposed resource management plan.

Special Status Species - Plant or animal species falling in any of the following categories (see separate glossary definitions for each):
- Threatened or Endangered Species
- Proposed Threatened or Endangered Species
- Candidate Species
- State Listed Species
- Bureau Sensitive Species
- Bureau Assessment Species

Species Diversity - The number, different kinds, and relative abundance of species.

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

Stand Density - An expression of the number and size of trees on a forest site. May be expressed in terms of numbers of trees per acre, basal area, stand density index, or relative density index.

Stand-replacement Wildfire - A wildfire that kills nearly 100 percent of the stand.

State Listed Species - Plant or animal species listed by the State of Oregon as threatened or endangered pursuant to ORS 496.004, ORS 498.026, or ORS 564.040.

Stem Exclusion Stage - The stage in forest development when new stems are prevented from successfully invading, and because some existing stems die are thus excluded from the stand. At this stage the stand appears to have a closed forest canopy layer.

Stream Class - A system of stream classification established in the Oregon Forest Practices Act. Class I streams are those which are significant for: 1) domestic use, 2) angling, 3) water dependent recreation, and 4) spawning, rearing or migration of anadromous or game fish. All other streams are Class II. Class II special protection streams (Class II SP) are Class II streams which have a significant summertime cooling influence on downstream Class I waters which are at or near a temperature at which production of anadromous or game fish is limited. Revised Forest Practices Act may have a new system within a year.

Stream Order - A hydrologic system of stream classification based on stream branching. Each small unbranched tributary is a first order stream. Two first order streams join to make a second order stream. Two second order streams join to form a third order stream and so forth.

Stream Reach - An individual first order stream or a segment of another stream that has beginning and ending points at a stream confluence. Reach end points are normally designated where a tributary confluence changes the channel character or order. Although reaches identified by BLM are variable in length, they normally have a range of ½ to 1-1/2 miles in length unless channel character, confluence distribution, or management considerations require variance.

Structural Diversity - Variety in a forest stand that results from layering or tiering of the canopy and the die-back, death and ultimate decay of trees. In aquatic habitats, the presence of a variety of structural features such as logs and boulders that create a variety of habitat.

Succession - A series of dynamic changes by which one group of organisms succeeds another through stages leading to potential natural community or climax. An example is the development of series of plant communities (called seral stages) following a major disturbance.

Suitable Woodland - Forest land occupied by minor conifer and hardwood species not considered in the commercial forest land ASQ determination and referred to as noncommercial species. These species may be considered commercial for fuelwood, etc. under woodland management. Also included are low site and nonsuitable commercial forest land. These lands must be biologically and environmentally capable of supporting a sustained yield of forest products.

Surface Erosion - The detachment and transport of soil particles by wind, water, or gravity. Surface erosion can occur as the loss of soil in a uniform layer (sheet erosion), in many rills, or by dry ravel.

Thermal Cover - Cover used by animals to lessen the effects of weather. For elk, a stand of conifer trees which are 40 feet or more tall with an average crown closure of 70 percent or more. For deer, cover may include saplings, shrubs or trees at least five feet tall with 75 percent crown closure.

Threatened Species - Any species defined through the Endangered Species Act as likely to become endangered within the foreseeable future throughout all or a significant portion of its range and published in the Federal Register.

Timber Production Capability Classification (TPCC) - The process of partitioning forestland into major classes indicating relative suitability to produce timber on a sustained yield basis.

Transportation System - Network of roads used to manage BLM-administered lands. Includes BLM controlled roads and some

privately controlled roads. Does not include Oregon Department of Transportation, county and municipal roads.

Understory - That portion of trees or other woody vegetation which form the lower layer in a forest stand which consists of more than one distinct layer (canopy).

Understory Reinitiation Stage - The stage in forest development when overstory trees start declining in vigor and mortality may occur. This provides growing space for herbaceous, shrub and tree species in the understory hence the reinitiated understory.

Vegetation Condition Class - The BLM Medford District Watershed Analysis Committee designated 8 vegetation condition classes to describe the types of and size of vegetation present on the landscape. The condition classes are as follows: grass and herbaceous vegetation; shrub lands; Hardwood/Woodlands; early seral stage trees (0 to 5 years of age); seedlings/saplings (0 to 4.9 inches DBH); poles (5 to 11 inches DBH); mid (11 to 21 inches DBH); and mature/Old-growth (21 inches DBH and larger trees).

Viable Population - A wildlife or plant population that contains an adequate number of reproductive individuals to appropriately ensure the long-term existence of the species.

Viewshed - The landscape that can be directly seen from a viewpoint or along a transportation corridor.

Visual Resources - The visible physical features of a landscape.

Visual Resource Management (VRM) - The inventory and planning actions to identify visual values and establish objectives for managing those values and the management actions to achieve visual management objectives.

Water Quality - The chemical, physical, and biological characteristics of water.

Water Yield - The quantity of water derived from a unit area of watershed.

Wetlands or Wetland Habitat - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include, but are not limited to, swamps, marshes, bogs, and similar areas.

Wet Meadows - Areas where grasses predominate. Normally waterlogged within a few inches of the ground surface.

Wildlife Tree - A live tree retained to become future snag habitat.

Withdrawal - A designation which restricts or closes public lands from the operation of land or mineral disposal laws.

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

China Keeler Landscape Project
Appendix H

Summary of Cumulative Effects Considered

China Keeler Cumulative Effects

The following table summarizes the cumulative effects considered in the China Keeler Environmental Assessment. It is not meant to be a summary of all effects, rather a summary of the effects considered. See the China Keeler EA for specific effects related to each alternative.

Landscape and general cumulative effects were disclosed in the *Final Environmental Impact Statement for the Proposed Medford District Resource Management Plan* for projects that are within the description and design criteria of those described in the Plan (which includes China Keeler, and are incorporated by reference).

Cumulative effects based on site specific actions for China Keeler are described in detail in the China Keeler Landscape Project environmental assessment.

Cumulative Effect/ Activity	**Analysis Boundary/ Analysis Type**	**Effects/Source**
		FEIS= Medford District Proposed Resource Plan Environmental Impact Statement *Listed by Alternative (***A/B/C***)*
	Global Warming	
Global warming from activities proposed or anticipated on Medford District BLM and other western Oregon forest lands, including old growth timber harvest.	Western Oregon Forests (narrative)	**A/B/C**--The effect on global climate would be slight. (FEIS, 4-8)
	Vegetation	
Past fire suppression, logging and silvicultural practices on vegetative and biological diversity.	Medford District BLM (narrative)	**A/B/C**--Fire suppression, logging activities, and land development have resulted in fragmentation, decreased acreage in late seral and old growth, and increases in stand density, fuel loading, fuel continuities, and fire hazard. (FEIS, 3-17)
Current and past fire, logging, and development activities on landscape vegetation patterns and structure.	China Keeler Analysis Area (narrative)	**A/B/C**--Landscape vegetation patterns are the result of topography, early large scale fire, timber harvesting, and land development. (EA, pages 18-20)
Drought, road construction, insects, and private land management on outcome of proposed silivicultural treatments.	China Keeler Analysis Area (narrative)	**A—**Tree mortality increases resulting in increased snags for cavity nesters, and fuel for wildfire. (EA page 50) **B/C**--Tree species will occur on sites where they are best adapted; leaving untreated stands may increase insect epidemics;

