United States Department of the Interior

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

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:
1792(OR116)
China Keeler Landscape Project EA

JUN 24 2005

Dear Interested Citizen:

The Ashland Resource Area staff has 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. This is the second EA to be issued for this project area. An EA was issued in May of 2004, but no Decision was made nor was the project implemented. As a result of public comment and further analysis, a revised proposed action was developed along with this new EA. This new document completely revises and supersedes the May, 2004 EA. The new proposed action is essentially a scaled down version of the project proposed about one year ago. Again 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 land. Transportation system maintenance, including renovation of existing roads, a small amount of 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 both before and after issuing the May, 2004 EA. The development of and changes to the project were influenced directly by comments and concerns that we heard from interested citizens.

The announcement of the Environmental Assessment (EA) for the China Keeler Landscape Project is being printed in the Medford Mail Tribune on June 27th, 2005. This announcement starts the official 21-day public review period. Comments are due to BLM by close of business, 4:30 PM, July 18thth, 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.

Sincerely,

John Gerritsma
Acting Field Manger
Ashland Resource

2 Attachments
1 – Map
2 – Environmental Assessment

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-116-05-02

This document replaces and supersedes EA No. OR-116-04-01 previously issued 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 advertisement in Medford's *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

EA NUMBER: OR-116-05-02

LOCATION: T.38S. R3W., Sections 8,9,16,17,21,22,29,31,32; T.38S. R.4W. Sections 22, 25-27,34; Jackson County, Oregon

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John Samuelson	Forest Engineer	Engineering and Roads
Ken Brown	Forester	Harvest/Logging Systems
Scott Haupt	Silviculturist	Silviculture prescriptions, Vegetation
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John Gerritsma	Applegate Adaptive Management Area Liaison	Writing/Editing

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CHAPTER I: PURPOSE AND NEED FOR THE PROPOSED ACTION

A. INTRODUCTION

This Environmental Assessment (EA) documents the environmental analysis conducted to estimate the site-specific effects on the human environment that may result from the implementation of the China Keeler Landscape proposal. This document complies with the Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA; 40 CFR Parts 1500-1508) and the Department of the Interior's manual guidance on the National Environmental Policy Act of 1969 (516 DM 1-7). This document replaces and supersedes EA No. OR-116-04-01 previously issued on May, 2004. Public comment and further analysis have led to a new proposed action.

B. WHAT IS BLM PROPOSING?

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

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

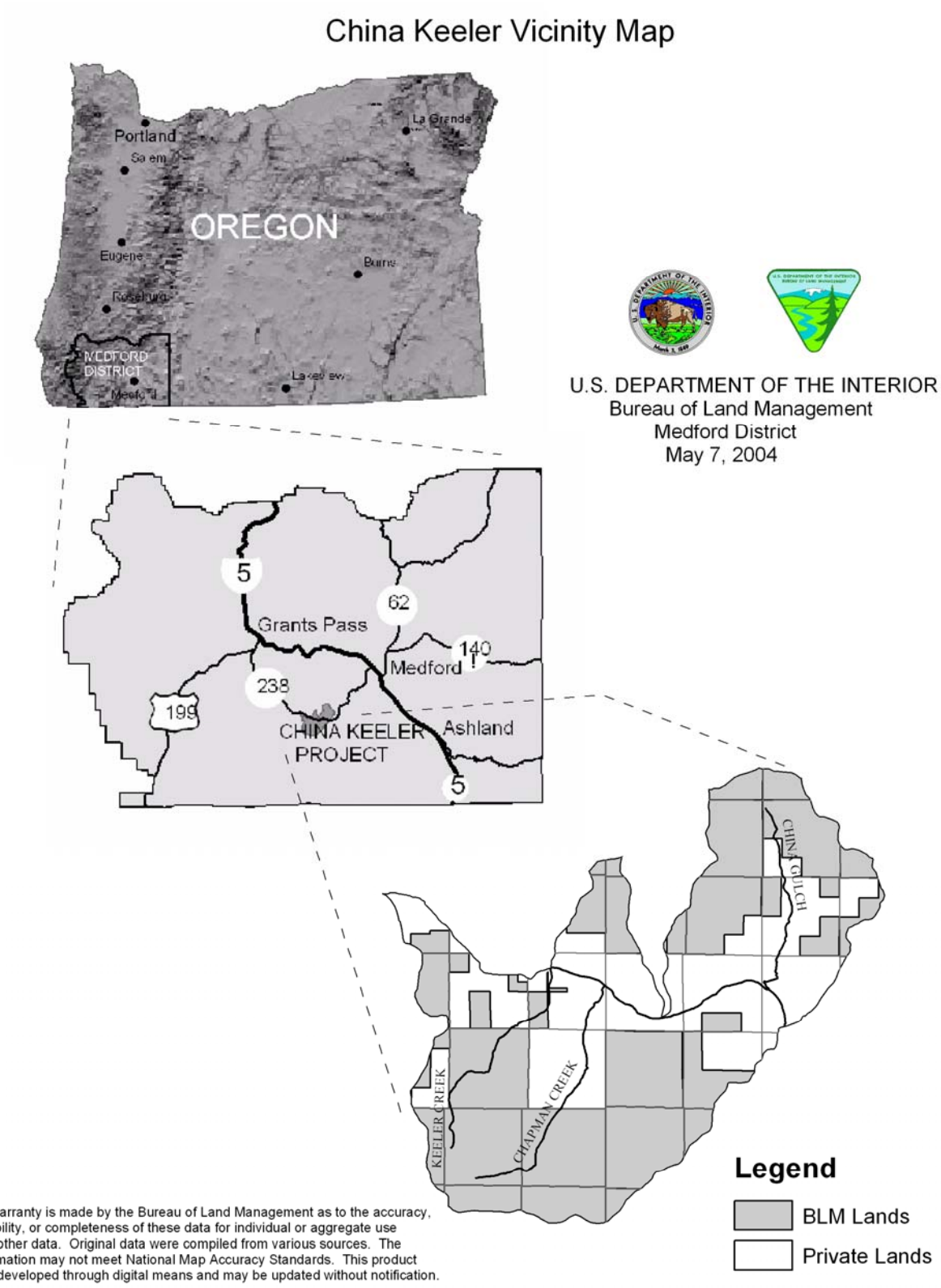
Two alternatives were considered and analyzed in detail, a No-Action Alternative (Alternative A) and the Proposed Action (Alternative B). A detailed description of the Proposed Action is contained in Chapter II, Alternatives.

C. WHERE IS THE PROJECT LOCATED?

The China Keeler Landscape Project is located in the Middle Applegate Watershed, the legal description is: T.38 S., R.3 W., in sections 8,9,16,17,21,22,29,31,32; and T.38 S., R.4 W., in sections 22,25-27,34, Jackson County Oregon (Map 1-1).

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 1,938 acres, or 25 percent of the BLM administered lands within the project area.. No commercial treatment is proposed in Riparian Reserves or the great gray and northern spotted owl reserves.


China Keeler Vicinity Map
Portland
Salem
La Grande
OREGON
Eugene
Burns
Roseburg
MEDFORD DISTRICT
Medford
Lakeview
U.S. DEPARTMENT OF THE INTERIOR
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CHINA KEELER PROJECT
Ashland
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CHINA GULCH
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Legend
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Private Lands
No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. The information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notification.

Map 1-1

D. NEED FOR THE CHINA KEELER PROJECT

The overall need for the China Keeler Project is to implement the Management Actions/Direction of the Medford District Record of Decision and Resource Management Plan (RMP) within the China Keeler Planning Area located in Middle Applegate Watershed Watershed. The following site-specific needs would be met through the implementation of the China Keeler Project:

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

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

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

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

Trees in the project area are growing at the lowest levels since stand establishment in the 1800s. Ten year radial growth is approximately .45 inches, considerably less than 1 inch of diameter growth every 10 years. Entomologists have found that at least 1.5 inches of tree diameter growth per decade decreases the risk of bark beetle attack. Stand vigor is decreasing because timber stands are significantly overstocked. Relative density index (RDI) ratings indicate that stands are at the point of imminent mortality and suppression (RDI of .55; crown closure occurs at a RDI of .15). Relative density index is the ratio of actual stand density to the maximum stand density attainable in a stand with the same mean tree volume. Many stands in the project area have a relative density of over .70, so in regard to stand growth and vigor the forest is not healthy. (See Appendix - Silvicultural Prescriptions for China Keeler)

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

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

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

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

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

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

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

As a result of the forest continuing to grow over time and the policy to suppress all natural wildfire events, there is a build-up of fuels and a change to more fire-prone vegetative conditions. In most areas, surface fuels and ladder fuels have increased, which has increased the threat of fire spreading to the canopies of trees. While some disagree with the cause of fuels build-up or whether the level of fuels build up is greater than pre-fire exclusion levels, the fact remains that 41 percent of the China Keeler planning area is characterized with a moderate fire hazard and 49 percent as high fire hazard. These hazard ratings developed for the project area characterize an existing fuel profile which represents a moderate to high resistance to control of fire under average climatic conditions, (see Chapter III, Affected Environment, Fire and Fuels). Both BLM-managed resources and rural residential areas are threatened from a potential for high-intensity stand replacing wildfires.

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

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

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

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

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

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

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

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

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

E. PURPOSE

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

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

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

Purpose #2. Contribution towards the Districts Allowable Sale Quantity

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

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

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

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

F. CONFORMANCE WITH EXISTING LAND USE PLANS

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

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

G. RELATIONSHIP TO STATUTES, REGULATIONS, AND OTHER PLANS

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

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

H. RELEVANT ASSESSMENTS & PLANS

1. Watershed Analysis (USDI 1995)

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

The China Keeler Project Area falls within the Middle Applegate Watershed Analysis Areas. Watershed analysis generally focused on the use of existing information available at the time the analysis was conducted, and provides baseline information. Additional information, determined to be necessary for completing an analysis of the China Keeler Landscape project, has been collected and is considered along with existing information provided by the 1995 Middle Applegate Watershed Analysis documents. Management Objectives and Recommendations of each Watershed Analysis document were considered and addressed as they applied to the China Keeler proposal. Information contained in these watershed analysis documents is incorporated by reference throughout this EA.

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

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

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

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

of the Applegate Fire Plan. Recommendations for the Humbug Strategic Planning Area include completing the thinning and fuel hazard reduction work associated with the China Keeler project.

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

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

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

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

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

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

I. DECISIONS TO BE MADE

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

J. SCOPING AND ISSUES

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

Scoping has occurred for the China Keeler Landscape Project. The China Keeler Project was originally announced with the listing of the project in the Medford Messenger. Public outreach occurred for the original China Keeler Landscape project, the previously planned project, and for the current China Keeler project. Outreach included mailings to interested organizations, community groups, other agencies, tribes, adjacent land owners, and other individuals; newsletters; public meetings; public field trips; and meetings with neighbors and organized neighborhood groups. A number of letters and comments were received by the BLM in response to public outreach. See Chapter II, Public Involvement.

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

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

K. RELEVANT ISSUES

Aquatic Systems: Hydrology, Water Quality and Fish

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.

Transportation System

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

Wildlife

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

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

Special Status Animal Species

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

Special Status Plant Species

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

Invasive, non-native plants

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

Off Highway Vehicle (OHV)

Use of the area by off highway vehicles has been increasing over the last several years. While this is a legal use of public lands, there is concern that undue resource damage may occur associated with OHV activity.

Cumulative Effects

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

Air Quality

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

CHAPTER II. ALTERNATIVES INCLUDING THE PROPOSED ACTION

A. INTRODUCTION

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

B. PROJECT DEVELOPMENT

1. Introduction/Background

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. 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, available 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.

An array of fuel treatments can be utilized along with forest health thinning treatments to modify vegetative patterns and reduce high fuel levels. Factors such as existing and projected fuel loadings, existing vegetative conditions, slope, and access are considered when prescribing the type of fuels management treatment that should be implemented. These treatments include mechanical methods, manual treatments, prescribed burning or a combination of these treatments (described in below).

The RMP directs that all silvicultural systems (forest thinning strategies) applied to achieve forest stand objectives would be economically practical (ROD/RMP p. 180; PRMP/EIS p. 2-62). The economic feasibility of forest management actions is affected by the ease of access from the forest road system. Therefore, road development and maintenance is important component of project development (RMP p. 84, 86). The renovation of roads to reduce road related run-off and sediment production is also the most important component of watershed restoration (ROD/RMP p. 23). Roads throughout the project area were reviewed by a BLM road engineer to identify roads in need of renovation and roads that were no longer needed to meet transportation and access needs. Road renovation and road decommissioning were identified to respond to the purposes described in Chapter I, Purpose and Need. As forest stands were identified for commercial treatments, the need for new road construction was identified to provide access to forest stands currently inaccessible (or difficult to access) from the existing transportation system. Each proposed road location was reviewed by the interdisciplinary team; some roads were eliminated from detailed study entirely, some locations were modified to address resource and/or social concerns (see section 3, Actions and Alternatives Eliminated from Detailed Study).

Approximately 500 acres of non-commercial fuels reduction treatments in woodland and shrub plant communities were included in the original China Keeler Landscape Project proposal first put forward in 2003 and 2004. Many comments were received from the community and neighbors during scoping

requesting that BLM expedite these types of non-commercial fuels reduction (especially near homes) in order to reduce fire hazard to residents living in the Wildland Urban Interface (WUI). In response to public comments, the highest priority non-commercial fuels reduction treatments were analyzed under a separate NEPA process using a Categorical Exclusion Review. Annual budget requests for fuels reduction money require NEPA to be complete before funding is granted. Having NEPA completed, allowed the Medford District BLM to obtain funding in order to expedite hazardous fuels reduction adjacent to homes. Non commercial fuels reduction treatments within the China Keeler project area were started in 2004 and completed in the early part of 2005.

All ongoing or recently completed actions within this planning and analysis areas are addressed in the cumulative effects analysis for affected resources in Chapter III.

2. Public Involvement

Scoping occurred for this project as summarized in Chapter I, Scoping and Issues. Comments were reviewed by the Interdisciplinary Team and the Resource Area Field Manager, and were considered by specialists as they designed the project and conducted analysis of the alternatives. Comments received in response to the proposed action have been utilized to shape the issues discussed in Chapter I and III.

The Medford District RMP provides Objectives and Management Actions/Direction for working with rural residential landowners (parcels zoned for 1-5 or 5-20 acre lots) located within one-quarter mile of BLM lands. "Use design features and mitigation measures to avoid/minimize impacts to health, life, and property, and quality of life." (RMP p. 88).