		access via new roads will improve growth and vigor of thinned stands; and potential activities on private lands may increase forest fragmentation. (EA, pages 50-51)
Long term forest health and future options	China Keeler Analysis Area (narrative)	**B/C**--By implementing the variable landscape prescriptions, future silvicultural options will be greater. (EA, pages 51)
Fire and Fuels		
Risk of catastrophic wildfire from forest vegetation management, drought, fire suppression, and accumulation of forest fuels.	Medford District BLM and adjacent lands (narrative)	**A/B/C**--Due to the continued increase in fuel hazard from forest management and cultural activities, conifer mortality associated with drought, and fire suppression, the risk of catastrophic wildfire remains high. (FEIS, 4-121)
Past fire suppression and management practices and current drought on wildfire size.	China Keeler Analysis Area (narrative)	**A/B/C**--Increasing fuel loads due to fire suppression, drought, and past management practices contribute to larger fires over the past 20 years. (EA, page 21-22)
Current industrial, home, and prescribed burning activities' contribution to particulate matter.	Medford/Ashland Airshed (narrative)	**A/B/C**--Major sources of particulate matter are woodstoves, dust and industrial. Prescribed fire adds less than 4% of the annual total of particulates. (EA, page 24-25)
Proposed and future prescribed burning on particulate matter in relationship to home, agricultural, and industrial activities.	Medford/Ashland Airshed (narrative)	**B/C**--Prescribed burning complies with guidelines by the Oregon Smoke Management Plan and the Visibility Protection Plan which only allow activities to occur when particulate generation stays within acceptable limits. (EA, page 55-56)
Past, Present and Future treatments on potential wildfire behavior.	China Keeler Analysis Area (narrative)	**B/C—**Combination of improved access, homeowner treatments and fuels treatments reduces potential fire behavior in China Keeler and across landscape. (EA page 52-56)
Soil		
Soil compaction from road construction and ground based machinery, OHV, mining and recreation.	Medford District BLM (narrative)	**B/C--**Mitigation (management direction) and Best Management Practices would reduce potential compaction, bare soil exposure, yet there is an increase in risk of reducing soil productivity. (FEIS, 4-14)
Compaction and erosion from timber harvest, wildfire potential, fire suppression, and road construction.	China Keeler Analysis Area (narrative)	**B--**Moderate short term increase in erosion; slight decrease in long term (EA page 58) **C**--It is unlikely there would be any noticeable effect from soil compaction caused by road construction, helicopter landing construction, and timber yarding

		methods. Erosion potential is reduced because destructive fire potential is reduced. (EA, page 60-61)
Surface erosion and landsliding from road and landing construction, timber harvest, machine piling and scarification, and broadcast burning.	Medford District BLM (narrative)	**B/C**--Mitigation (management direction) and Best Management Practices would reduce potential compaction, bare soil exposure, yet there is an increase in risk of reducing soil productivity. (FEIS, 4-14)
Hydrology		
Water Quality, Stream Flow. Groundwater, Stream Morphology and Stream Channel	Expected Hydrologic Effects by Alternative	**A/B/C**--Table showing long term beneficial effects of both action alternatives (B&C) (EA Table 4-1 Page 60)
Sedimentation, Stream Morphology, Stream Temperature, Summer Stream Flow, Flood Control, Groundwater flow	Expected Hydrologic Effects by Alternative	**A/B/C**--Cumulative effects of the alternatives on resources as observed near the mouth of the tributary streams (EA Table 4-y Page 79)
Sedimentation, Stream Morphology, Stream Temperature, Summer Stream Flow, Flood Control, Groundwater flow	Expected Hydrologic Effects by Alternative	**A/B/C**-- Cumulative effects of the alternatives on resources as observed in the Applegate River at Applegate (EA Table 4-x Page 79)
Background Notes on Hydrological Cumulative Effects Analysis		**A/B/C**—18 page appendix detailing hydrologic cumulative effects analysis approach. Includes past, present and reasonably foreseeable future actions in planning area. (EA Appendix J)
Riparian habitat conditions for amphibians on BLM lands and other lands in the Medford District	Medford District BLM (narrative)	**A/B/C**--Cumulative effects of BLM actions and actions on other lands are unclear. (FEIS, 4-63)
Fisheries		
Timber harvest on federal and private lands, water quality changes, and loss of large woody material, riparian vegetation management on private lands on fish habitat.	Medford District BLM (narrative)	**A/B/C**--Greatest effect is an overall reduced level of large woody debris and habitat. Full recovery of fish habitat potential depends on a substantial conversion of riparian vegetation to conifers and the growth of these conifers to mature size large enough to remain stable in the stream channel over time. (FEIS, 4-65 to 4-67)

Past and current- T effects of mining, irrigation withdrawals, diversion dams, floodplain development, timber harvest, road building, removal of large wood, and grazing on fish habitat.	China Keeler Analysis Area (narrative)	**A/B/C**-- the Middle Applegate watersheds have experienced numerous anthropogenic disturbances at many spatial and temporal scales. In the last 100 years, fire exclusion, 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. (EA, page 84)
Future effects of activities in China Keeler project on fish habitat.	China Keeler Analysis Area (narrative)	**A—** it is likely that a severe wildfire would cause fine sediment to be released, potentially filling downstream reaches with fine sediment and reducing fish habitat quality. (EA page 80) **B/C**-- 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. (EA, page 84)
	Wildlife	
Timber harvesting and road construction on wildlife species associated with older conifer forests (total habitat; degree of fragmentation; and connectivity).	Medford District BLM (narrative)	**B/C**--It appears likely that species associated with older forests will be maintained. (FEIS, 4-55)
Timber harvesting on private land with expected results on BLM lands on coarse woody debris.	Medford District BLM (narrative)	**A/B/C**--Due to timber harvest on private lands, and low retention of coarse woody debris there, it is likely that lower populations of up to 67 species of wildlife will result. (FEIS, 4-60)
Timber harvesting on snag levels on BLM lands and other adjacent lands.	Medford District BLM (narrative)	**A/B/C**--Cumulative effects of actions on BLM and other lands are expected to maintain low-snag abundance and cavity-user populations. (FEIS, 4-61)
Habitat loss from federal and private timber harvest, pesticide use, and land development on neotropical migratory birds.	Medford District BLM (narrative)	**A/B/C**--In conjunction with habitat changes created by federal and private timber harvest and land development in the Pacific Northwest, and the pesticide use on wintering grounds, several species of neotropical bird species have experienced substantial population declines. (FEIS, 4-63)
Canopy closure and amount of late seral habitat	China Keeler Analysis area	**B/C** -- it is estimated that approximately 10,600 acres could again provide a high degree of canopy closure and probably

		function as late-successional habitat in 10-30 years. (EA page 91)
Timber harvest and road building on sustainability of northern spotted owl.	Range of the Northern Spotted Owl (via consultation with the US Fish and Wildlife Service) (quantitative--by USFWS--and narrative)	**B/C**—USFWS concluded that the timber sales and other projects from 2004 through 2008 are not likely to jeopardize the northern spotted owl or destroy or adversely modify critical habitat for the northern spotted owl. (EA, page 91)
Past timber harvesting on suitable northern spotted owl habitat.	Range of the Northern Spotted Owl	**A/B/C**--Past logging could have already resulted in a significant loss of connectivity between physiographic provinces and consequent reproductive isolation. (FEIS, 4-75)
Timber harvest and development on BLM and other lands on northern spotted owl dispersal habitat.	Range of the Northern Spotted Owl	**A/B/C**--BLM checkerboard ownership pattern may yield cumulative dispersal habitat conditions that constitute less than 50% of the landscape. (FEIS, 4-77)
thinning some of the closed-canopy pole-sized conifer stands would facilitate establishment of herbaceous and shrub components thus improving intra-stand habitat complexity and diversity.	China Keeler Analysis Area and Adjacent Landscapes (narrative)	**B/C—**Conditions resulting from treatments will contribute positively to biological diversity. (EA page 85)
Botany		
Recreation, timber harvest, road building, fire suppression and prescribed fire on the continued persistence of federally listed species.	China Keeler Analysis Area (narrative)	**A/B/C**--Detrimental indirect and cumulative effects might result if fuel levels accumulate to the point that a stand destroying fire occurs (EA, pages 96-97)
Visual Resource		
Timber harvesting, road building, development of private land on visual effects.	Medford District BLM (narrative)	**A/B/C**--BLM's ability to affect any area's overall scenic quality depends to a large degree on land ownership patterns. (FEIS, 4-88)
Rural Interface		
Rural interface management effects upon neighbors from cumulative management actions (especially timber harvesting, burning, road construction, use of helicopters).	Medford District BLM (quantitative and narrative)	**A/B/C**--It is anticipated that allocating lands to timber production in the interface zone would create some level of controversy with communities or neighbors over how these lands are managed. (FEIS, 4-119)

China Keeler Landscape Project
Appendix I

What is the Adaptive Management Area (AMA)?

What Is the Adaptive Management Area (AMA)?

Adaptive management and community involvement are emphasized within the context of sustained timber management.

The philosophy that led to the creation of the Northwest Forest Plan was guided by President Clinton's desire to develop a management strategy to protect old-growth related species and produce a sustainable level of timber *(ROD[1], page 3)*. The strategy is implemented by setting aside about 4 of every 5 acres for conservation **(within the range of the northern spotted owl)**, while allowing programmed timber harvest on the remaining acre.

The lands withdrawn from timber production emphasis (78% of the land **within the range of the northern spotted owl**) constitute the areas set aside for conservation of old growth related species *(ROD, page 2)*. These withdrawals include Congressionally reserved areas (wilderness, scenic rivers, etc.), late successional reserves (mature and old growth stands), administratively withdrawn lands (Areas of Critical Environmental Concern, natural research areas, etc.), and riparian reserves (lands along streams, lakes, aquatic systems, etc.).

Within the range of the northern spotted owl, programmed timber harvest occurs in the 22% of the land designated as matrix or adaptive management areas, and only in compliance with the standards and guidelines designed to achieve conservation objectives *(ROD, page 2)*. On matrix and AMA lands governed by the Oregon and California Lands Act, managers have the discretion to determine how to manage the forest on a sustained-yield basis that provides for permanent timber production over a long-term period. *(ROD, page 49)*

To verify the underpinnings of the Northwest Plan's conservation strategy, Adaptive Management Areas (AMAs) were created to test and monitor approaches and effects of integrating sustained timber production with ecological, economic, and social/community objectives *(ROD, page 6).* The primary purpose of the ten AMAs is to encourage development of non-traditional techniques to meet management objectives. *(ROD, page 67)*

Primary management objectives for the Applegate AMA are: *developing and testing of forest management practices including partial cutting, prescribed burning, and low impact approaches to forest harvest (ROD, page D-12).* The percent of BLM lands in the Applegate AMA designated for programmed timber harvest is estimated to be 46%. Additional withdrawals take place after site specific visits by resource specialists.

The *Applegate Adaptive Management Area Guide* suggests the strategies and actions by which questions about integration with ecological, economic, and social goals are addressed.

[1]ROD = *the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl*

China Keeler Landscape Project
Appendix J

Background Notes On Watershed Cumulative Effects Analysis

For China Keeler Project

Background Notes- Cumulative Effects Analysis for China Keeler Project

The document "Considering Cumulative Effects Under the National Environmental Policy Act," Council on Environmental Quality, January 1997 was used to guide this analysis. It can be obtained at:
http://ceq.eh.doe.gov/nepa/nepanet.htm

Working definition of cumulative effects:

> The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of hat agency or person undertakes such actions.

The document identifies 11 steps for cumulative effects analysis:

Scoping

1. Identify the significant cumulative effects issues associated with the proposed action and define the assessment goals.
2. Establish the geographic scope for the analysis
3. Establish the time frame for the analysis
4. Identify other actions affecting the resources, ecosystems and human communities of concern.

Describing the Affected Environment

5. Characterize the resources, ecosystems, and human communities identified in the scoping in terms of their response to change and capacity to withstand stresses.
6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.
7. Define a baseline condition for the resources, ecosystems, and human communities.

Determining the Environmental Consequences

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.
9. Determine the magnitude and significance of cumulative effects.
10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.
11. Monitor the cumulative effects of the selected alternative and adapt management.

Cumulative Effects Analysis for the China Keeler Project Area

The following material was developed for the China Keeler Project by using the steps identified in the document "Considering Cumulative Effects Under the National Environmental Policy Act," that was published by the Council on Environmental Quality in January 1997.

1. Identify the significant cumulative effects issues associated with the proposed *action and define the assessment goals.*

This analysis focuses on three specific water-related issues: The effects of the project alternatives on **Stream Channel Morphology**, **Streamflow**, and **Water Quality**.

The assessment goal is to analyze and document these effects in the form of a qualitative and narrative assessment that is applied to an appropriate geographic reference.

2. Establish the geographic scope for the analysis

This analysis applies to proposed projects within the China Keeler Project Area. The direct and indirect effects associated with the project have been identified in Chapter 4 of the EA. Cumulative effects require a larger scale and to provide a cumulative effects analysis of all associated effects, two distinct reference points will be used: (1) The lower reaches of the tributaries within the project area that drain into the Applegate River and consist largely of non-BLM land ownership and (2) The Applegate River and the associated watershed that lies above the town of Applegate.

3. Establish the time frame for the analysis

Streams and forests are dynamic systems and a cumulative effects analysis needs to consider the natural changes along with the human-related changes to provide the necessary context for the analysis. The time scale for these changes can range from seconds to centuries. The rate of human influence accelerated in the Applegate River Subbasin with the Euro-American settlement in the mid 1800s. For this analysis, the cumulative effects will be considered in a time-interval from minus fifty years to plus ten years. The time line will be broken down into past, present (pre-proposal), proposal, and future time intervals.

4. Identify other actions affecting the resources, ecosystems and human communities of concern.

Since the forest and streams are naturally dynamic, it is necessary to evaluate human activities in the context of the natural processes. This section will discuss how human actions have influenced key processes and the corresponding consequences of these actions. The Middle Applegate Watershed Analysis (USDI 1995b) has more detailed information on the history of the watershed and the processes that affect it.