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
May, 2004	China Keeler Landscape Project EA issued to public – No Decision was made on the proposal. Comments and ideas received were incorporated into a newly designed proposed action
June, 2005	China Gulch Neighborhood Picnic to discuss China Keeler Project and answer questions

Outreach in the form of written public comment and discussions with neighbors concerning BLM's forest management proposal had direct influence on certain aspects of the project design (including project design features). Public concerns also led to the more expeditious treatment of non-commercial fuel hazard reduction work as outlined above.

In May of 2004, BLM issued EA No. OR-116-04-01, China Keeler Landscape Project, for public review. Numerous comments were received concerning the project. No final Decision was made on the project. As a result of public comments and other internal BLM policy changes, this revised project proposal and EA have been created.

C. PROPOSED ACTION AND ALTERNATIVES

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

Actions and Alternatives Eliminated From Detailed Study

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

***Rationale for Elimination*:** 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. Therefore, this action was eliminated from detailed study.

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

Rationale for Elimination: Several routes were considered to provide road access to the areas proposed for treatment but ultimately rejected from the Proposed Action. The single route chosen for incorporation in the Proposed Action minimizes the resource impacts and the amount of new road construction required to treat the areas proposed. Other routes initially considered would increase the density of roads in the project area beyond acceptable limits and may have chosen locations of new roads in potentially unstable terrain. New roads originally considered were dropped because of the trade off between economics, access and potential for unregulated OHV activity in some areas. Road renovation in the Wellington Butte area was dropped for economic and social value concerns.

Maximize economic return by utilizing regeneration harvest for the dominant portion of the area.

Rationale for Elimination: 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 understory ladder fuels and young stands would not provide the reduction of fuel hazard and increase of vigor expected from those treatments. Therefore, this action was eliminated from detailed study. Therefore, this action was eliminated from detailed study.

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

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

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

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

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

Rationale for Elimination: In conifer stands, using prescribed fire alone would not be effective in reducing stand densities to improve the vigor and health of stands. The energy release from prescribed fire (underburning) as the initial entry would exceed desired intensity levels and have undesirable effects on vegetation and soil. A combination of mechanical or manual treatments with prescribed fire is necessary to insure all resource objectives are met. Prescribed underburning alone would not meet the need to supply timber in contribution of the Medford District's Allowable Sale Quantity and to provide sustainable forest products from lands managed under the Oregon and California Lands Act.

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

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

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

D. ALTERNATIVES CONSIDERED IN DETAIL

Alternative A - No Action Alternative

Under the "no action" alternative, no vegetation management projects would be implemented; there would be no commercial cutting of trees, no roads would be constructed, decommissioned or renovated, and there would be no hazardous fuels reduction.

Alternative B (Proposed Action)

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

1. Variable prescription commercial thinning of trees over 8 inches DBH would occur on approximately 1,315 acres of forested stands. 368 acres of the above commercial thinning areas would also have pockets of young trees less than 7 inches in diameter thinned. All acres treated would have activity fuels and natural fuels reduced as an integral part of the thinning.
2. 623 additional acres would have young stands less than 8 inches DBH thinned to enourage more vigorous growth.
3. Approximately .7 (seven tenths) of a mile of new road would be constructed.
4. Road decommissioning would take place on approximately 1.8 miles of existing roads.
5. Approximately 32 miles of existing roads in the project area would be renovated to bring them up to current BLM standards.

ALTERNATIVE INFORMATION

Listed below is a brief summary of the proposed action and No Action Alternative. The environmental consequences are provided in Chapter III.

TABLE 2-1: Acres of conifer forest treated by silviculture prescription

PRESCRIPTION	ALT A	ALT B
Moist Douglas Fir Thinning	0	5
Dry, Douglas Fir Thinning	0	1088
Pine Regeneration	0	194
Douglas-fir Poles	0	16
Douglas-fir Regeneration	0	12
Total Acres	**0**	**1315**

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

ROAD SUMMARY	ALT A	ALT B
Existing BLM Road Miles In Project Area	32.1	32.1
Proposed Miles of New Road Construction	0	0.7
Proposed Miles of Decommissioning	0	1.8
Proposed Miles of Maintenance/renovation On Existing Roads	N/A	32.1

TABLE 2-3. Non-commercial acres treated

PRESCRIPTION	ALT A	ALT B
Young Conifer Stands (PCT)	0	623

TABLE 2-4: Acres treated by logging systems

Logging System	ALT A	ALT B
Helicopter	0	795
Crawler Tractor	0	118
Cable	0	402
Total Acres	0	1315

Road Construction, Renovation, Decommission for Alternative B

Table 2-5: 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	-	0
38-3-5.1	2.60	6"ASC	BLM	-	1
38-3-5.2A	1.19	6"ASC	BLM	-	1
38-3-7.0	0.93	6"ASC	BLM	4"ASC	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	0.52	6"ASC	BLM	4"ASC	1
38-3-16.1	0.36	6"ASC	BLM	4"ASC	1
38-3-21.0	3.27	NAT	BLM	8"ASC / 1.05 miles	1
38-3-32.1	8.17	4"ASC	BLM	4"ASC/4.32 miles	1
38-3-33.0	2.30	BST	BLM	-	0
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
38-4-35.3	1.36	NAT	BLM	8" ASC on Seg C	1
38-4-36.0	1.11	NAT	PVT		1
Total Mileage:	31.84				

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 2-6: 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)
38-4-34.1	0.70	-	BLM	8" ASC	1
Total Mileage:	0.70				

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 2-7 : Proposed road decommissioning in the project area.

Road Number	Approxi mate Length (miles)	Existing Surface: Type[1]	Control[2]	Treatments[3]	Seasonal Restriction[4] (for log hauling)
38-3-16.0	0.7	ASC	BLM	MD remove 7 culverts	1
38-3-16.1	0.4	ASC	BLM	MD remove 6 culverts	1
38-3-21.0	0.7	NAT	BLM	ND no culverts	1
Total Mileage:	1.8				

- 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

TABLE 2-8: Individual Unit Data

UNIT	UNIT ACRES	SILVI. METHOD 1/	YARDING SYSTEM 2/	FUELS MGT 3/	VOLUME CUT/ACRE (range)(MBF)	VOLUME CUT/UNIT Low (range)(MBF)	High
4	126	DDF/P	CR/PS/H	HP/UB/SL	3 - 5	378	630
5	136	DDF	CR/PS/H	HP/UB/SL	3 – 5	408	680
6	171	DDF/P	CR/H	HP/UB/SL	3 – 5	513	855
7	49	DDF/P	CR/H	HP/UB/SL	3 – 4	147	196
8	28	DDF	CR/H	HP/UB/SL	3 – 5	84	140
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	4 – 5	60	75
15	27	DDF	H	HP/UB/SL	3 – 4	81	108
16	3	DDF	H	HP/UB/SL	2 – 4	6	12
17	15	DDF	H	HP/UB/SL	6 – 8	90	120
18	53	DDF	H	HP/UB/SL	6 – 8	318	424
19	6	DDF	H	HP/UB/SL	6 – 8	36	48
20	45	DDF	PS/H	HP/UB/SL	7 – 9	315	409
21	28	DDF	H	HP/UB/SL	7 – 9	196	252
22	42	DDF/P	CR/PS	HP/UB/SL	5 – 7	210	294
23	23	DDF	H	HP/UB/SL	7 – 9	161	207
24	15	DDF	H	HP/UB/SL	5 – 8	75	120
27	4	P	H	HP/UB/SL	3 – 5	12	20
28	17	DDF/P	CR/H	HP/UB/SL	6 – 8	102	136
38	210	DDF/DfG/MDF/P/Po	CR/PS/H	HP/UB/SL	3 – 4	630	840
39	6	DDF	H	HP/UB/SL	3 – 4	18	24
40	9	DDF	H	HP/UB/SL	5 – 7	45	63
41	21	DDF/P	H	HP/UB/SL	4 – 6	81	126
42	15	DDF/P	H	HP/UB/SL	2 – 5	30	60
43	48	DDF/MDF	CR/PS/H	HP/UB/SL	6 – 8	288	384
44	94	DDF	CR/PS/H	HP/UB/SL	3 – 5	282	470
45	3	MDF	PS	HP/UB/SL	1 – 2	3	6
46	1	MDF	PS	HP/UB/SL	1 – 2	1	2
47	6	DDF	H	HP/UB/SL	4 – 6	24	36
48	72	DDF/P	H	HP/UB/SL	5 – 7	360	504
49	6	Po	H	HP/UB/SL	4 – 7	24	42
50	2	DDF	H	HP/UB/SL	2 – 4	4	8
SUM	1315					5007	7346

1/Silvicultural Methods:
DDF = Dry Douglas-fir;
MDF = Moist Douglas-fir; P = pine;
DfG = Douglas-fir Regen;
Pi = Pine;
Po=Douglas-fir/pine poles;

2/Yarding Systems:
CR = Crawler (117ac.)
PS = Cable (402ac.)
H = Helicopter (795ac.)

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

3. Components of Action Alternative

Vegetation Treatment Prescriptions –

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(c) One acre openings can be created around individual yellow bark, old-growth pine trees. Leave healthy pine and all incense cedar trees in created openings.
(d) Trees with old-growth characteristics would be retained.

Douglas-fir Understory Reinitiation (Regeneration Harvest): Forest stands proposed for understory reinitiation or regeneration harvest are stands that have poor vigor, severely declining health, and have overstory trees that are 150 years of age or older. Selective harvest prescriptions focus on maintaining the largest trees while opening up stands to encourage the establishment and growth of young healthy trees and the creation of multi canopied late-successional characteristics. There are 12 (upland) acres of understory reinitiation or "regeneration harvest" in this project.

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

(a) For situations 1 and 2, select a minimum of 16 trees per acre (bole spacing 45 to 52 feet) that are 20 inches or larger diameter breast height (dbh) for leave trees when available. When the older trees are widely spaced, then healthier second-growth trees would be left to prevent spaces more than 35 feet between tree crowns. In openings between trees, leave an additional 10 to 20 basal area acre of seedlings through large pole-sized trees. (2 to 2,500 trees per acre).
(b) Where natural regeneration exists or is desired, openings (66-foot tree bole spacing) can be created.
(c) In situation 3, where patches of younger second growth trees occur, thin trees to appropriate spacing/basal area based on site encountered. For moist Douglas-fir sites, thin trees to 3 to 10 foot crown spacing (100 to 160 basal area per acre; 35 to 55 trees per acre); for dry Douglas-fir sites, thin trees to 10 to 25 foot crown spacing (80 to 140 ft^2 basal area per acre; 30 to 45 trees per acre). Select trees from various crown classes (intermediate, codominate, dominate) as leave trees to create as much stand diversity as possible.
(d) In all situations, where healthy pine seed trees are encountered (18 inches dbh or greater) on west and northwest slopes group selection openings (1/5th to 1 acre in size) may be created to maintain the health of the pines and to encourage pine regeneration.

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

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

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

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

possible, landings would be located on ridges or in saddles. One new landing is located on the proposed road construction and would be incorporated into the new road construction design.

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

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

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

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

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

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

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

Conifer/hardwood Communities

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

- Trees up to 2 inches DBH – 12-foot spacing;

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

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

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

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

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

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

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

(6) Follow-up Maintenance Underburning would involve the controlled application of fire to understory vegetation and downed woody material when fuel moisture, soil moisture, and weather and atmospheric conditions allow for the fire to be confined to a predetermined area at a prescribed intensity to achieve the planned resource objectives. Various ignition patterns are used depending on resource objectives and site and weather conditions. The most common ignition technique used is referred to as strip-head ignition. Beginning on the uppermost end of a unit along a control point such as a road or ridgeline, fire is ignited in narrow strips running along the contour of the slope. Working down slope, strips are ignited at intervals and the fire burns upslope toward the previously burned strip of fuels. The speed at which fire is applied and the width between strips adjusts the intensity of fire to address variations in fuel conditions (amount, type, and moisture content), weather, and topography as needed to meet resource objectives.

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

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

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

Wildfire Suppression Assumptions Common to All Alternatives

The Bureau of Land Management has a master cooperative fire protection agreement with the Oregon Department of Forestry (ODF). This agreement gives the responsibility of fire protection of all lands

within the project area to the Oregon Department of Forestry. This contract directs ODF to take immediate action to control and suppress all fires. Their primary objective is to minimize total acres burned while providing for fire fighter safety. The agreement requires ODF to control 94 percent of all fires before they exceed 10 acres in size.

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

- BLM resource advisors will be dispatched to fires which occur on BLM lands. These resource advisors are utilized to ensure that suppression forces are aware of all sensitive areas and to insure damage to resources is minimized from suppression efforts.
- When feasible, existing roads or trails will be used as a starting point for burn-out or backfire operations designed to stop fire spread. Backfires will be designed to minimize fire effects on habitat. Natural barriers will be used whenever possible and fires will be allowed to burn to them.
- In the construction of fire lines, minimum width and depth will be used to stop the spread of fire. The use of dozers should be minimized and resource advisors will be consulted when appropriate. Live fuels will be cut or limbed only to the extent needed to stop fire spread. Rehabilitation of fire lines will be considered.
- The felling of snags and live trees will only occur when they pose a safety hazard or will cause a fire to spread across the fire line.
- The construction of helispots should be minimized. Past locations or natural openings should be used when possible. Helispots will not be constructed within riparian reserves, or areas of special concern.
- Retardant or foam will not be dropped on surface waters or on occupied spotted owl nests.
- Resource advisors will determine rehabilitation needs and standards in order to reduce the impacts associated with fire suppression efforts.

E. PROJECT DESIGN FEATURES – APPLICABLE TO THE PROPOSED ACTION

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 Alternative B.

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 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, 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. Applicable Non-Commercial Silvicultural Project Design Features (Uplands Only)

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	75' buffer for machine; can reach in to extent of cutter	30' buffer
Short-duration intermittent	Where necessary (treating through is OK, as prescribed)	75' 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. Applicable Road Construction- and Renovation-Related Project Design Features

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. Applicable Road Decommissioning Project Design Features

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
•
•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 existing quarries located in SW1/4 Section 8 of T.38S.R.3W., and SW1/4 Section 34 of

T.38S., R.4W., and SW1/4 Section 1, T.39S., R.4W 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.