Native American use dominated the area until the mid 1850's and this use was relatively benign. Some research indicates that the Native Americans made frequent use of fire to promote fresh undergrowth to enhance game and forage yields. In the early 1800's trappers started to reduce the beaver populations. Euro-American settlers started to arrive in the

1850's at which time they acquired Donation Land Claims and proceeded to mine and develop agricultural areas. Initially the mining was placer and lode but later in the 1870's hydraulic mining began to be used in some areas. This use continued on a large scale well into the 20th century. Agricultural expansion on private lands led to clearing trees from riparian areas and draining wet areas and floodplains to create additional farm land.

In the mid to late 1800's a transportation system started to develop with the conversion of the main trails into roads. Many of the early roads were located along the side of the streams and encroached upon the natural flood plain.

In the late 1960's many large farms and ranches were broken up into smaller homesite parcels with an associated increase in roading and clearing. By this time, intensive logging had started on BLM-administered land in the Middle Applegate River Watershed and continued at a relatively high level until the early 1990's. This activity resulted in an extensive road network throughout the project area.

The effect of wildfire suppression is discussed in detail in the Wildfire History portion of Chapter 3 of this EA. Briefly, since 1900 fire suppression efforts have resulted in dense, overcrowded stands that have an increased risk of a high intensity stand replacement fire as opposed to more open stands with older and larger trees.

The Applegate Reservoir was completed in 1980 and regulates the flow from about 44% of the Applegate River Subbasin above the project area. This dam moderates both high and low flows in the mainstem of the Applegate River.

As the population increases in the area, recreational use is also increasing. Of particular concern is the OHV use that is occurring in unauthorized areas on BLM-administered lands within the project area. More roads of all types continue to be built as the population and use of the area increase.

Starting in the late 1960's the National Environmental Policy Act, the Clear Air Act, the Clean Water Act (CWA) and the Endangered Species Act were passed and had a major influence on the land management practices in the entire nation. Implementation of the CWA is ongoing with management plans being developed under the Oregon Department of Environmental Quality's (DEQ) Total Maximum Daily Load (TMDL) process and also under Senate Bill 1010. Federal forest management in western Oregon was changed drastically in 1994 with the implementation of the Northwest Forest Plan. Private forest lands continue to be regulated under the Oregon Forest Practices Act. Concern over the high fire risk has led to the development of the Applegate Fire Plan by area residents and stakeholders.

Currently, timber harvest levels on federal land are low relative to the 1970's and 1980's. Riparian Reserve land allocations provide substantial buffer zones around all defined stream channels. Timber harvest on private forest lands is expected to continue at about a 40-year rotation rate. Riparian protection is provided through the Oregon Forest Practices Act.

The following section provides more specific information about past, present and future actions within the Middle Applegate River Watershed.

Past actions generally refer to those post-European settlement, for example, commercial timber harvest on public and private land, road construction, and agricultural development in the valley bottom. For a summary of the effects of past actions, see the Middle Applegate Watershed Analysis (USDI 1995b, pages 9-21). The present proposed action is defined as the China Keeler project. Reasonably foreseeable future federal actions include upcoming scheduled BLM projects. Personal communication with representatives from the Forest Service indicate that there are no major Forest Service projects being planned in the Middle Applegate River Watershed at this time. For reasonably foreseeable private actions, BLM assumes that all merchantable private forest land would be clearcut.

Past Actions

Fuel hazard reduction work has occurred in the Middle Applegate River Watershed since 1995. To date, three landscape projects within this watershed have been implemented. These projects are the Lower and Middle Thompson Creek projects and the Forest Creek project. Along with these projects a small amount of acreage has been treated in the Appleseed project area which includes the Ferris Bugman project area. Approximately 7,414 acres (9% of the watershed) of BLM-administered lands have been treated within the Middle Applegate River Watershed since the Northwest Forest Plan was implemented (USDI 2002). Of these acres, 2,316 have been on non-commercial timber land. Treatments include manual, mechanical and prescribed burning. The following table displays the acres treated to 2002:

Middle Applegate River Watershed
Acres Treated 1995-2002

Unit Type	Total Acres[1]
Shrubland	443
Shrubland/Grassland	310
Density Management	2,201
Fuel Break /Shrubland	20
Fuel Break Timber	483
Fuel Break / Shrubland	181
Grassland	241
PCT/Natural stands	1,996
PCT/plantation	26
Woodland	1,121

1/ Ferris Bugman E.A.

In addition to these acres approximately 4,400 acres are under contract to be treated in this watershed.

Breakdown of acres to be treated:

3,150 acres in the Forest Creek timber sales
132 acres of non-commercial land (slashbuster and manual)
580 acres Spencer Lomas Area
500 acres in the Lower and Middle Thompson Creek projects

Since 1995 an estimated 1,780 acres (5%) of private land has been harvested and 8,955 acres (18%) of federal timber land has either been thinned or is under contract to be thinned on BLM and U.S. Forest Service managed land within the Middle Applegate Watershed . The following Table depicts this acreage by year sold.
Total acres harvested on public and private land in the
Middle Applegate watershed: 1995-2000.

Year Sold	Acres Harvested
1995	719
1996	2052
1997	2607*
1998	1040
1999	2083
2000	454
Total	8,955

Includes 220 acres of U.S. Forest Service thinning in Upper Thompson Ck.

Between 1995 and 2002, 4.96 miles of new road has been constructed or is under contract to be constructed within the Middle Applegate Watershed on federal land in the Ashland R. A. In addition, 10.77 miles of roads have been or are under contract to be decommissioned within this watershed. Approximately 2.53 miles of temporary roads have been either been built and/or decommissioned or are under contract to be built and decommissioned.

Current Actions Ferris Bugman
The Ferris Bugman project was planned by BLM and some parts of it are currently being implemented in the Middle Applegate Watershed.

Breakdown of land ownership and treated acres in the Ferris Bugman project area.

Description	Total Area (acres)
Private land within the Ferris Bugman Project	9,426
BLM administered land within the Ferris Bugman Project	10,081
Conifer forest on BLM administered land within Ferris Bug man Project	4,906
Conifer forest being proposed for thinning/stand density (commercial)	1,856
Conifer forest being proposed for thinning/stand density (precommercial)	311
Non-commercial sites proposed for thinning and prescribed burning with a follow-up maintenance burn within the next 10 years.	1,537

Present Proposed Actions China Keeler
Breakdown of land ownership and treated acres proposed (Alt. B) in the China Keeler project area.

Description	Total Area (acres)
Private land within the China Keeler Project	4,963
BLM administered land within the China Keeler Project	7,630
Proposed for thinning/stand density (commercial)	2,162
Conifer forest being proposed for thinning/stand density (precommercial)	889
Non-commercial sites proposed for thinning and prescribed burning with a follow-up maintenance burn within the next 10 years.	617

Future Actions

Precommercial thinning of 1,282 acres are planned, in the near future, on federal land within the Ferris Bugman Project area. Commercial timber harvesting projects being planned on federal land within the Middle Applegate watershed on the Ashland R.A. in the foreseeable future are Upper Thompson (FY 2006). The amount of acreage to be harvested and the type and amounts of road work are unknown at this time because of the lack of completed pre-treatment surveys and site specific analysis.

Future landscape projects are planned over the next five years in the Middle Applegate Watershed. These areas include the China Gulch area, Chapman-Keeler area and the upper Thompson Creek drainage.