Special Status Species

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

I. Protection of Botanical Resources Project Design Features

Special status plant species

Clarkia heterandra: Eight occurrences in and on the edges of units proposed for treatment in 38S3W31 will be buffered with a 150 foot buffer.

Crumia latifolia: Four occurrences in a unit proposed for treatment in 38S4W25 (3 sites) and 38S3W20 (1 site) will be buffered with a 100 foot radius buffer.

Cypripedium fasciculatum: Five known sites of this species are in or adjacent to areas proposed for treatment in 38S3W31 (2 sites), 38S4W25 (1 site), 38S4W26 (1 site) and 39S3W6 (1 site) will be buffered with a 150 foot radius buffer.

Fritillaria gentneri: Occurrences in sections 38S3W20 (1 site) and 38S3W22 (1 site) will be buffered with a 150 foot radius buffer.

Mimulus congdonii: One site in 38S3W16 will be buffered with a 150 foot radius buffer.

To minimize the spread of noxious weeds

1.Vehicle and equipment use off existing roads in the project area would be limited to the dry season.
2.Mechanical equipment (e.g. skidders, yarders, etc.) would be power washed and cleaned of all soil and vegetative material before entering the project area. Equipment moving from a weed infested work site to or through a noninfested area will be field washed before moving. Field washing station would include a high pressure pump, containment mat, filter system, and a holding tank.
3.Seeding of native grasses and/or an approved seed mix on highly disturbed soil (e.g., landings, new road cut and fill slopes, etc.) would occur.
4.Roadside noxious weed populations would be treated prior to timber sale activity with subsequent treatments as necessary and as funding is available.

CHAPTER III. AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

A. INTRODUCTION

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

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

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

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

Effects Assumptions

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

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

of the "no action" alternative to the effects described when adding the proposed action, we can discern the "cumulative impact" resulting from adding the "incremental impact" of the proposed action to the current environmental conditions and trends.

Watershed analysis, a component of the Aquatic Conservation Strategy developed under the Northwest Forest Plan and incorporated into the Medford District RMP, is a useful analysis for gaining an understanding of ecological processes and how those processes are functioning within a given watershed. Watershed analysis characterizes the human, aquatic, riparian and terrestrial features, conditions, processes, and interactions within a watershed. Knowledge gained through watershed analysis enhances the agency's ability to estimate direct, indirect, and cumulative effects of our management activities (Guide to watershed analysis p. 1). The 1995 Middle Applegate Watershed Analysis provided a coarse filter analysis generally using existing data and information, but is useful in identifying issues of importance to analyze in greater detail during project specific analysis. Some issues identified during watershed analysis have been analyzed and addressed at broader scales in association with regional and land use plans, the link from this site specific project to these broader analyses have been noted where applicable in this Environmental Assessment.

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

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

For the reasons described above, this document does not contain a detailed catalogue (or chronology) of past actions, to do so would provide irrelevant detail and would not contribute to a better understanding of conditions which are to be addressed through this analysis. Rather, the analysis of direct, indirect and cumulative effects contained in this EA focuses on cause and effect relationships deemed important for determining the impact on the environment which may result from the incremental impact of the China Keeler Project when added to other past, present, and reasonably

foreseeable future actions and whether or not there is potential for this proposal to contribute to significant cumulative effects beyond those addressed in programmatic land use plans.

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

B. VEGETATION

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

Issues/Concerns

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

Density of forest stands are too high for long term forest health

Declining vigor of forest stands

Loss of shade intolerant species such as ponderosa pine and sugar pine

Affected Environment

Dense stand conditions are causing shifts in species composition, poor vigor (average vigor index of 47) in a substantial number of trees, and high incidence of tree mortality creating stand development dynamics that are causing various vegetative communities to move further away from their natural range of variability. This deviation decreases resiliency to natural disturbances like fire, insects and diseases.

Increasing evidence suggests that existing old growth forests started under conditions quite different than those found in the dense, closed-canopy young stands of today (Tappeiner and others 1997; Poage 2001; in Muir and others, page 6). Existing old trees apparently grew quickly at low densities during early stages of their lives, and maintained diameter growth as they aged. Development of future old growth likely means that existing young, dense stands will require substantial thinning.

A study that addresses contributions of thinning young stands of Douglas-fir forests in western Oregon concluded that thinning can both enhance biodiversity and accelerate the development of old growth (Muir and others 2002). Though less conclusive about results for stands younger than 40 and older than 60 (because other aged stands were not specifically researched), the authors conclude that the benefits of thinning should apply to stands 15-120 years old.

Peer reviewed data developed for use in determining Fire Regime Condition in SW Oregon, shows that much greater amounts of open, mature stand conditions were historically present, as well as much less proportions of young to middle aged dense forest. Most stands in the China-Keeler area are dominated by dense stands 80-120 years old. This dominance results in poor distribution of varied seral stages across the project area.

The Applegate Adaptive Management Area Ecosystem Health Assessment recommends 60 to 120 ft^2 BA/AC as an acceptable level of basal area on pine sites, ridges, and droughty areas in order to maintain maximum health and stand resiliency. 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).

When radial growth is less than .5 inches per decade, pine trees cannot pitch-out bark beetles and tree mortality results (Dolph, 1985). 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).

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.

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 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.

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.

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).

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. That is, 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.

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 of seedlings and saplings. Natural mortality has also created openings in the canopy layer. Natural mortality is a result of Douglas-fir dwarf mistletoe, bark beetles tree pathogens 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.

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, native grass and herbaceous 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. 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.

Trees in the project area are growing at the lowest rate 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. Entomologists have found that trees growing quickly, with at least 1.5 inches of tree diameter growth per decade, decreases the risk of bark beetle attack 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). Stand vigor is decreasing because timber stands are significantly overstocked. The average relative density for the area is .75 and indicates that physiologically the trees are at the point of suppression and mortality (.75 is 5x past the point of crown closure, which occurs at .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.

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.

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.

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 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 (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.

Environmental Consequences

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

Alternative A – No Action

Without action, species composition and forest structure will continue to develop and change along current trends. 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. Douglas-fir continues to replace ponderosa pine, sugar pine and incense cedar because of its more shade-tolerant nature. Douglas-fir continues to encroach upon the edges of the oak woodlands, and mortality of Douglas-fir along these edges will continue. 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. 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. 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. Leaf area index would decline as live tree crowns decrease in size from tree competition.

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.

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.

Where dense forest stands persist over time, 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.

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.

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.

Alternative B – Proposed Action

Alternative B proposes 1315 acres of conifer forest thinning using prescriptions suited specifically to each site. 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. A combination of silvicultural methods will be used to reduce the density of all vegetation, reduce fuel loading, and create structurally diverse forest stands.

Douglas-fir replacement of ponderosa pine, sugar pine and incense cedar is retarded by removing competing suppressed, intermediate and some codominant, Douglas-fir which provides openings for regeneration of species that are intolerant of shade. 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. When pine trees are present, 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. Of the 321 acres suitable for this treatment within the planning area, 194 acres would be improved. The remaining acres will continue to exhibit the effects on composition outlined in Alternative A. The net result is a trajectory for the untreated acres decreasing in forest health and species diversity.

Competing vegetation will increase in openings as a result of the proposed action. 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. Follow-up cool underburning will be used in these areas to reduce fire hazard and aid in establishing Douglas-fir regeneration.

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.

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 anticipated to create undue competition. 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 since future maintenance of these areas with prescribed fire is 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.

The structure of pine sites would be improved by thinning competing Douglas-fir and generally thinning suppressed trees. One-fifth to one-acre group selection cuts will occur around suitable pine and seed trees to increase unshaded sites for regeneration of pine and cedar. Pine series sites with oak species and whiteleaf manzanita present would 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. Sixteen 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.

Stand densities would 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 would 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).

Twelve acres of Douglas-fir stands will be selectively harvested (regeneration and selection harvest) to create multiple-canopied stands and release existing natural regeneration. No less than 10 of the largest overstory trees will remain on site. By removing some of the overstory trees, the seedlings will be released to grow and vertical stand structure will be enhanced over time.

As a result of this treatment and thinning treatments for other purposes, the net change in seral stage proportion is a trajectory toward more old growth forest in the future.

Commercial thinning primarily occurs in dense Douglas-fir stands. Minimal basal area after thinning ranges from 80 to 160, depending on site conditions and existing stand conditions. Tree growth is increased by about 20% which results in faster growth and development of old growth characteristics. Stands resulting from this thinning more closely resemble historical stands in that they have larger and fewer trees per acre. All conifer stands that are thinned should respond with increased vigor and consequently an increase in the ability to withstand insect attacks.

There were approximately 1,320 acres of commercial forest land removed from the project because of short term wildlife habitat protection 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.

In summary, changes to vegetation from implementing Alternative B are: All acres treated would benefit through improvement in vigor, species composition, and structure as a result of thinning predominantly in the understory. Pine stands will benefit from the creation of stand conditions which allow more sunlight to reach individual trees and more open conditions which favor the successful reproduction and establish of young vigorous pines. As a result, the byproducts of these thinning and stand improvements amount to about 5.9 million board feet of raw wood to be sold in contribution of the Medford District's Allowable Sale Quantity goal.

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

C. FIRE/FUELS MANAGEMENT

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

Issues/Concerns

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

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

Some believe fuels reduction can occur without the construction of new roads. The China-Keeler project constructs new roads.

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

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

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

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

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

Because of mitigation and/or project design features, which result in zero or immeasurable effects, the following anticipated effects are not considered further.

For various reasons, other anticipated effects related to fire and fuels management were found to be not relevant to the China-Keeler project. These are:

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

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

Affected Environment

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

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

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

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

Fire Regimes

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

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

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

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

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

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

Condition Class

The process for making an assessment on how much fire exclusion along with other management activities has affected an ecosystem is through classifying the current condition of the site based on a reference usually pre-dating when fire exclusion became an influence. **Condition class** descriptions are used to describe these affected ecosystems. Condition classes are a function of the degree of departure from historical fire regimes resulting in alterations of components such as species composition, structural stage, stand age, and canopy closure. There are three condition classes:

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

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

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

Ponderosa pine areas (fire regime 1) proposed for treatment in this project area total 194 acres and are in condition classes 2 and 3. The pine sites proposed for treatment have a dense understory of Douglas-fir and brush due to the absence of fire. Previously treated plant communities (oak woodlands) treated in this fire regime and condition class within this project area total approximately 389 acres.

The dry westside Douglas-fir stands (fire regime 3) proposed for treatment are in condition class 2. Approximately 1,110 acres are proposed for treatment. There are small portions of these stands that are in condition class 1 and 3. Stand densities are extremely dense due to the absence of fire.

Effects of Fire Suppression and Fire Exclusion

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

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

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

Many forests developed high tree densities and produced slow growing trees rather than faster growing trees after abrupt fire suppression became policy in about 1910. In the Douglas-fir series in southwest Oregon there has been an increase in tree basal area with a shift to more shade tolerant species (Atzet

1996). Trees facing such intense competition often become weakened and are highly susceptible to insect epidemics and tree pathogens. Younger trees (mostly conifers) contribute to stress and mortality of mature conifers and hardwoods. High density forests burn with increased intensity because of the high fuel levels. High intensity fires can damage soils and often completely destroy riparian vegetation. Historically, low intensity fires often spared riparian areas, which reduced soil erosion and provided wildlife habitats following the event.

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

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

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

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

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

one must infer that these are mature to old growth stands. Therefore, the results of this study are not comparable to young stand conditions which are the subject of thinning proposals in China-Keeler.

Effects of Logging

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

Commercial timber harvesting has occurred in the China-Keeler project area on BLM managed land since the early 1960's. Harvest techniques that created the current state of wildfire potential include the harvesting of stands of mostly large diameter trees; leaving behind untreated slash; and clearcutting (which results in young, more flammable stands of trees). Clearcutting was last done on federal lands in China-Keeler project area in 1985.

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

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

Unmanaged blocks of contiguous mature and old growth forests generally have sufficient structural diversity to create microclimate effects that inhibit extremely hot fires (DellaSalla 1995). Many of these natural checks to intense fire behavior and high severity effects (large down trees, shade from intact canopies) were removed by timber harvest in the 1980's. This project is not treating unmanaged blocks of contiguous mature and old growth forests. The commercial thinnings proposed in this project are generally in stands that are less than 150 years of age and are removing the smaller diameter trees from the understory.

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

Timber harvest has increased fire severity, *if not* accompanied by adequate reduction of fuels, by increasing surface dead fuels (SNEP 1996). Studies that correlate logging with increased fire behavior (Weatherspoon and Skinner 1995) are mostly based on the forest practice of not treating logging and

thinning debris (slash). Thus it is the added ground fuel which in a drier, hotter microclimate, as a result of opening forest canopy that significantly contributes to fire behavior in a wildfire situation.

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

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

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

Effects of Climate

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

Effects of Roads

Research has shown that 78% of human-caused fires occurred within 265 feet of a road. Other studies have estimated that humans cause 90% of wildfires, and that over half of those are started from roadsides (Noss 1995). While roads provide locations for fires started by humans, microclimate changes which favor increased fire behavior along roads are very localized. Odion and others (2004) found little overall difference in fire severity between roaded and unroaded areas.
The fire history data for the China Keeler project area (1967 – 2001) shows that 73% of the fires that occurred on BLM land were started from lightning compared to the 10% referenced by (Noss 1995).
The China Keeler project proposes to construct .7 miles of road but will have a net reduction of 1.2 miles of road due to decommissioning existing roads. Roads may have adverse ecological impacts, but also make applying prescribed fire easier (Agee 2002).

Fire Risk

Fire 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:

Table 3-1: Fire Number by Size

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 (1967-2001).

Table 3-2: Fire Number by Cause

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, lightning started 73% and the remaining fires were human caused.

Fire data for the project area indicates seven of the fires were started by recreationists. These fires are likely from unattended campfires. Neither an annotated bibliography and research assessment on the environmental and social effects of OHV's (Stokowski and LaPointe 2000) nor the Wildlands Center for Preventing Roads or the Sierra Club websites dealing with OHV show studies or sources connecting OHV activity as ignition sources for wildfires. Because OHV's have spark arrestors, it is unlikely the direct operation of these vehicles cause wildfires.

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.

Table 3-3: Fire Hazard Ratings

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

Fuels Reduction/Fire Restoration

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

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

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

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

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

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

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

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

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

Wildland Urban Interface

The entire project area is within the Applegate wildland urban interface. The effect of reducing home ignitions by reducing forest fuels around structures has been demonstrated by Cohen 1998; Cohen 1999). He found that even severe fires will not directly ignite structures at distances beyond 200 feet. However, fire brands from beyond 200 feet may land on combustible surfaces and ignite structures. In cooperation with fire agencies, the community developed the Applegate Fire Plan. Using the Fire Plan as both a guiding document and leverage for obtaining assistance funds, Fire Plan personnel and Applegate Valley Rural Fire Department #9 have spearheaded significant efforts to create defensible space around structures, driveways, and important roads. As a result of education and outreach efforts involving the Fire Plan, 87% of homeowners in the Applegate Valley have created defensible space around their homes (pers. Com., Brett Fillis, Fire Chief). Because of the leadership of a few residents in the China-Keeler project area, defensible space is expected to be at least as high as the Valley average. Many local residents have expressed concern for loss of their forest resources to wildfire in addition to their homes.

This concern has motivated a number of landowners to perform thinning operations on private forest land in order to create conditions that will allow for less damaging wildfires to occur on their property.

Environmental Consequences

One of the benefits of vegetation treatments in China-Keeler is to reduce vegetative horizontal and vertical structure to decrease the probability of uncharacteristic wildfire (increase fire resiliency). Therefore, per acre measurements in the China-Keeler Analysis Area of the stand's fire hazard is a reflection of the horizontal (patchiness, fuel continuity) and vertical (age/size, height) structure. Because effects on the ecological and social environments increase when natural fire return cycles are missed, the percent of each fire regime that has fire restored (albeit prescribed fire and not natural fire) is a relevant measure of the impact on fire behavior. The consequences of reducing fire hazard and restoring fire intervals is displayed in the text below.

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

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

Alternative A (No Action)

The 194 acres of ponderosa pine which are in condition classes 2 and 3 would not be treated. Restoration objectives for these areas would not be accomplished.

The dry westside Douglas-fir stands (1,110 acres) proposed for treatment that are in condition class 2 would not be treated. Without treatment the condition class of these stands would deteriorate to a condition class 3.

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

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

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

Based on trends in the last 35 years, humans will continue to be responsible for the majority of wildfires (51%), but be responsible for only a small portion of the total acres burned. On BLM lands, lightning will continue to be the major cause (73%) for fire starts. Most of the human-caused fires will continue to be associated within about 300 feet of roads.

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

Fire suppression will continue because there are no policies in place or being proposed that will allow fires to burn naturally within the China-Keeler project area. An average 1.3 fires per year will be suppressed. There are no private industrial lands that are known to be scheduled for timber harvest, but it is possible at any time that private forest land could be scheduled for harvest There are no other known timber harvest projects in China-Keeler by the BLM. Defensible space and driveway treatments will continue by private land owners, but the amount is unknown. Though significant in the immediate vicinity of structures, the defensible space work that is ongoing totals up to a negligible amount of acres, particularly because so much has been accomplished already. There are no expected significant gains in the miles of new roads, except for an occasional private driveway.

Alternative B

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

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

This alternative results in 1,304 acres of timbered stands that are in condition class 2 and 3 being thinned. The thinning prescriptions target suppressed and co-dominant trees. Some of the smaller diameter commercial trees that are proposed for harvest act as ladder fuels.

The end result of these stands being thinned will be a reduction in ladder fuels, an increase in the height to the base of tree crowns and the reduction of crown bulk density. All these are important factors in reducing crown fire potential and sustaining a crown fire in these stands (Omi and Martinson 2002). Over time, the commercial thinning would also increase diameter growth of the residual stand. Larger diameter trees are more tolerant to surface fires so there would be less mortality to the stand in the event of a surface fire. The commercial thinning would also favor more fire tolerant species such as pine. Lowering basal area through thinning and prescribed fire can increase the long term vigor in the residual trees within a stand (Agee and Huff, 2000).

Timber harvesting treatments which do not have increased fire resiliency as an objective are 12 acres of regeneration harvest.

Regeneration harvesting is necessary to provide renewal of forest conditions that will grow the next stand of trees for timber harvest. All factors being equal, a small tree is more flammable than a large tree. However, not all trees will be large all the time. Thus, there is an inherent increased risk in forested environments that occurs naturally (when trees are young). The result of regeneration harvest is 12 acres that in the short term are more fire resilient, but in the long term (after 10 years and after the stand is re-established with small trees) will have an increase in flammability, until the stand once again develops into an older age class.

In addition, these regeneration areas are 12 acres in size and will not be planted into dense rows of trees (as previously done in the aftermath of a clearcut). Thus the regenerated stand will exhibit more natural spacing and tree density that is more fire resilient than the replanted clearcuts of past timber harvests. Moreover, the small sized-openings that are being created through regeneration treatments have much less fuel (less density, smaller size to generate heat), and will likely not have the fire effects that are noted with studies of wildfire in large replanted clearcuts. Because the regeneration patches are small, are not replanted to dense plantations, and mimic the more natural regeneration patterns of the stand, the effect of the regeneration units on fire resiliency is minimal, though increased simply because the trees are younger and more flammable.

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

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

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

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

Treatments designed to reduce canopy fuels through density management, increase and decrease fire hazard simultaneously. Slash generated from the commercial thinning of timber stands, if not treated,

would create surface fuels that would be greater than current levels. The existing surface fire behavior fuel model in the majority of stands proposed for commercial thinning are represented by a Timber Group fire behavior fuel model. Fuel amounts are measured in tons per acre for different size material. Material up to 3 inches in diameter has the greatest influence on the rate of spread and flame length of a fire, which has direct impacts on fire suppression efforts.

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

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

Thinning and subsequent slash treatments are followed with prescribed burns. The reduction in stand density would make it possible to use prescribed fire as a tool to further reduce fire hazard in these stands. Fuel treatment for stands that are commercially thinned are proposed for treatment within two years after a unit is harvested. Most units would be treated within one year of harvest. Treatments would take place where slash three inches in size and less exceeds 5 to 6 tons per acre. Treatments should ensure that under most climate conditions, flame lengths would be less than three feet allowing for direct attack of a wildfire. Because research indicates that thinning followed by prescribed fire is effective in reducing fire behavior, 1,304 acres treated by thinning and followed by fire will be more fire resilient.

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

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

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

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

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

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

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 these acres along with the shaded fuel break would be easier and less costly if this new road was in place**.** The cost of burning can double when access is limited because it raises the complexity of the burn.

Also maintenance burning of the previously treated stands would have less risk of escape due to better access to the top of these units. This road is above private land residents in the Thompson Creek 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.

Studies which indicate roads are not needed for successful prescribed fire occurred in different vegetation types (Southern Sierras). These burns targeting natural fuels, which is not the case in this project area. Activity fuels are being targeted which have higher rates of spread, greater flame lengths and a higher resistance to control. These studies were also not burning in the wildland urban interface and adjacent to private property. In the China Keeler project the road proposed for construction into section 27 have a distinct role to play in the tactics of successful prescribed fire operations for this area (*see also Agee 2002*). The ecological impacts of this road are discussed in other sections of this document.

This alternative builds 0.7 miles of new roads, but closes 1.8 miles. Even considering the effectiveness of road closures by the BLM (see such and such where Ashland monitoring study is referenced), as a result of this project there will be reduction of 1.1 miles of road as part of the active transportation system. 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%), so the addition or use of new roads would have little effect on the number of fires started by humans. Because the total miles of roads are less, and because lightning is more responsible for fire starts than people, there is no increase in fire risk due to the construction of new roads.

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

The thinning of approximately 1,304 acres within the urban interface reduces the chances that embers originating beyond the immediate defensible zone will ignite structures. In combination with homeowner treatments, fuels reduction beyond the home defense zone is reducing the chance of structural loss or damage in a wildfire situation.

The thinning treatment of 1,304 acres in Alternative B increases the China-Keeler's fire resiliency to the extent that these treatments are effective during a large, wildfire event. Since little is known about the landscape level effectiveness of individual stand treatments to alter potential wildfire effects, the net result of Alternative B is unknown, especially with the relatively unknown effects of global climate change. As large wildfires burn in mosaic patterns of stand replacement to mild underburns, the net effect of the fuels reduction treatments in wildfire situations are determined by numerous factors in a complex situation.

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

- Increased fire resilience in stands that are thinned followed by prescribed burning (1,304 acres).
- No anticipated change in fire risk because there is a net loss of road miles.
- No anticipated change in fire risk due to the use of OHVs.

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

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

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

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

not have much cumulative effect to treated stands because fire will be continually applied over time, as needed. Maintenance burns will continually reduce accumulated forest debris and new plant growth.

D. AIR QUALITY

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

Issues/Concerns

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

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

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

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

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

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

Affected Environment

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

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

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

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

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

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

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

Past Actions

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

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

population centers of Grants Pass and Medford/Ashland have been in compliance for the national ambient air quality standards for PM-10.

Environmental Consequences

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

Alternative A

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

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

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

Alternative B

Burning of the logging slash created with this project and performing maintenance underburns will produce smoke.

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

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

The greatest potential for impacts from smoke intrusions is from underburning to localized drainages within and adjacent to the project area. Alternative B proposes approximately 1315 acres of commercial logging which could be underburned in the future. Because underburning requires a low intensity burn, there is not the energy to lift the smoke away from the project site. Smoke retained on site could be transported into portions of non-attainment areas if it is not dispersed and diluted by anticipated weather conditions. Localized concentration of smoke in rural areas away from non-attainment areas may continue to occur during prescribed burning operations.

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

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

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

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

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

In addition, Alternative B results in 1.1 miles of fewer open roads than exist currently. Therefore, dust impacts from new roads are reduced simply because there are fewer miles of total roads.

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

E. SOILS

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

Issues/Concerns

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

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

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

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

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

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

Logging may have a high correlation to landslides.

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

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

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

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

Roads are also perceived to allow increased use of OHVs, which results in trails that are compacted and result in erosion.

Off-Highway Vehicle (OHV) impact on the landscape includes the destruction of vegetative cover, soil compaction and increased runoff followed by increased erosion. Hillclimb gullies can have a significant loss of soil fertility due to accelerated erosion. Soil texture and slope length are dominant factors controlling soil erodibility (Tuttle, 1987. p.111).

Prescribed fuel treatments are perceived to increase soil erosion.

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

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

Affected Environment

The China Keeler Project area consists mainly of the China Gulch drainage and the Chapman/Keeler drainage. Soils series identified in the project area are Caris, Offenbacher, Jayar, Manita, McMullin, Ruch, Vannoy, Voorhies. Soils in the project area are generally moderately sensitive to disturbance activities like road construction, log yarding and prescribed fire. Caris and Offenbacher soils on slopes over 65 percent may exhibit signs of instability and raveling. A map showing the location of the soils in the project area is on file at the Medford District office. A description and characteristics of the soils identified in the project area is at the end of this section.

There are approximately 113 total miles of road in the project area. In the China Gulch drainage there is about 19 miles of roads with about two-thirds of the roads being on private land. Private roads occupy the majority of roads in most of the drainages in the project area except for the Keeler creek drainage where BLM roads (8 miles) make up about seventy percent of the total roads. Most of the roads have some degree of surfacing but there are about 4 miles of natural surface roads in the Chapman/Keeler drainages and about a mile of natural surface road in the China Gulch drainge. All roads on BLM managed lands are established roads (10+ years) that are in stable condition. Observations after the 1997 flood event revealed no landslides or mass failure with only small areas of cutbank sloughing associated with the road system. This confirms that the dominant source of road related sedimentation is from road surfaces, cutbanks and ditches.

Numerous OHV trails have been observed in the area of the China Keeler project, exact numbers are not available. Most observed trails occur in the China Gulch and adjacent drainages. Bunk (2004) reported OHV use extensive and trail density high in the China Gulch drainage. A thorough analysis of the trails in China Gulch should be accomplished in the John's Peak Timber Mountain OHV Management Plan.

There is approximately 1,980 acres of potentially unstable/highly erodible ground identified in the project area. Soils identified as potentially unstable/highly erodible are the Caris and Offenbacher soils on slopes over 65 percent or soils from granite parent material.

Past Actions

Timber harvesting last occurred in the China Gulch drainage between 1989 and 1993 when small amounts of scattered dead trees were salvaged using a helicopter. Except for miscellaneous salvage, the Chapman/Keeler drainage was last entered for timber harvest around 1982 when approximately 231 acres were partial cut and about 225 acres had the overstory removed. The following table list both past and possible future disturbances by Hydrologic Unit Code (HUC) at the 7th field drainage level. All drainages have recovered nicely from previous management activities with erosion rates being near natural levels in most areas except where roads and motorcycle trails exists. About 0.5 mile of BLM road in the China Gulch drainage is presently located in the Riparian Reserve while about 1.5 miles in the Keeler Creek Drainage is in the Riparian Reserve. The remaining roads in the Chapman/Keeler drainage either traverse across the hill slope or are located near ridge tops. A thorough review of the road situation can be found in the Water Resources section. The table below lists past management actions in the drainages of the proposed China Keeler project.

Table 3-5. Past Management in China-Keeler Project Area

HUC	Ownership	Unit Size (acres)	Type of Mgt. Activity	Management System	Year
303	PVT	100	Timber Harvest	Non-designated tractor	<30 yrs
306	BLM	68	Individual Trees (China Bunny sale)	Non-designated tractor	1982
306	PVT	50	Timber Harvest/Fuels	Non-designated tractor	<15 yrs
306	BLM	148	Fuels Reduction	Slashbuster	2001
306	PVT	80	Fuels Reduction	Slashbuster	<5 yrs
309	BLM	65	Fuels Reduction	Slashbuster	2004
315	BLM	46	Partial Cut (Chapman-Keeler)	Cable	1981
315	PVT	5	Fuels Clearing	Non-designated tractor	<15 yrs
318	BLM	113	Partial Cut (Chapman-Keeler)	Cable	1981
318	BLM	109	Overstory Removal (Chapman-Keeler)	Cable	1981
318	BLM	26	Overstory Removal (Chapman-Keeler)	Non-designated tractor	1981
318	PVT	170	Partial Cut	Cable	<30 yrs
321	PVT	160	Partial Cut	Cable	<30 yrs
324	BLM	56	Partial Cut (Chapman-Keeler)	Cable	1981
324	BLM	16	Partial Cut (Chapman-Keeler)	Non-designated tractor	1981
324	BLM	59	Overstory Removal (Chapman-Keeler)	Cable	1981
324	BLM	31	Overstory Removal (Chapman-Keeler)	Non-designated tractor	1981
324	PVT	160	Partial Cut	Cable	<30 yrs
327	PVT	40	Fuels Reduction	Non-designated tractor	<15 yrs
330	PVT	30	Fuels Reduction	Non-designated tractor	<15 yrs
336	PVT	5	Fuel Reduction	Non-designated tractor	<15 yrs

Environmental Consequences

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

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

The appropriate scale for measuring soil productivity criteria (compaction, erosion, etc.) is site specific or on a unit by unit basis. The appropriate scale for measuring erosion or compaction that may affect water quality or quantity would be the 7th level hydrologic unit. Short-term impacts (or affects) are those being ten years or less and long-term more than ten years.