Non-commercial treatments include the Slashbuster IV project which is planned for FY 2003-04. This project involves 1,400 acres in Humbug Creek, Long Gulch, and China Gulch watersheds.

{The slashbuster units in Humbug will be completed by early September.
Long Gulch and China will not be completed until late fall (November) or
next spring , depending on funding available}

5. Characterize the resources, ecosystems, and human communities identified in the scoping in terms of their response to change and capacity to withstand stresses.

This section discusses factors that affect the hydrology of the area and the associated water distribution system.

Channel Morphology

A stream system is basically the end result of a particular precipitation regime and land surface that is defined by its geology and topography. The resulting stream network is the result of land mass uplifting forces being canceled by weathering and erosional forces. As water moves downhill, it carries sediment if it has sufficient energy and deposits it when the flow is slowed due to energy dissipators or lower gradient. The end result is generally a channel profile that is steeper at the headwater area and gradually changes to a low gradient near the mouth (Leopold 1994). Over geologic time hierarchal nested watersheds are formed that have characteristics that are determined by many factors that include age, geology, climate, vegetation and surface materials. The Rosgen channel classification system illustrates how channel configuration depends upon the local conditions, flow, and the position within the watershed (Rosgen 1996).

Channels are not static but are continually being changed by several different external influences. Gravitational forces are responsible for a pervasive tendency for material to move downslope. Soil and rock material that becomes exposed to the surface elements tends to become detached by weathering processes and will then move downslope. Moving water can greatly accelerate this process. Consequently, all flowing channels transport material downslope causing an associated change in the local channel configuration.

Every channel has a history of extreme flow events that were responsible for much of the channel formation. Typically an extreme event will result in significant channel cutting and the movement of large amounts of material throughout the system. Following the event, the channel adjusts to the new condition, rapidly at first and then more slowly. For example, after thirty years, it may be possible to detect on-going channel adjustment to changes that occurred within a few hours during a 100-year event. Changes in the watershed condition that may affect the flow regime or the channel structure will also lead to channel alteration.

Since channels are strongly influenced by large-event flows through a watershed, a change in the upland portion of a watershed may not result in a corresponding change in the channels until the occurrence of the next extreme event. This delay makes a direct association between the activity within the watershed and the channel changes difficult. Often, a sudden channel change is attributed solely to the storm event without identifying the link to the causal activity. For example, a headwall may fail during a large storm event several years after a new road modified the drainage and caused more water to flow into the headwall area. Fortunately, subsequent events generally cause less change as the drainage adjusts to the new condition.

Floodplains in forest regions are also dynamic systems. A large event removes the vegetation on the floodplain when the force of the flow is greater than the resistive strength of the vegetation. After removal, the flow capacity of the channel is enlarged and force of the subsequent flood flows is less. As vegetation becomes reestablished, the flow capacity is again reduced and the hydraulic pressure increases until it again overcomes the vegetation and washes it downstream. In general, anything that reduces the flow capacity of the channel will be impacted during the inevitable extreme flow event.

Water flowing down steep slopes has tremendous erosive potential. Usually the stream energy in these channels is dissipated by a step-pool configuration. At the edge of each step the velocity vector is directed vertically downward and the associated energy is dissipated by the plunge-pool turbulence. At this point, the horizontal velocity component becomes zero and any transported material tends to be deposited. As a result of this pattern, the step-pool streams tend to accumulate soil, rock and woody material. These accumulations grow until they become unstable and release the mass of material downslope. If the next step is also vulnerable, it too will break and the combined material from the two steps will put additional pressure on the next step. In some cases this process continues a considerable distance producing a huge debris torrent that essentially scours out the stream channel. The resulting channel has little energy dissipation capability and often is transformed into a bedrock chute. This transformation has obvious impacts on the habitat for any local aquatic organisms. Over time, the step-pool configuration is reestablished as debris material falls into the channel. It should be noted that large debris material results in structurally stronger steps.

Woody vegetative material is typically a key component in the structure of a stream channel in forested areas. This material tends to impede flow and promote debris accumulations and control points that are essential for energy dissipation within the channel. Debris recruitment, utilization and decomposition is an ongoing process in natural channels in this area. The size of the debris influences the character of the channel and it is thought that historically the debris material tended to consist of large wood. A change in this structural material will influence the morphology of the channel. In the step channel areas described above, larger wood provided greater stability and reduced risk of consecutive step failure and debris torrents. In the lower channels the large debris (and beaver dams) provided control on the deeper colluvial deposits and reduced the tendency for channel downcutting. In the Applegate River, debris accumulations provided channel complexity and control and promoted side channel development on the floodplain.

At the top of each headwater channel is a collection area and an incipient point where the flow from the collection area is sufficient to cause displacement of material and the formation of a channel. These areas are usually particularly sensitive because they are on top of the erodible soil mantle. The location of the incipient point is influenced by the largest event that occurred in the recent past. Disturbance of the collection area can cause this incipient point to shift causing associated erosion and sedimentation. For example, a road system across a collection area can affect the water distribution to the area, causing a change in the location of the incipient point when the next large event occurs. After the adjustment is made, subsequent extreme events will not have as much effect on the channel.

Streamflow and groundwater

The quantity of groundwater in an area depends upon the inflow, storage capacity and outflow. Inflow can result from direct infiltration through the soil or from surface water features such as streams, ponds or rivers. Typically, in the China Keeler area, the groundwater supply is recharged in the winter and becomes depleted as supplies to the streams approach the base flow condition during the summer.

Groundwater flow is influenced by gravity forces and on steep slopes can be relatively rapid. Consequently, the groundwater availability on steep slopes is often limited during the summer months.

Some changes in the condition of a watershed can affect the quantity and distribution of the groundwater. Soil compaction can reduce the infiltration rate with increased loss to evaporation and runoff. Compaction can also impede the flow of groundwater through shallow aquifers causing an increase in local storage and a reduced downslope contribution.

Increased transpiration results in groundwater depletion. This effect can be significant in the summer. Diurnal fluctuations in stream flow resulting from day-time plant transpiration is common in the small headwater streams. A change in vegetation type or quantity can also influence groundwater quantity and subsequently streamflow. This effect can be pronounced during the summer drought season.

Material stored in the channel step reaches discussed in the previous section can promote subsurface storage and flow in the channel zone. This condition leads to "gaining" and "losing" reaches that are commonly observed during low flow conditions. This zone is the hyporheic zone and can be an important part of the aquatic ecosystem. Also, peak daily stream temperatures can be reduced by hyporheic exchange because water emerging from the gravel is cooler than the ambient[1] water temperature during the high temperature period.

In the low gradient channels, channel down-cutting can lower the water table, thereby reducing summer flow. Water removal by wells can also reduce the amount of groundwater available for flow.

Streamflow starts from the incipient headwater point and accumulates as it moves downstream. During the summer the water is supplied from the remaining available groundwater (base flow). This flow can be influenced by any action that intercepts water that supplies the stream. Quantity is usually related to the size of the supplying watershed or drainage. Peak flow values associated with storm events are influenced by storm intensity, duration, and the amount of surface retention. Dense vegetation can intercept precipitation and reduce flows while roads can extend the surface drainage and affect the timing of the runoff pattern for a watershed. Increases in snow accumulation in the rain-on-snow zone can result in higher flows during rain-on-snow events.

Dams, diversions, and other withdrawals also directly affect streamflow.