Alternative A

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

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

Table 3-6. Possible Future Management in China-Keeler Project Area

HUC	Ownership	Unit Size (acres)	Type of Mgt. Activity	Management System	Year
303	PVT	40	Timber Harvest	Non-designated tractor	Future
303	PVT	15	Fuels Reduction	Slashbuster	Future
306	PVT	160	Fuels Reduction	Slashbuster	Future
309	PVT	10	Timber Harvest	Non-designated tractor	Future
309	PVT	20	Fuels Reduction	Slashbuster	Future
315	PVT	15	Timber Harvest	Cable	Future
315	PVT	70	Timber Harvest	Non-designated tractor	Future
318	PVT	100	Timber Harvest	Cable	Future
318	PVT	60	Timber Harvest	Non-designated tractor	Future
321	PVT	20	Timber Harvest	Non-designated tractor	Future
231	PVT	30	Fuel Reduction	Slashbuster	Future
324	PVT	20	Timber Harvest	Cable	Future
327	PVT	20	Timber Harvest	Non-designated tractor	Future
327	PVT	50	Fuels Reduction	Slashbuster	Future

HUC	Ownership	Unit Size (acres)	Type of Mgt. Activity	Management System	Year
330	PVT	20	Timber Harvest	Non-designated tractor	Future
330	PVT	20	Fuels Reduction	Slashbuster	Future
336	PVT	5	Timber Harvest	Non-designated tractor	Future
336	PVT	55	Fuels Reduction	Slashbuster	Future

Alternative B

Under this alternative, about 0.7 miles of road will be constructed, 1.1 miles of road would be mechanically decommissioned, about 0.7 miles of road would be naturally decommissioned, about 11 miles of existing road would be renovated, approximately 119 acres would be tractor logged using designated skid trails, 371 acres would be skyline-cable logged using partial suspension, and 826 acres would have the logs removed with a helicopter. Approximately 57 acres of cable logging would occur on potentially unstable ground. A skyline cable system would provide for maximum suspension decreasing the ground disturbance. About 115 acres of helicopter logging would occur on potentially unstable ground. Slash created by the logging would be treated by burning to reduce the total fuel loading on-site.

Impacts associated with roads would have the greatest impact on the soil resource as approximately four acres of land is disturbed and taken out of vegetation production for every one mile of road proposed. There is approximately 0.7 miles of new road construction proposed in this alternative. The road would be surfaced with about 4 to 8 inches of rock. Most of the new road construction would be located on or near the ridgetop in stable areas, thus minimizing the likelihood of disturbed soil reaching stream channels. The geomorphology of this terrain consists of metasedimentary and metavolcanic rocks of the Applegate formation in the Klamath Mountains. The soils in this area are the Caris, Offenbacher and Vannoy series. Roads built in similar slope locations in this area show little soil movement. 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 very low as much of the new roads are designed to be outsloped with few ditchlines.

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 and are no way portrayed as absolute values.

The new road construction would be about 0.7 miles long built on or near the ridgeline. The WEPP module indicates that an average of approximately one-quarter ton of soil would be eroded from this road surface yearly. One ton of soil equates to approximately two-thirds of a cubic yard. It was predicted that about 200 pounds of soil sediments would reach the stream annually. Sediments are soil particles that are either suspended in the water of local waterways or deposited on the streambed. This 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.

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

The mechanical decommissioning of approximately 1.1 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. These effects are minimized by deferring road decommissioning until the end of the project (not in conjunction with road construction) and in the dry season, protecting existing vegetation on roadways where natural recovery is already occurring, restoring natural drainages, and discouraging use through placement of debris. A slight, long-term decrease in erosion rates associated with the roads in China Gulch area would result from the decommissioning project. The surfacing of about 3.5 miles of existing natural surface road will help in reducing surface erosion from roads and decrease sediments reaching local waterways, which is a slight, positive direct, indirect and cumulative effect.

It is anticipated that OHV use could increase in the China Gulch drainage as a result of the adjacent Timber Mountain/Johns Peak OHV area. The main increase would be the use of the 38-3-21.0 road as it is an access route to the OHV area. Under this project that road is being renovated with portions in the lower drainage being surfaced which would decrease the surface erosion coming from the road presently. There is other casual OHV use in the drainage that appears to be local in nature as Bunk (2004) reported that there does not appear to be significant change in condition of trails at three photo points. In the rest of the project area, OHV use appears to be low, casual and dispersed.

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

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

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

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

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

The increase in erosion rates over present levels would be minimal as a result of burning handpiles because the piles would be spaced throughout and occupy approximately 3 to 5 percent of the total area. The increase potential of soil particles reaching the local waterways as a result of the prescribed burning would be low as underburning would be avoided and handpiling of slash would not occur near waterways. High soil temperatures generated by burning piles would severely and negatively affect soil properties in the 3 to 5 percent of the unit by physically changing soil texture and structure and reducing nutrient content.

Duff and woody debris represent a storehouse of minerals and protection for the soil surface. Since Nitrogen losses are roughly proportional to the amount of duff consumed, burn prescriptions that allow greater retention of woody debris benefit long-term site productivity. Burning volatizes organic Nitrogen or changes it into a readily available form. Large proportions of the total Nitrogen budget can be lost through volatilization. Total foliar Nitrogen content also is reduced (14% in moderate burns, 33% in intense burns), and the effects last at least 4 years (Atzet, 1987 p.193). Overall, soil productivity would experience a slight, negative decrease short-term but potential long-term positive effects would be realized from the proposed actions as the risk of catastrophic fire is diminished.

In summary, there would be a slight, short-term increase in erosion rates as a result of timber harvesting activities which would return to near pre-harvest levels within 5 years. There would be a net increase in compacted area in the tractor harvest units averaging about 12 percent which would slightly decrease soil

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

There would be a slight net decrease in the amount of roads in the China Gulch drainage which would result in a slight, short-term increase in erosion rates but a slight long-term positive effect as the decommissioned roads become re-vegetated. The newly constructed road would slightly increase the amount of roads in the drainage and have a slight increase soil erosion rate potential locally; particularly the first few years after construction and use. A very slight increase in the cumulative erosion rate potential would occur as a result of the road construction.

The effects actions which occurred over twenty years ago, except for the roads, have long since diminished and soil erosion rates in all drainage are most likely near the normal level of 0.7 yd^3/ac/yr reported by Amaranthus (1985). Most of the actions in the reasonably foreseeable future would occur on private land and are described in table 3-6. The possible future actions on private land are relatively small and dispersed across the landscape. These actions should have a minimal effect on soil erosion potential. The cumulative effects of these actions on soil compactions could increase the peak flow potential and this topic is addressed in the Water Resources section.

Cumulatively, there is currently little direct evidence to indicate that harvest removals in themselves lead to soil depletion over several succeeding rotations (Beschta, nd). A crucial aspect that affects soil productivity is cutting intensity. Cutting intensity means the proportion of standing trees harvested, i.e., clearcutting vs. shelterwood vs. selection cutting. The less intense the cutting intensity, the lower is the effect on the soil. Another critical aspect of a silvicultural regime is the rotation or cycle length. Rotation length determines the intervals at which the site is entered and disturbed and nutrients are removed, redistributed or lost. Rotation length is especially important from the point of view of cumulative effects since it determines the time periods allowed for recovery between harvests. Soil productivity decline should be least likely when low silvicultural intensity is combined with high inherent productivity and favorable conditions. Since the China Keeler project would utilize 3 low intensity cutting prescriptions and would utilize project design features (PDFs) designed to minimize soil disturbance and provide for adequate water dispersal, protective soil cover would remain in place minimizing potential for off site movement of soils. Erosion rates would return to near normal within about five years. Past harvest that had a substantial affect on soil erosion rates was over twenty years ago and the site had recovered from that event. Therefore, cumulative effects to the soil resource would remain minimal if the soil resource is allowed enough time to recover from the disturbance of this project.

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

Soil Descriptions in planning area

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.

F. WATER RESOURCES

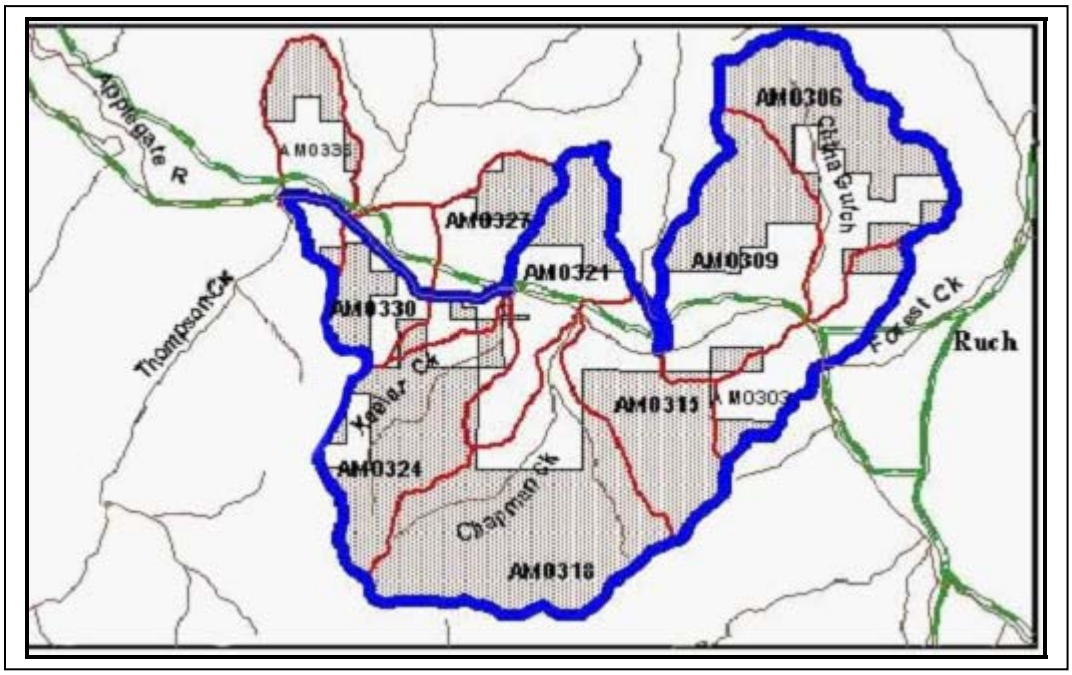
Characterization

Project Area Description

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 Forest Creek (near Rd 238 / Hamilton Rd intersection) on the east and Thompson Creek (near Applegate) on the west. 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 above the project area.

Map 3-1 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 with the Applegate River. The remaining drainages (marked with an asterisk in Table 3-7) are frontal watersheds that drain 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 (AM0327, AM0330, and AM0036) 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.

Map 3-1. China Keeler Project Area and Associated Drainage Areas



Most of the BLM-administered 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 3-7. Drainage Areas Associated with the China Keeler Planning Area

Drainage Area 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 Forest Cr and China Gulch	218	646	864	864	1.3
AM0306	**China Gulch drainage**	1,238	659	1,897	1,897	3.0
AM0309*	Between China Gulch and Long Gulch	936	930	1,866	1,866	2.9
AM0315*	Between Long Gulch and Chapman Cr	909	398	1,307	1,307	2.0
AM0318	**Chapman Cr drainage**	2,254	461	2,714	2,714	4.2
AM0321*	Between Chapman Cr and Keeler Cr	462	740	1,202	1,202	1.9
AM0324	**Keeler Cr drainage**	1,185	335	1,520	1,520	2.4
AM0327*	Between Keeler Cr and Gage 14366000	78	136	214	939	1.5
AM0330*	Between Gage 14366000 and Humbug Cr	312	233	545	845	1.3
AM0336*	Between Humbug Cr and Thompson Cr	32	143	175	894	1.4
Totals		**7,623**	**4,681**	**12,304**	**14,048**	**22.0**

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

Surface Water

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 (USDA and USDI 1994). 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 3-8).

Table 3-8. Stream Miles 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				
		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**
Total		**8.7**	**13.7**	**10.1**	**18.4**	**24.1**	**16.5**	**64.2**	**22.8**	**107.1**	**71.4**	**178.5**

Springs, wetlands, and reservoirs on BLM-administered lands within the project area have been identified and mapped in GIS. All of these 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 (Appendix D). Springs that appear to be used by private parties are identified in Appendix D.

Groundwater

Groundwater supplies in the project area are limited and primarily found in valley bottom alluvium of the Applegate River corridor (USDI 1995b:47). Well water quality problems are prevalent throughout the Rogue basin, arising from natural sources such as arsenic, boron, and fluoride. Surface contaminants such as nitrate and fecal matter may enter ground water through improperly constructed wells. Increasing demand from rural population density increases and years with below-normal precipitation have been identified as factors affecting ground water supplies in Jackson County (USDI 1994:3-13). The RMP/EIS identified that an increase in rural population density has been accompanied by an increase in ground water diversion, and this trend is expected to continue (USDI 1994:3-13).

Water Quantity

This section discloses the impacts from various vegetation treatments and ground disturbing activities on water quantity. Impacts to water quality are discussed in the subsequent water resources section. Habitats and wildlife related to water are discussed in the "Fish" section.

Issues/Concerns

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

Some oppose road construction because roads alter the natural drainage patterns.

Some oppose logging and road construction due to the potential effects of compaction.

Some oppose logging and aggressive forms of thinning and fuels reduction with associated road construction, because such treatments may affect streamflows.

Roads, trails, and ditches can intercept both surface and subsurface flow thereby changing the local drainage pattern (Wemple 1994). This is of particular concern if they force the natural drainage system that has developed over millennia, to adjust to a new regime. For example, a road might intercept storm flow and transport it into a different drainage. The channel in the drainage receiving the additional flow must start an adjustment process to accommodate this flow increase while the original channel responds to a reduction in water. Well-designed roads and trails with a properly functioning drainage system attempt to mimic the local natural drainage pattern by keeping the local downslope movement of water similar to the pre-road condition. However, during extreme events (drought or peak flow) any hydrologic differences between the artificial drainage associated with the road system and the natural system become more critical and can cause noticeable effects to the local environment.

Soil compaction (due to ground-based logging equipment, ground-based fuels treatment machinery, and the existence of forest roads and trails) and removal or alteration of vegetation (from timber harvest, roads, fuels reduction, prescribed fire and wildfire) may increase the frequency and magnitude of peak streamflows (Harr 1976). Compaction can reduce the infiltration properties of the soil, resulting in increased runoff. Soil compaction can also impede the subsurface movement of water as it moves

downslope in shallow aquifers. Peak flows for small, headwater streams appear to be increased where at least 12% of a watershed was seriously compacted by road building, tractor skidding, or tractor windrowing of slash (Harr 1976). Severe fire can also reduce the infiltration properties of the soil, resulting in increased runoff.

Reduction in vegetation canopy has the potential to cause the following hydrologic process changes: reduced interception and transpiration; increased snow accumulation in transient snow zone; increased snow melt rate; decreased snow melt time in transient snow zone; and increased soil water content (Chamberlin, et al. 1991). Possible effects on the streamflow regime from these hydrologic process changes include reduced time to hydrograph peak; increased frequency of peak flows; and increased magnitude of peak flows. Altered peak flows may affect stream channel condition by eroding streambanks, scouring streambeds, and transporting and depositing sediments.

Affected Environment

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. 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. 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.

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 (WPN 1999:IV-9-11) 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.

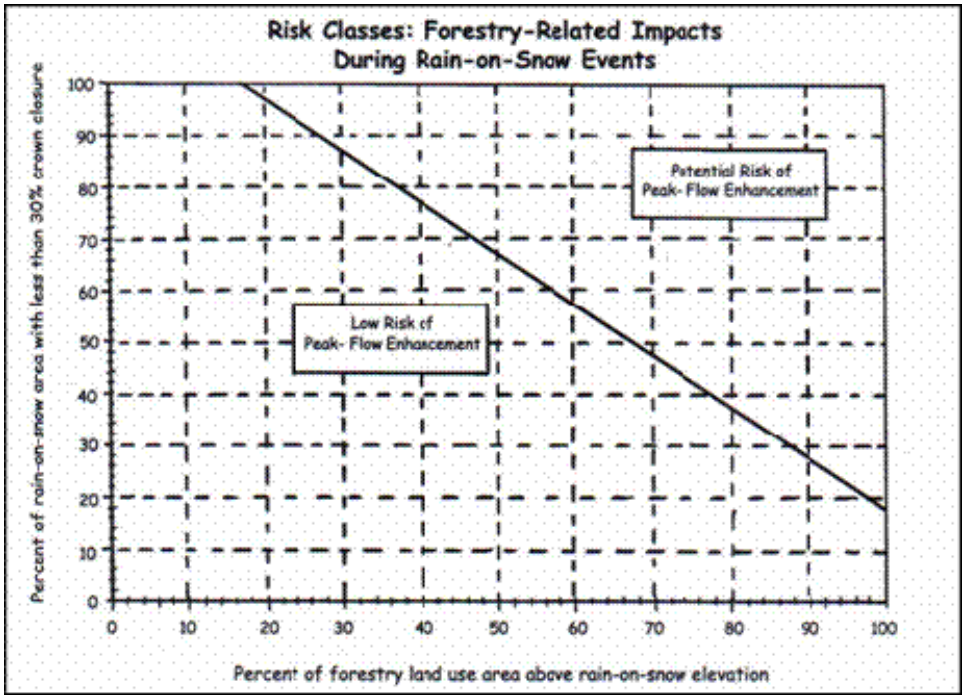
Chapman Creek (AM0318) is the only drainage in the project area with more than 25% of the area within the transient snow zone (Table 3-9) and therefore, may have a risk of increased peak flows. The OWAM risk assessment chart (Figure 3-1) indicates that more than 85% of the area in the transient zone would have to have less than 30% crown cover to cause a detectable increase in peak flows (based on Figure 3, Page IV-11 of the OWAM). Aerial photo analysis (2001 aerial photos) shows that approximately 2% of the transient snow zone in Chapman Creek has less than 30% crown cover. 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% (WPN 1999: Appendix A) 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.

Table 3-9. Percent of drainage areas within the transient snow zone.

Drainage Area Number	Location	Acres in Precipitation Zone			% in Transient Snow Zone
		Rainfall Zone	Transient Zone	Snow Zone	
AM0303	Between Forest Creek and China Gulch	864	0	0	0%
AM0306	China Gulch	1,878	19	0	1%
AM0309	Between China Gulch and Long Gulch	1,866	0	0	0%
AM0315	Between Long Gulch and Chapman Creek	1,252	55	0	4%
AM0318	Chapman Creek	1,938	776	0.3	29%
AM0321	Between Chapman Creek and Keeler Creek	1,201	1	0	0%
AM0324	Keeler Creek	1,282	239	0	16%
AM0327	Between Keeler Creek and Gage 14366000	939	0	0	0%
AM0330	Between Gage 14366000 and Humbug Creek	845	0	0	0%
AM0336	Between Humbug Creek and Thompson Creek	894	0	0	0%

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



Past Actions

Road miles were determined from the BLM GIS data base and from an aerial photo survey (Table 3-10). 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 (Squyres 2003).

Road density provides a general index of relative extent of the amount of road in the project drainages (Table 3-10). Areas with higher road densities will generally experience more road-related effects, however, many other factors such as design, location, maintenance, use, surface type, and geology can

influence the effect of any particular road. High road densities are found in all drainage areas associated with the project area except AM0318 (2.4 mi./mi.^{2}) (Table 3-10), due in part to the higher residential use along the Applegate River. Overall road density is 5.2 mi./mi.^{2}.

The percentage of the drainage area in roads is a similar index. The OWAM (WPN 1999:IV-16) suggests that rural drainages with more than 8% roads have a high potential of experiencing more than a 10% increase in peak flows. Drainages with 4-8% have a moderate risk and less than 4% have a low risk. No drainage areas have a high potential of increased peak flows, even if the estimated area in roads was increased by 30% for undetected roads. Drainage areas AM0303 (between Forest Creek and China Gulch), AM0327 (between Keeler Creek and gage 14366000), and AM0330 (between gage 14366000 and Humbug Creek) have a moderate potential of having an increase in peak flows (Table 3-10). These three drainage areas are less than 1,000 acres in size with high residential use and less than 40% managed by BLM. Drainage area AM0306 (China Gulch) could be included in the moderate category if the area in roads was increased by 30% for undetected roads. The remaining drainages are in the low risk category.

Table 3-10. 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[1]
	Within Project		Outside Project		Within Project		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	7.3	4.1%
AM0330		1.3		2.7	0.6	1.1		3.6	9.2	7.0	4.0%
AM0336		1.0		2.4		0.9	1.3	1.5	7.2	5.1	2.9%
Total	**21.6**	**40.1**	**0.1**	**10.3**	**7.9**	**22.8**	**2.5**	**8.0**	**113.3**	**5.2**	**2.9%**

1/ Based on 30 foot average width.

Roads located near a stream or mid-slope generally have a greater chance of directly affecting the hydrologic function of the stream system. The number of stream crossings by stream type for each drainage area is used as an indicator of road location (Table 3-11). The stream crossing density (crossings/mi.^{2}) is high for most of the drainage areas, with the highest densities found in AM0303 (between Forest Creek and China Gulch), AM0318 (Chapman Creek), AM0324 (Keeler Creek), and AM0327 (between Keeler Creek and gage 14366000). Of the 356 total stream crossings identified, 45% are on BLM-administered land, whereas, the BLM manages 59% of the drainage areas analyzed. Note that 66% 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 3-11. 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
Total	**22**	**24**	**3**	**59**	**29**	**54**	**106**	**59**	**356**	**16.2**

Although no comprehensive inventory of Off Highway Vehicle (OHV) trails exists for the planning area, numerous field observations indicate that OHV use in non-designated areas is common in the northern portion of the China Keeler project area, particularly in the AM0303 (between Forest Creek and China Gulch), AM0306 (China Gulch), and AM0309 (between China Gulch and Long Gulch) drainage areas. OHV-caused vegetation removal and soil compaction has resulted in runoff on many trails and in dry draws. This use is especially damaging in wet weather when ruts are formed that direct the surface water 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. If a trail becomes impassible due to rutting, frequently a new, adjacent trail is established. OHV use has occurred in areas posted with closure signs and new OHV trails continue to be created illegally. The BLM's Timber Mountain/Johns Peak Off-highway Vehicle (OHV) Management Plan and Environmental Impact Statement (EIS) are currently being developed with a draft scheduled to be published in the winter of 2005/2006. The OHV use in the AM0303, AM0306, and AM0309 drainage areas will be analyzed further in that document.

Large areas of compacted soil, such as occur from roads, tractor yarding, or ground-based fuel treatments, can be a concern from a hydrologic perspective because such areas can decrease the infiltration properties of the soil, resulting in increased surface runoff. This can also contribute to decreased soil moisture within and downslope of the compacted area. Past soil-compacting treatments on BLM-administered lands were identified from timber sale and fuel treatment records and those on non-BLM lands were identified from aerial photo analysis (see Soils section). The following assumptions were used to calculate the compacted area resulting from past treatments (Table 3-12): 1) roads are assumed to be permanently compacted at the rate of 2.5 acres per mile of road (20 foot compacted width on all roads); 2) for forest stands under approximately 30 years of age, 25% of the harvest acreage is compacted for units that were tractor logged and 4% of the harvest acreage is compacted for cable units (Clayton, 1981; Dyrness, 1967); and 3) acres of ground-based vegetation treatments (i.e. "slashbuster") are assumed for this exercise to compact 15% of the area treated. No inventory is available for OHV trails and they are not included in the compacted area analysis.

Drainage areas AM0303 (between Forest Creek and China Gulch) and AM0306 (China Gulch) have the highest percent compacted area (5.2%), and drainage area AM0318 (Chapman Creek) has the lowest percent compacted area (1.8%) (Table 3-12). The existing percent compacted area in all the drainage areas associated with the China Keeler project is well below the 12% level of concern identified for potential increases in peak flows (Harr 1976).

Table 3-12. Estimated Existing Soil Compaction by Drainage Area for All Lands

Drainage Area Number	Compacted Area From Past Treatments (< 30 years)			Compacted Area From Roads[1] (Acres)	Total Compacted Area (Acres)	Total Compacted Area (%)
	Cable (Acres)	Tractor (Acres)	Slashbuster (Acres)			
AM0303	0	10	0	35	45	5.2%
AM0306	0	30	22	47	99	5.2%
AM0309	0	0	22	33	55	2.9%
AM0315	2	1	0	21	24	1.9%
AM0318	16	7	0	25	48	1.8%
AM0321	6	0	0	22	28	2.3%
AM0324	11	12	0	27	50	3.3%
AM0327	0	10	0	26	36	3.8%
AM0330	0	8	0	22	30	3.6%
AM0336	0	1	0	18	19	2.1%

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

Increased openings in the forest canopy from harvest activity may increase the magnitude and frequency of peak streamflows, especially openings in the transient snow zone where greater snow accumulation may increase the amount of streamflow during rain-on-snow events. 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 3-13 shows the variety of vegetation conditions for the BLM-administered lands. Drainage area AM0318 (Chapman Creek) has the highest percentage (15%) of early seral and pole stands on BLM-managed lands. BLM-administered lands in the other drainage areas have 10% or less in early seral and pole stands.

Table 3-13. BLM Vegetation Condition Class by Drainage Area

Drainage Area Number	Acres and % of BLM Vegetation Condition Class by Drainage Area							Private (Acres & %)	Total (Acres & %)
	Grass	Brush	Woodland	Early Seral	Poles	Mid Seral	Mature		
AM0303		12.5	44.8	40.4	42.6	79.2		644	864
		1%	5%	5%	5%	9%		75%	100%
AM0306	19.1	96	337	28.5	64.8	587	104	661	1,897
	1%	5%	18%	2%	3%	31%	5%	35%	100%
AM0309		355	150		142	164	127	928	1,866
		19%	8%		8%	9%	7%	50%	100%
AM0315			75.7	15.3	7.4	395	420	394	1,307
			6%	1%	1%	30%	32%	30%	100%
AM0318	8.6		220	183	215	982	642	463	2,714
	0%		8%	7%	8%	36%	24%	17%	100%
AM0321	11.9	161	232		4.7	36.6	12.1	744	1,202
	1%	13%	19%		0%	3%	1%	62%	100%
AM0324		1	23.1	141	14.3	433	570	338	1,520
		0%	2%	9%	1%	28%	37%	22%	100%
AM0327		193	86.4			30.9	47.9	581	939
		21%	9%			3%	5%	62%	100%
AM0330			76		3.6	72.9	166	526	845
			9%		0%	9%	20%	62%	100%
AM0336		166	161			2	30.2	535	894
		19%	18%			0%	3%	60%	100%

Crown closure for the analysis area was estimated based on an aerial photo survey using BLM 2001 aerial photos (Table 3-14). The historic crown closure for this eco-region is listed as greater than 30%

(WPN 1999: Appendix A). The crown cover across all the drainage areas is at or greater than 30% and on the BLM-managed lands it is well above the lower end of the historic range (Table 3-14).

Table 3-14. Average Crown Cover in the Project Drainage Areas

Drainage Area Number	BLM		Private		Total Drainage	
	Acres	% Crown Cover	Acres	% Crown Cover	Acres	% Crown Cover
AM0303	218	75%	646	15%	864	30%
AM0306	1,238	65%	659	55%	1,897	62%
AM0309	936	60%	930	15%	1,866	38%
AM0315	909	70%	398	20%	1,307	55%
AM0318	2,254	70%	461	60%	2,714	68%
AM0321	462	50%	740	30%	1,202	38%
AM0324	1,185	80%	335	75%	1,520	79%
AM0327	358	50%	581	60%	939	56%
AM0330	319	60%	526	35%	845	44%
AM0336	359	60%	535	15%	894	33%

Environmental Consequences

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

For purposes of analyzing environmental consequences of the no action and the proposed action on water resources, the project area is divided into drainage areas ranging in size from 845 to 2,714 acres (Table 3-7). Seven of the drainage areas are totally within the project area and three are partially outside the project area. This size of analysis watershed is large enough to assess the cumulative effect of actions that, taken individually (site scale) may not be significant, but when combined with effects from everything else going on in the drainage, may have a potential significant impact ("cumulative effect"). The drainage areas are small enough to avoid "drowning out" evidence of adverse effects. As the size of the analysis area increases, there is an increasing possibility of the analysis indicating that there is "no problem" when in fact individual drainages may have issues of concern.