Water Quality

Sedimentation is directly related to channel morphology (see Channel Morphology discussion above). Channel alteration generally results in increased sedimentation because

[1] The "ambient stream temperature" refers to the temperature of most of the water in a channel cross section. This temperature is usually quite uniform due to water circulation. However, if there is cold water inflow, there will be a small zone with cooler temperatures. These zones may be relatively small but can provide critical thermal refuge to cold water species during warm period of the day.

the energy pattern of the channel is changed affecting both the erosion and deposition patterns of the channel (Leopold 1994).

Stream temperature is a direct measure of the net thermal flux in the stream at the moment of measurement. It typically has a definite diurnal pattern caused by daily solar exposure as well as a seasonal pattern driven by longer duration changes in cloud cover and moving air masses. During the summer period, stream temperatures are coldest at the headwater emergent points where it typically is close to the mean annual air temperature of the area. As the water moves downstream, the temperature is influenced by the local environment that includes the net solar radiation. The temperature tends to increase in the downstream direction in part, because the proportion of cooling groundwater inflow to total flow is decreasing. Typically the mean stream temperature approaches the mean temperature of the local environment in a distance of about twenty miles. In an homogenous environment the longitudinal temperature profile will be a smooth logarithmic curve that increases initially at a rapid rate and then slowly reaches an equilibrium value further downstream. However, areas with distinctively different solar exposure, channel characteristics or groundwater inflow will cause irregularities on the profile curve.

A large reservoir such as the Applegate Reservoir can affect downstream temperatures. The large mass of stored water tends to approach the mean annual temperature of the area. While the surface temperature of the reservoir may become warmer in the summer, the water that is released is typically from below the surface and is colder. Summer release results in cooler temperatures downstream by introducing colder water and a higher flow volume. The higher flow results in a faster velocity and a greater depth and both of these factors impede the downstream heating process. The influence zone of the reservoir depends on many factors but distances of 15 miles can be expected. However, eventually the river temperature will again approach the temperature of the local environment.

Maximum 7-day average high water temperatures in the Applegate River were 74.4 °F at Applegate in 1994 (USDI 1995b) and the mean August air temperature at Ruch is 69.4 °F (www.ocs.orst.edu). If it is assumed that the high temperature value is about 5°F above the mean value then the data indicates that mean temperature of the river is near the mean temperature of the local environment which is expected for a river of this size.

Water temperature can be reduced by increasing the percentage of the local groundwater contribution to the total surface flow. Hyporheic flow can also help by desynchronizing the diurnal temperature pattern and thereby providing cool thermal refuge points. Increased structure and associated gravel accumulation can enhance this hyporheic action which, in turn can provide critical cool water refugia in the relatively warm river.

The current summer water temperature criteria is set at 64°F. This value was established because it is the upper limit of the range of ideal conditions for the cold-water fish species. This temperature in not necessarily achievable in the larger rivers and streams in southwest Oregon. Southwest Oregon has higher groundwater temperatures (due to warmer winters) and warm summers (that result in warm local environments). It is likely that the ambient temperatures of these rivers and streams historically exceeded the 64°F value. A key

difference historically was the presence of the large wood accumulations that kept the water table high and, with the stored gravels, may have provided more cool refuge habitat areas in the river.

6. Characterize the stresses affecting these resources, ecosystems, and human communities and their relation to regulatory thresholds.

Stresses affecting channel morphology, streamflow and water quality

The ownership of the Middle Applegate River Watershed is about 59% federal and 41% private. The main underlying stressor for the area is local population growth with an associated increase in land development and land use. This scenario is resulting in several stresses that directly affects the hydrology of the area.

- The urbanization of the valley agricultural lands has increased road density and modified the natural drainage structure. More roads has also increased the potential for sediment delivery to streams. With the increased population there is an increased demand for waste disposal. Illegal dumping of trash and other unwanted items is an on-going problem on BLM-administered lands. The dumping of toxic materials is a particular concern.

- Increased population in the area has also increased the water for domestic use. Water withdrawals for irrigation reduce streamflows during the summer season when streamflow in the tributaries is at critically low levels. These withdrawals have the potential to affect surface water temperatures.

- Conversion of the valley and streamside areas to agricultural fields and residential use has resulted in removal of riparian vegetation and a change from older conifer stands to younger stands dominated by hardwoods. These changes mean less shade on the stream surface and an increase in stream temperatures.

- Increased residential use impacts riparian areas with lawn encroachment and presents an increased risk of water contamination from household and yard chemicals. Stream-side vegetation is often removed or significantly altered.

- Increased activities increase the risk of chemical contamination resulting from spills during transport, misuse, or improper disposal.

- Private timber lands have been roaded and harvested as regulated by the Oregon Forest Practices Act.

- The Applegate Reservoir benefits the area residents by providing flood control and increased water availability. However, in the process, the dam has significantly altered the flow regime of the Applegate River which directly affects the channel morphology and water water quality.

- Timber harvest activity on federal lands has been sharply reduced from 1980 levels by implementation of the Northwest Forest Plan. This is affecting the vegetation patterns that influence evapotranspiration and water runoff rates by creating fewer clearcut openings.

- Fire suppression has been ongoing in the watershed since 1900. The natural fire frequency interval for areas within the watershed typically range from less than 35 years to less than 50 years with most of the fires being of low severity. The fire suppression activities have resulted in a build-up of high risk fuels causing an increase in the overall fire hazard. The overall risk is further exacerbated by the increase in vulnerable structures and improvements on the private lands.

- Severe stand replacement fire directly impacts channels by eliminating the ground cover and the wood structure material associated with the affected channels. The result is more surface erosion and a reduction in the channel structural integrity. This condition is compounded by increased peak storm flows that can result from the reduction in vegetative cover. The end result is often scoured channels, large sediment loads, and downstream instability. Stream recovery can take many decades due to the absence of large wood to restore the structural component.

- OHV recreational use has been increasing along with an increase in an associated network of unauthorized trails and roads. This activity occurs during the entire year but use during wet weather can be particularly damaging to the local drainage.

- There is a general deficiency of large wood in the channels and riparian areas throughout the watershed. On federal forest lands this condition is improving through current riparian management policies. On private lands some restoration may occur but wood utilization and flood concerns will probably limit any improvement in instream wood.

The following is a list of some of the regulatory measures that exist to address these issues.

- Many of the activities in the residential areas are regulated by the county. Roads, septic systems and water withdrawals are regulated through the County and the State.

- Forest activities are regulated by state and federal policies and the agricultural areas are regulated by the Oregon Department of Agriculture. Oregon Department of Environmental Quality (DEQ) has regulatory authority to maintain water quality.

- The flow discharge of the Applegate Reservoir is controlled by the U.S. Army Corps of Engineers to meet the objectives of the reservoir.

- The OHV use is supposed to be limited to specific areas on public lands (USDI 1995, pp. 66-67) and meet basic land use requirements on private lands. However, unauthorized use is common and substantial resource damage is occurring.

7. Define a baseline condition for the resources, ecosystems, and human communities

The following conditions represent what is probably the best condition that can be expected under the current circumstances:

- The flow regime from Applegate Reservoir will probably not change. Ongoing channel adjustment in the river will have to be accepted as part of the cost of having the benefits of the reservoir.