Alternative A

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

Under Alternative A, there would be no changes in road densities, percent of area in roads, number of stream crossings, areas of compacted soil, or percent of area in nonrecovered openings within the transient snow zone. There would therefore be no changes to the magnitude and frequency of peak flows. The potential for peak flow increases would continue in the three drainage areas (AM0303, AM0327, and AM0330) identified as having a moderate potential for peak flow increases due to percent

of the area in roads. These three small drainage areas are frontal watersheds that drain small channels either directly into both sides of the Applegate River or into irrigation ditches.

Older roads in the area would be maintained but not upgraded or decommissioned and would continue to influence local runoff and groundwater flow. In the long term, older roads with limited drainage capability are more likely to experience a road failure during an extreme precipitation event causing subsequent adjustments to local flow and groundwater conditions. For example, 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 trails would likely continue to be created illegally thus increasing the area compacted. In the short term, the BLM would complete the Timber Mountain/Johns Peak Off-highway Vehicle (OHV) Management Plan and Environmental Impact Statement (EIS), and in the long term, it is likely that drainage on some OHV trails would be improved and the trails would be less likely to influence peak flows.

Past events in the project area that currently increase the potential for altered peak streamflows include past timber harvesting and mechanical ground-based fuel treatments, road construction, and land development. All of these activities potentially influence peak streamflows through soil compaction or alteration of drainage networks. Substantial removal of vegetation is not a factor that currently contributes to altered peak flows because the average crown cover is at or above the lower end of the historic range for all drainages analyzed and the area in the transient snow zone has greater than 30% crown cover. Risk assessments for potential increased peak flows consider the effects of these past actions in their methodology. For example, roads from past construction events (developing private land, logging, mining, etc.) are included in the percent of an area in roads (Table 3-10) for the OWAM's determination of potential for peak flow increases.

The most significant past event on lands adjacent to the project area was the building of the Applegate Lake Dam, which drastically moderated peak flows in the Applegate River. Because there are no gaging stations in the China Keeler project area drainages, the amount of current flow into the Applegate River is unknown. However, the flow contribution of the project area to the Applegate River is expected to be roughly proportional to the contributing area or about 4%.

In summary, there is virtually no risk to increased peak flow from rain on snow events in the transient snow zone as a result of past timber harvest because drainage areas in the project area have greater than 30% crown cover. Past road construction has resulted in a moderate potential of peak flow increases in three drainage areas (AM0303, AM0327, and AM0330) mostly due to the small size of the drainage areas and extensive road development on private land. The percent compacted area is low in all drainage areas and is not a concern for increased peak flows. Therefore, the factors that would result in increased peak flows—low crown cover, high percentage of area in roads, and high percentage of compacted area—are minimal.

Reasonably foreseeable future actions planned for BLM-administered lands in the project area include the potential sale of approximately 9 acres along Keeler Creek. Sale of the parcel along Keeler Creek includes only 300 feet of stream. If BLM sells this parcel, deed restrictions would protect the riparian vegetation so there would be no impact on water quantity. Most areas that could be harvested on non-BLM lands are accessible by existing roads, so no new road construction is likely. Future intensive timber harvests on non-BLM lands are possible in most drainage areas. It is assumed that private lands would continue to be intensively managed for timber production on approximately a 60-year rotation (USDI 1994:4-5). The actual timing of any private lands timber harvest is dependent on many factors,

including valuations based on supply/demand, ownership, etc. Any potential future wildfire would likely accelerate harvesting/salvage on non-BLM lands. Using aerial photos and assuming a 60-year rotation for private timber lands, a reasonably foreseeable future scenario was developed for private timber harvest within the project area (see Soils section). The projected change in average crown cover was estimated by drainage area, assuming that the reasonably foreseeable future harvest units would have 0% crown cover (Table 3-15). The largest change in percent crown cover (-4%) is projected to occur in drainage area AM0318 (Chapman Creek). This drainage area would still be well above the 30% historic crown cover. Crown cover in drainage area AM0303 (between Forest Creek and China Gulch) is estimated to decrease by 1% which would put it slightly under the 30% historic crown cover. This would be expected to be a short-term concern, as other portions of the drainage area would experience vegetative recovery with increased crown cover.

Table 3-15. Average Crown Cover in the Project Drainage Areas after Reasonably Foreseeable Future Timber Harvest on Non-BLM Lands

Drainage Area Number	BLM		Private		Total Drainage		Change in % Crown
	Acres	% Crown Cover	Acres	% Crown Cover	Acres	% Crown Cover	
AM0303	218	75%	646	14%	864	29%	-1%
AM0306	1,238	65%	659	55%	1,897	62%	0%
AM0309	936	60%	930	15%	1,866	37%	0%
AM0315	909	70%	398	16%	1,307	53%	-1%
AM0318	2,254	70%	461	39%	2,714	65%	-4%
AM0321	462	50%	740	29%	1,201	37%	0%
AM0324	1,185	80%	335	71%	1,521	78%	-1%
AM0327	358	50%	581	58%	939	55%	-1%
AM0330	319	60%	526	34%	845	44%	-1%
AM0336	359	60%	535	15%	894	33%	0%

Compacted area could increase as a result of these reasonably foreseeable future harvest activities as well as future ground-based mechanized fuel treatments. Based on slope, the most-likely harvest system was selected for the reasonably foreseeable future harvest units (see Soils section). The same assumptions used to determine the existing percent compacted area for tractor (25%) and cable (4%) logging systems were applied to the future harvest units. Reasonably foreseeable future mechanized fuel treatment units were determined from aerial photos and knowledge of the National Fire Plan activity proposed in the area, with a 15% factor used to calculate the area that would be compacted.

The greatest increase in percent compacted area (1.5%) is projected to occur in drainage area AM0315 (between Long Gulch and Chapman Creek), however the total percent compacted area would remain very low (3.3%) (Table 3-16). Drainage areas AM0303 (between Forest Creek and China Gulch) and AM0306 (China Gulch) would continue to have the highest percent compacted area under the projected reasonably foreseeable future actions on non-BLM lands, however the compacted area would still be well below a level of concern for peak flow increases.

Table 3-16. Percent Compacted Area after Reasonably Foreseeable Future Soil Compacting Actions on Non-BLM Lands

Drainage Area[1] Number	Estimated Compacted Area From Future Treatments on Non-BLM Lands			Existing Compacted Area (Acres)	Existing and Future Compacted Area (Acres)	Total Compacted Area (%)	Increase in Percent Compacted Area (%)
	Cable (Acres)	Tractor (Acres)	Slashbuster (Acres)				
AM0303	0	10	2	45	57	6.6%	1.4%
AM0306	0	0	24	99	123	6.5%	1.3%
AM0309	0	3	3	55	61	3.2%	0.3%
AM0315	1	18	0	24	43	3.3%	1.5%
AM0318	4	15	0	48	67	2.4%	0.7%
AM0321	0	5	5	28	38	3.2%	0.8%
AM0324	1	0	0	50	51	3.3%	0.1%
AM0327	0	5	8	36	49	5.2%	1.4%
AM0330	0	5	3	30	38	4.5%	0.9%
AM0336	0	1	8	19	28	3.1%	1.0%

In the long term, with no stand management on BLM-administered lands, a severe, stand-replacement fire would likely occur (see Fire section) and it could drastically alter the surface water and groundwater regime. Immediately after a severe fire, the loss of vegetation would make more groundwater available for streamflow and low summer flows would likely increase. However, the absence of vegetation would also result in an increased risk of higher peak flows. The Applegate River would receive higher peak flows from the tributaries after a severe fire event. The net effect on the river flow would not likely be noticeable since the flow contribution from the project area only amounts to approximately 4% of the Applegate River flows and a very small percentage (6%) of the area is within the transient snow zone.

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.

In conclusion, past and present actions within the project area have not resulted in any major increase in the magnitude and frequency of peak streamflows because the factors most likely to cause increased peak flows (high percent of area in roads, high percent compacted area, and low crown cover) are not a concern in the drainage areas analyzed. Of the reasonably foreseeable future actions analyzed, a large, severe, stand-replacement wildfire would be the greatest concern for potential increases in the magnitude and frequency of peak streamflows in the drainage areas analyzed. A severe, stand-replacement fire in drainage area AM0318 (Chapman Creek) would be of particular concern since it is the only drainage in the project area with more than 25% of the area within the transient snow zone.

Alternative B

Alternative B could indirectly affect streamflows in the project area as a result of changes in road drainage, percent of the area in roads, soil compaction, and vegetative cover. Alternative B would include the construction of approximately 0.7 miles of new road to access the China Keeler project sites, mechanical decommissioning of 1.1 road miles, natural decommissioning of 0.7 road miles, and improvement of approximately 11 miles of access road.

New road construction under Alternative B would occur in two drainage areas (AM0324 and AM0330). The proposed new 0.3 mile road segment in AM0324 (Keeler Creek) and 0.4 mile in AM0330 (between

gage 143660000 and Humbug Creek) would be located on or near a ridge and have very little effect on the hydrologic network, as there are no drainage crossings and soils are stable.

Under Alternative B, 1.1 miles of a road in drainage area AM0306 (China Gulch) would be mechanically decommissioned to reduce the road surface compaction. This action would tend to reduce the influence of the road on the local drainage and local flows (both groundwater and surface), especially since 0.5 miles of this road falls within Riparian Reserves and there would be eight less stream crossings. In the long term, the decommissioned road would tend to approach the pre-road flow patterns, reducing the potential for increased peak flows. The 0.7 miles of road proposed for natural decommissioning would mostly occur in drainage area AM0306 (China Gulch), with approximately 300 feet extending outside the project area on the ridge in AM0209 (Forest Creek below Right Fork and above Poorman Creek). This road would continue affecting flow patterns until vegetation becomes fully established and is considered part of the road network for the effects analysis.

Road renovation of approximately nine miles would consist of putting rock surfacing on 3.5 miles of natural surfaced roads and adding rock to the existing base on 5.5 miles. Of the nine road miles, approximately 1.6 miles would be renovated on or near ridges just outside the project area, with 0.95 miles in drainage area AM0203 (Forest Creek above Right Fork Forest Creek), 0.64 miles in AM0209 (Forest Creek below Right Fork and above Poorman Creek), and 0.04 miles in AM0312 (Long Gulch). Road drainage improvements would occur on approximately two miles to further disperse road runoff and decrease the rapid, concentrated routing of water to streams during storm events. This would help to minimize the impact of roads on the timing and magnitude of peak streamflows. Approximately 1.5 miles of road drainage improvements would take place within the project area boundary (drainage areas AM0303 and AM0306) and the remainder would occur in two adjoining Forest Creek drainage areas outside the project area boundary (AM0215 and AM0221).

Under Alternative B, a total of 0.7 miles of new road construction and 1.1 miles of mechanical road decommissioning would occur, resulting in a net decrease of 0.4 mile (Table 3-17). Road density would decrease in drainage area AM0306 (China Gulch) and increase in drainage areas AM0324 (Keeler Creek) and AM0330 (between gage 143660000 and Humbug Creek) (3-17). The greatest increase in road density (0.3 mi./mi.^{2}) and percent of the drainage area in roads (0.2%) would occur in AM0330. There would be eight less stream crossings in drainage area AM0306 and no stream crossings added (Table 3-17).

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

Drainage Area Number	Added Road Miles	Decommissioned Road Miles	Net Change (Miles)	Change in Road Density (Mi/Mi^2)	Change in Percent of Area in Roads	Change in # Stream Crossings
AM0306	+ 0.0	- 1.1	- 1.1	-0.47	-0.21	-8
AM0324	+ 0.3		+ 0.3	0.13	0.07	0
AM0330	+ 0.4		+ 0.4	0.30	0.17	0
Total	**+0.7**	**-1.1**	**-0.4**	**0.06**	**+0.03**	**-8**

Table 3-18, a comparison of Table 3-17 with Table 3-10, shows road changes between the existing condition and the proposed action, with the shaded cells denoting changed values. Overall road density in the drainage areas associated with the proposed project would decrease from 5.2 to 5.1 mi./mi.^{2}. Drainage area AM0303 (between Forest Creek and China Gulch) would continue to have the highest

road density, but would not be affected by Alternative B. Road density in drainage area AM0330 (between gage 143660000 and Humbug Creek) would increase from 7.0 to 7.3 mi./mi.^{2}. The majority of the roads in drainage area AM0330 are located outside the project area. This area is on the opposite side of the Applegate River from the project area and consists of several intermittent streams that are captured by ditches before reaching the Applegate River. Approximately 0.4 road miles would be constructed in AM0330, primarily along a ridge with slightly over 0.1 mile just below a ridge. Because the proposed road construction in AM0330 would be located at or near ridgelines, it is unlikely that it would affect hydrologic flow patterns or increase peak flows. Road density in drainage area AM0324 (Keeler Creek) would increase from 4.7 to 4.8 mi./mi.^{2}. The 0.3 miles of new road construction would be located on a ridge and it is unlikely that it would affect streamflows.

The percentage of the drainage area in roads also provides an index of road-related affects. The OWAM (WPN 1999:IV-16:IV-16) suggests that rural drainages with more than 8% roads have a high potential of experiencing more than a 10% increase in peak flows. Drainages with 4-8% have a moderate risk and less than 4% have a low risk. Based on this assessment method, the proposed action would not change the potential for peak flow increases due to roads. Drainage areas AM0303 (between Forest Creek and China Gulch), AM0327 (between Keeler Creek and gage 143660000), and AM0330 (between gage 143660000 and Humbug Creek) would continue to have a moderate potential for increased peak flows. The remaining drainage areas associated with the proposed action would continue to have a low potential for increased peak flows. Increasing the estimated percent of the drainage area in roads by 30% to account for undetected roads would only move drainage area AM0306 (China Gulch) from a low to moderate potential for increased peak flows. In conclusion, the proposed project is not expected to raise the peak flow risk rating for any drainage area affected by the proposed project.