- A program to address spill prevention and spill response for transport-related accidents should continue to fully address the spill risk.

- Roads need to be well designed and properly maintained. Erosion problems associated with existing roads need to be addressed. Roads that are not needed for future management access should be decommissioned.

- Good riparian stewardship on private lands should be encouraged. Riparian areas on federal lands should continue to be managed to meet ACS and Riparian Reserve objectives. This management will assure the future availability of large wood for stream shade and channel structure.

- The fire risk issue is being actively addressed in a collaborative manner by the area residents and stake-holders. The recent Applegate Watershed Fire Plan provides some helpful resources to further address this problem. A baseline condition with reduced fire risk for the watershed is anticipated.

8. Identify the important cause-and-effect relationships between human activities and resources, ecosystems, and human communities.

Relationship between human activities and the stream system

Stream channels have been disturbed historically by activities, such as hydraulic mining, that took place directly within the channel zone. The removal of large debris from the stream and river system, drainage ditching, hydraulic mining, and the reduction in beaver activity have perhaps been the most damaging changes to the stream channels in the area.

At the present time, regulations associated with wetlands have curtailed the development of additional ditches. Hydraulic mining has been banned by State law. Large wood replacement is ongoing as part of a stream restoration program in some areas. Federal and State policies restrict removal of large down wood from forest lands in the area. However, it is not likely that the river system will ever have significant wood accumulations or that beaver will return to the smaller streams in historic numbers.

During early settlement of the area, roads were often built along stream channels causing an encroachment and subsequent instability. Current federal management practices generally

minimize the influence of a road on a stream. However, the total amount of road continues to increase with the continued development of the area.

Roads can affect channel morphology at crossings by establishing a control point that restricts any natural lateral or vertical channel displacement. This condition can affect the stability of the channel and result in some associated instability. If a pipe culvert is used, a barrier to some aquatic organisms can be created.

Roads can also affect the local drainage as previous discussed. This effect can lead to rather subtle changes in the local incipient channels with new channel development and associated sedimentation occurring. Roads that are part of permitted projects are typically designed by professionals and, through the use of best management practices and good maintenance programs, keep the changes to channel morphology to a minimum.

Road density and the number of road crossings provide comparison indices of relative road effects between areas. However, there is a rather vast network of roads that are not well designed and/or maintained that continue to affect area channels. Of particular concern is OHV use on non-authorized roads and trails in the area. Erosion on these roads adversely affects streamflow, groundwater movement, water quality and channel morphology. At the present time there does not seem to be an effective regulatory option available to address this problem.

Activities that restrict the capacity of floodplains have an indirect effect on channel morphology. This is more of an issue for the lower gradient streams. Most flood control structures and management policies are probably established for this area. Flood control on the Applegate River is no longer a primary concern due to the flow regulation by the Applegate Dam.

Surface water withdrawals limits the availability of water for other beneficial uses. Groundwater use lowers the watertable and can indirectly limit summer streamflow.

The current forest condition is having an indirect adverse effect on channel morphology. Fire suppression since 1900 has resulted in dense, overcrowded stands that have an indirect effect on channel morphology. Without large wood replacement the channel structure is being transformed into a weaker, more failure prone, condition. Also, increased risk of a stand replacement fire means increased risk of severe channel modification. The average crown closure for an area provides an indication of the stand density and is a component of the fire risk rating.

9. Determine the magnitude and significance of cumulative effects.

Cumulative effects occur both over space and through time. For stream systems the effects of interest are usually located downstream. For this analysis two spatial scales are used. The first observation level is directly associated with the downstream component of the affected headwater streams. The second observation level includes the Applegate River at the lower end of the project area at Applegate.

A combination qualitative and narrative analysis is used to display the cumulative effects associated with each of the proposed alternatives. Tables 4-y and 4-x display the results of this analysis. The rating values indicate the relative condition of the resource compared to an average anadromous fish stream that would occur in a natural setting. The rating scale ranges from -10 to +10, with negative values denoting a degrading condition and positive values denoting an improving condition. Past denotes conditions existing 50 years ago, present denotes conditions in 2003, and future denotes conditions 10 years in the future. The rating scores are cumulative. For example, in table 4-y(a) the past value of -4 represents the net impact that accumulated from the worst conditions to a point 50 years ago. Between the past and the present, the system continues to degrade an additional -2 (for a total of -6). The proposal value (0) is the amount of change expected from the project relative to the other changes the system is experiencing. The future values reflect the differences between the no action alternative and the resulting high potential for severe wildfires and the two action alternatives that would improve forest health and reduce the wildfire potential. Proposed foreseeable future projects are also factored in to the future rating. The cumulative values are the sum of the individual ratings over time.

Table 4-y. Cumulative effects of the proposed alternatives on resources as observed near the mouth of the tributary streams – a qualitative and narrative assessment.

Table 4-y (a) Resource Issue: Sedimentation

	Alt A	Alt B	Alt C	Comments
Past	-4			High initial impact from mining, log removal, roads, etc (-5), some natural recovery (1).
Present	-2			Continued recovery (1), continued local impacts (-3).
Proposal	0	0*	0*	*Trace amounts possible from general activity and road work. Alt B slightly higher than Alt C.
Future	-3	1	1	Alt A - severe fire damage, Alt B&C some recovery and improvement in channel condition.
Cumulative	-9	-5	-5	

Table 4-y (b) Resource Issue: Channel Morphology - Stability

	Alt A	Alt B	Alt C	Comments
Past	-4			High initial impact from mining, log removal, roads, etc (-5), some natural adjustment (1).
Present	-2			Continued recovery (1), continued local impacts (-3).
Proposal	0	0	0	No direct project related effects expected..
Future	-3	1	1	Alt A - severe fire damage, Alt B&C some recovery and improvement in channel condition.
Cumulative	-9	-5	-5	

Table 4-y (c) Resource Issue: Stream Temperature

	Alt A	Alt B	Alt C	Comments
Past	-3			Reduced shade and groundwater inflow
Present	0			No change
Proposal	0	0*	0*	* Possible slight improvement due to increased summer flow.
Future	-1	1	1	Alt A (-1) due to severe fire riparian damage. +1 all alts for natural shade development.
Cumulative	-4	-2	-2	

Table 4-y (d) Resource Issue: Summer Stream Flow

	Alt A	Alt B	Alt C	Comments
Past	-4			Loss of groundwater and channel storage
Present	2			Increased headwater storage
Proposal	0	0*	0*	* Possible small increase due to veg removal.
Future	-2	0	0	Alt A (-2) due to loss of storage due to severe fire.
Cumulative	-4	-2	-2	

Table 4-y (e) Resource Issue: Flood Control

	Alt A	Alt B	Alt C	Comments
Past	3			Channel clearing increased capacity (+4), Increased roads (-1) =+3 reduced floods.
Present	0			no change
Proposal	0	0	0	No detectable direct effects expected.
Future	-2	0	0	Alt A (-2) due to severe burn and reduced storage.
Cumulative	1	3	3	(More flooding with Alt A)

Table 4-y (f) Resource Issue: Groundwater inflow

	Alt A	Alt B	Alt C	Comments
Past	-3			Channel clearing lowered water table
Present	0			No change.
Proposal	0	0	0	No direct change expected.
Future	+1 -1	0	0	Alt A (+1) if deposition from severe fire; (-1) if scour from severe fire.
Cumulative	-2 -4	-3	-3	

Table 4-x. Cumulative effects of the proposed alternatives on resources as observed in the Applegate River at Applegate – a qualitative and narrative assessment.

Table 4-x (a) Resource Issue: Sedimentation

	Alt A	Alt B	Alt C	Comments
Past	-2			High initial impact from mining, log removal, etc (-5), some natural recovery (3).
Present	-1			Continued recovery (1), dam reduction (1), adjustment to regulated flow regime (-3).
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	-5	-3	-3	Continued impact of new flow regime (-3), severe fire effects Alt A (-2).
Cumulative	-8	-6	-6	

Table 4-x (b) Resource Issue: Channel Morphology - Stability

	Alt A	Alt B	Alt C	Comments
Past	-4			High initial impact from mining, log removal, channel alterations, etc (-5), some natural recovery (1).
Present	-3			adjustment to regulated flow regime (-3).
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	-5	-3	-3	Continued impact of new flow regime (-3), severe fire effects Alt A (-2).
Cumulative	-12	-10	-10	

Table 4-x (c) Resource Issue: Stream Temperature - Applegate River

	Alt A	Alt B	Alt C	Comments
Past	-4			Reduced channel complexity, groundwater, shade.
Present	1			Increased summer flows
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	1.5	1	1	Aggradation of channel will improve groundwater and hyporheic action.
Cumulative	-1.5	-2	-2	More structure in Applegate could help.

Table 4-x (d) Resource Issue: Summer Stream Flow

	Alt A	Alt B	Alt C	Comments
Past	-3			Reduced groundwater, water withdrawals
Present	4			Increased summer flows from reservoir
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	0	0	0	No change expected
Cumulative	1	1	1	

Table 4-x (e) Resource Issue: Flood Control

	Alt A	Alt B	Alt C	Comments
Past	3			Channel clearing increased capacity
Present	3			Reservoir flood control
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	0	0	0	No change expected
Cumulative	6	6	6	Flood protection for land use

Table 4-x (f) Resource Issue: Groundwater inflow

	Alt A	Alt B	Alt C	Comments
Past	-3			Channel clearing lowered water table
Present	-2			Higher summer flow (+1), reduced flood recharge (-3)
Proposal	0	0	0	No detectable direct effects expected in the Applegate River.
Future	0	0	0	No change expected
Cumulative	-5	-5	-5	

In summary, the tables indicate that the hydrology of the lower tributaries and the Applegate River was altered during early settlement and development and that the system continues to adjust to a new regime that is consistent with the new conditions. Key changes are the historic loss of large wood structure in the channels and river and flow modification by the Applegate Reservoir.

Relative to historic changes, the effect of the proposed project alternatives would be small. The largest changes would be associated with Alternative A and the subsequent result of a severe fire. The only positive effect from severe fire that came out of the analysis was the limited benefit of the addition of large wood material into the river system by means of a debris torrent. However, due to the extensive development along the river, this material would probably be viewed as degrading the site or a threat to property and would be removed to preserve the current condition.

10. Modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects.

Since both Alternatives B and C would reduce the risk of a severe fire, they should be considered as preferred alternatives that would tend to minimize hydrologic cumulative effects. It is apparent that reducing the risk of severe wildfire is critical for the best beneficial use of the water resources in the area.

11. Monitor the cumulative effects of the selected alternative and adapt management.

Implementation monitoring is conducted on a sampling basis as described in the BLM Medford District Resource Management Plan (USDI 1995). It is expected that the lower channels and the Applegate River would benefit from the introduction of large wood. However, these areas are primarily on private lands and any instream projects would need to be undertaken by the landowners. Care would have to be taken to assure that these changes are consistent with current land-use objectives for the area.

Significant improvement of the ambient temperature of the Applegate River is unlikely. However, identification and enhancement of thermal refuge areas would be beneficial to the cold-water fish resource.

China Keeler Landscape Project
Appendix K

Springs and Associated Water Rights/Rights of Way

China Keeler – Water Rights and Springs

Water Rights/Rights-of-Way for Springs on BLM-Administered Lands

Springs/seeps were identified during field visits and those that are being diverted by private parties are listed in Table H-1. "Reach" numbers refer to identifying numbers the Ashland Resource Area assigns to each stream feature on the landscape. Township/Range/Section location information is provided for each spring/seep in Table H-1 along with any evidence of recent use of the spring (such as pipelines, ditches, etc.). A search of BLM records identified four rights-of-way for pipelines originating from BLM-administered land. The Oregon Water Resources Department water rights database (http://stamp.wrd.state.or.us/apps/wr/wrinfo/wrinfo.php) shows three water rights for private parties accessing water from BLM-managed land. On other pipelines and spring developments, it is possible that private landowners are using water without securing the required water right from the State of Oregon and the right-of-way from the BLM for installation and use of these facilities on public land. Landowners must initiate application for, and are usually granted, a right-of-way for water sources located on BLM-administered lands if the landowner has a valid existing water right for the water source. Without a right-of-way for the transport facilities, the pipeline or ditch is in trespass, and the Bureau of Land Management technically is not liable for damages that may occur to the facilities in the course of the Bureau's land management activities.

Following is a list of springs surveyed on BLM-administered land within the China Keeler project area that appear to be diverted by private parties:

Table H-1. Springs on BLM-Administered Land Being Diverted for Private Use

Drainage Number		Reach #	Location T	R	S	1/4 1/4	Comments
03	03	4823	38S	03W	29	SWSE	INTERMITTENT SPRINGS USED FOR PRIVATE WATER SUPPLY. No water rights and no right-of-way.
03	21	1215	38S	03W	19	SWSW	SPRING IN MIDDLE OF DRAW DIRECTLY BELOW ROAD CROSSING. SPRING WATER DIVERTED BY 1.5 INCH DIAMETER METAL PIPE TO THE EAST. SPRING APPEARS TO HAVE BEEN DUG OUT.
03	21	1215	38S	03W	19	SWSW	SPRING DIVERSION AND IMPOUNDMENT.
03	21	1215	38S	03W	19	SWSW	SPRING 20 FEET WEST OF REACH IMPOUNDED WITH OLD CONCRETE WALL 2 FEET HIGH AND 6 FEET LONG.
03	21	1215	38S	03W	19	SWSW	SPRING WATER DIVERSION AND IMPOUNDMENT.
03	27	3926	38S	04W	24	SENW	SPRING IN HEADWALL CUT, WHITE PVC PIPE DIVERTING FLOW TO PRIVATE PROPERTY.
03	36	3566	38S	04W	15	NWNE	SPRING ON LEFT SLOPE EMERGING FROM 3' BY 3' HOLE EXPOSED BY DIGGING. SPRING RUNS DOWN REACH FOR 75' TO ROAD CROSSING AND IS DIVERTED DOWN ROAD FOR 40 TO 60 FEET BEFORE GOING SUBSURFACE. WHITE PLASTIC PIPE PRESENT BUT NOT DIVERTING FLOW.

There are four springs being diverted in T. 38 S., R. 3W., Sec. 19, SWSW, but the Water Resources Department water rights database only shows one point of diversion with a water right for this legal description. The BLM has granted three rights-of-way for waterlines in the SWSW of T. 38 S., R. 3W., Sec. 19.