Table 3-18. Alternative B Total Road Miles for All Drainages Affected by the Project[1] (shaded cells denote values that would change with Alternative B)

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[2]
	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	3.3	6.6			2.8	5.6			18.3	6.2	3.5%
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	7.3	2.3			1.0	0.7			11.3	4.8	2.7%
AM0327	0.3	0.8	0.1	5.2		0.2	1.2	2.9	10.7	7.3	4.1%
AM0330	0.4	1.3		2.7	0.6	1.1		3.6	9.6	7.3	4.1%
AM0336		1.0		2.4		0.9	1.3	1.5	7.2	5.1	2.9%
Total	21.2	40.1	0.1	10.3	7.9	22.8	2.5	8.0	112.9	5.1	2.9%

1/ The data for Table 3-18 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 3-18 the change in road density and the change in the percent of the roaded area are not affected by this correction and can be used to compare the relative effects of the alternatives.

2/ Based on 30 foot average width.

Alternative B proposes 118 acres of tractor yarding, 371 acres of cable yarding, and 826 acres of helicopter yarding, which could potentially compact 37 acres. Tractor yarding would be limited to designated skid trails, minimizing the compacted area to 12%. Compaction is assumed to be 4% from cable yarding and 1% from helicopter yarding (Clayton, 1981; Dyrness, 1967). The maximum soil compaction resulting from proposed logging systems in a drainage area would be 12 acres in both AM0306 (China Gulch) and AM0315 (between Long Gulch and Chapman Creek) (Table 3-19). No ground-based mechanized fuel treatments are proposed under Alternative B. Proposed new roads would potentially compact approximately two acres in two drainage areas and the proposed mechanical road decommissioning in drainage area AM0306 would decrease the compacted area by approximately three acres (Table 3-19). Under Alternative B, the greatest increase in soil compaction (0.9%) would occur in drainage area AM0315 (between Long Gulch and Chapman Creek). For each drainage area, the projected total of the existing percent compacted area and compaction due to Alternative B would still remain well below the 12% level of concern for increases in peak streamflows. Thus, peak streamflows are not expected to be affected by soil compaction resulting from this project**.** Project design features such as no yarding in Riparian Reserves, 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.

Table 3-19. Estimated Compacted Area Resulting from Alternative B

Drainage Area	Estimated Compacted Area From Alternative B			Compacted Area From Proposed Roads[1] (Acres)	Total Compacted Area From Alternative B (Acres)	Total Compacted Area From Alternative B (%)	Total Compacted Area (Alt. B and Existing) (%)
	Cable (Acres)	Tractor (Acres)	Helicopter (Acres)				
AM0303	1	0.4	0.3	0	2	0.2%	5.4%
AM0306	4	8	3	-3	12	0.6%	5.8%
AM0309	0	0	2	0	2	0.1%	3.0%
AM0315	6	5	1	0	12	0.9%	2.8%
AM0318	1	1	0.4	0	2	0.1%	1.8%
AM0321	0	0	0	0	0	0.0%	2.3%
AM0324	1	1	0.2	1	3	0.2%	3.5%
AM0327	0.5	0.1	0.5	0	1	0.1%	3.9%
AM0330	1	0	1	1	3	0.4%	4.0%
AM0336	0	0	0.2	0	0.2	0.0%	2.1%

1/ Based on 20 ft. road width for compacted surface. The negative value for drainage area AM0306 reflects the mechanical decommissioning that would minimize the compacted road surface.

Changes in vegetation canopy have the potential to alter peak streamflows. 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 (WPN 1999:Appendix A) for this area indicates a natural crown cover of greater than 30%.

Alternative B proposes to commercially harvest approximately 1,315 acres and pre-commercially thin (PCT) approximately 655 acres, of which 368 acres are within and 287 acres are outside the commercial harvest units. The majority of the vegetative treatments would occur in drainage areas AM0306 (China Gulch) and AM0315 (between Long Gulch and Chapman Creek) (Table 3-20). The **minimum** expected post treatment crown closure would range from 40-60% (Table 3-20 depending on the harvest prescription. The predominant harvest prescription, Dry Douglas Fir (1,088 acres), would leave a minimum of 50% crown closure. Harvest prescriptions are described in Chapter 2.

Table 3-20. Alternative B Proposed Commercial Harvest[1] and PCT Treatments

Drainage Area Number	DF Poles (60%)* (Acres)	DF Regen (40%)* (Acres)	Dry DF (50%)* (Acres)	Moist DF (50%)* (Acres)	Pine Regen (40%)* (Acres)	PCT[2] (50%)* (Acres)	Total Area Treated (Acres)	% of Drainage Treated
AM0303	6.0		39.2		19.5	36.4	101.1	12%
AM0306			403.2		49.7	88.1	541.1	29%
AM0309			122.9		70.0	74.6	267.5	14%
AM0315	2.1	11.9	262.2	5.0	9.5	49.8	340.5	26%
AM0318	7.7		45.5		12.1		65.2	2%
AM0321								0%
AM0324			18.8		33.3	35.1	87.3	6%
AM0327			58.5		0.1		58.6	6%
AM0330			121.5			3.2	124.8	15%
AM0336			16.4				16.4	2%
Total	**15.8**	**11.9**	**1,088.2**	**5.0**	**194.2**	**287.3**	**1,602.5**	**11%**

1/ See Chapter 2 for description of harvest prescriptions.
2/ Pre-commercial thinning (PCT) acres do not include PCT treatments within commercial harvest units.
* Value denotes minimum post-treatment crown closure.

Under Alternative B, the greatest reduction in crown closure for a drainage area (6%) would occur in AM0315 (between Long Gulch and Chapman Creek) and the greatest reduction for BLM-managed lands (12%) would occur in AM0303 (between Forest Creek and China Gulch) (Table 3-21). Proposed treatments would maintain the average crown closure above the natural minimum of 30% for all drainage areas except AM0303 (between Forest Creek and China Gulch). The average crown closure on BLM-managed lands in AM0303 would be approximately 63% after implementation of Alternative B, however, the average for the entire drainage area would decline to 27%. On BLM-administered lands, the proposed treatments would tend to reduce the risk of severe fire while keeping the canopy cover well above the natural minimum of 30%. No noticeable increase in the magnitude or frequency of peak streamflows would be expected as a result of crown closure reductions proposed under Alternative B.

Table 3-21. Change in Estimated Average Crown Cover Associated with Alternative B

Drainage Area Number	BLM-Managed Land				Total Drainage			
	Acres	Current Crown Closure	Alt B Crown Closure	Difference	Acres	Current Crown Closure	Alt B Crown Closure	Difference
AM0303	218	75%	63%	-12%	864	30%	27%	-3%
AM0306	1,238	65%	58%	-7%	1,897	62%	57%	-5%
AM0309	936	60%	56%	-4%	1,866	38%	36%	-2%
AM0315	909	70%	62%	-8%	1,307	55%	49%	-6%
AM0318	2,254	70%	69%	-1%	2,714	68%	68%	0%
AM0321	462	50%	50%	0%	1,202	38%	38%	0%
AM0324	1,185	80%	78%	-2%	1,520	79%	77%	-2%
AM0327	358	50%	50%	0%	939	56%	56%	0%
AM0330	319	60%	56%	-4%	845	44%	43%	-1%
AM0336	359	60%	60%	0%	894	33%	33%	0%

Vegetation canopy closure reductions in the transient snow zone have a greater potential to influence changes in peak flows than reductions outside the transient snow zone. According to the OWAM (WPN 1999:IV-9-

11), drainages with more than 25% of the area in the transient snow zone may be at risk for possible peak flow increases. Drainage area AM0318 (Chapman Creek) has about 776 acres (29%) in the transient snow zone and more than 85% of this area would have to have less than 30% crown cover to cause a detectable increase in peak flows. Approximately 2% of the transient snow zone is currently in this range. Under Alternative B, no vegetative treatments are proposed in the Chapman Creek transient snow zone. Consequently, no change in the amount of area below the critical 30% closure level would occur and no increased risk of peak flows associated with rain-on-snow events is expected to occur.

Alternative B is not expected to noticeably increase peak flows in any of the drainage areas affected by the proposed project because: 1) there would be no new stream crossings and the number of stream crossings would decrease in one drainage area; 2) road construction would be minimal (0.7 miles) and located on or near ridgetops; 3) the change in the percent roaded area would not affect the potential for peak flow increases; 4) the increase in compacted area would not go above the 12% level of concern for peak flow increases; 5) the average crown closure on BLM-administered lands would remain well above the natural crown cover of 30%; and 6) no vegetation treatment is proposed in the transient snow zone of the only drainage area with greater than 25% of the area in the transient snow zone.

The analysis of the direct and indirect effects of Alternative B on water quantity incorporates past and present actions that may affect watershed conditions. For the cumulative effects analysis, the reasonably foreseeable future actions identified under Alternative A need to be added to the direct and indirect effects of Alternative B. There are no reasonably foreseeable future actions planned for BLM-administered lands in the project area other than what is proposed under Alternative B. Most areas that could be harvested on non-BLM lands are accessible by existing roads, so no new road construction is likely other than what has already been described under Alternative B.

Future intensive timber harvests on non-BLM lands are assumed to be the same as under Alternative A. The cumulative effect of crown cover changes that would result from Alternative B and reasonably foreseeable future timber harvest on non-BLM lands are determined from combining Tables 3-15 and 3-21 (Table 3-22). Under this scenario, drainage area AM0303 would be the only area with an average crown cover slightly less than the historic 30% minimum. Only one stream originating in drainage area AM0303 reaches the Applegate River, the rest are intercepted by irrigation ditches. The high level of agricultural and residential use in this drainage area would likely have more affect on peak flow increases than a 4% reduction in average crown cover.

Table 3-22. Estimated Average Crown Cover in the Project Drainage Areas with Implementation of Alternative B on BLM-Administered Lands and Reasonably Foreseeable Future Timber Harvest on Non-BLM Lands

Drainage Area Number	Estimated Average Crown Cover						Change in % Crown Cover
	BLM (Alt. B)		Private (Foreseeable Future Actions)		Total Drainage		
	Acres	% Crown Cover	Acres	% Crown Cover	Acres	% Crown Cover	
AM0303	218	63%	646	14%	864	26%	-4%
AM0306	1,238	58%	659	55%	1,897	57%	-5%
AM0309	936	56%	930	15%	1,866	35%	-2%
AM0315	909	62%	398	16%	1,307	48%	-7%
AM0318	2,254	69%	461	39%	2,714	64%	-4%
AM0321	462	50%	740	29%	1,201	37%	0%
AM0324	1,185	78%	335	71%	1,521	76%	-3%
AM0327	358	50%	581	58%	939	55%	-1%
AM0330	319	56%	526	34%	845	42%	-2%
AM0336	359	60%	535	15%	894	33%	0%

Increases in compacted area as a result of these reasonably foreseeable future harvest activities as well as future ground-based mechanized fuel treatments are identified under Alternative A. The cumulative effect of compacted area changes that would result from Alternative B and reasonably foreseeable future timber harvest on non-BLM lands are determined from combining Tables 3-12, 3-16, and 3-19 (Table 3-23). Under this scenario, the percent compacted area for each drainage area would remain below the 12% level of concern for peak flow increases.

Table 3-23. Percent Compacted Area with Implementation of Alternative B on BLM-Administered Lands and Reasonably Foreseeable Future Soil Compacting Actions on Non-BLM Lands

Drainage Area[1] Number	Existing Compacted Area (Acres)	Estimated Compacted Area From Alternative B (Acres)	Estimated Compacted Area From Future Treatments on Non-BLM Lands (Acres)	Total Compacted Area (Acres)	Total Compacted Area (%)	Increase in Percent Compacted Area (%)
AM0303	45	2	12	59	6.8%	1.6%
AM0306	99	12	24	135	7.1%	1.9%
AM0309	55	2	6	63	3.3%	0.4%
AM0315	24	12	19	55	4.2%	2.4%
AM0318	48	2	19	69	2.5%	0.8%
AM0321	28	0	10	38	3.2%	0.8%
AM0324	50	3	1	54	3.5%	0.3%
AM0327	36	1	13	50	5.3%	1.5%
AM0330	30	3	8	41	4.9%	1.3%
AM0336	19	0.2	9	28	3.1%	1.0%

In conclusion, the cumulative effects of the past, present, and reasonably foreseeable future (including Alternative B) actions would not result in a discernable change in peak flows at or beyond the mouths of the individual drainage areas analyzed (Table 3-24). Streamflows in the Applegate River would not be affected by these cumulative effects.

Table 3-24. Comparison of Potential for Peak Flow Increase between Cumulative Effects of Alternatives A and B

Drainage Area Number	Potential for Peak Flow Increase under Alternative A	Potential for Peak Flow Increase under Alternative B
AM0303	**Moderate**	**Moderate**
AM0306	**Low**	**Low**
AM0309	**Low**	**Low**
AM0315	**Low**	**Low**
AM0318	**Low**	**Low**
AM0321	**Low**	**Low**
AM0324	**Low**	**Low**
AM0327	**Moderate**	**Moderate**
AM0330	**Moderate**	**Moderate**
AM0336	**Low**	**Low**

Water Quality

This section discloses the impacts from various vegetation treatments and ground disturbing activities on water quality. Habitats and wildlife related to water are discussed in the "Fish" section.

Issues/Concerns

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

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

Timber harvesting operations have variable effects on sediment production (Everest et al. 1987). No harvest in Riparian Reserves prevents disturbance to stream channels during the felling and yarding operations. Yarding operations can cause extensive ground disturbance in harvested areas; however, cable systems that partly or fully suspend logs generally cause minimal disturbance to the soil surface (Everest et al. 1987). Increased surface erosion can result from ground disturbance and soil compaction caused by tractor logging (Sidle 1979). A buffer width of 100-200 feet is sufficient to prevent most sediment from reaching streams (A.C. Kindig and Cedarock 2003).

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

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

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

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

Studies conducted in western Washington and Oregon found that 80 percent of the road runoff points emptied directly into the drainage system (Duncan et al. 1987). Of the stream entry drainage points, 88 percent entered first or second order channels while only 13 percent emptied directly into permanent water.

Thus, the delivery of road sediment to larger streams often depended on its transport through these smaller, often ephemeral channels. Woody material in these small channels acted to trap and hold sediment, thus preventing it from reaching larger channels downstream.

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

Stream sediments may negatively impact aquatic species such as salmonids, amphibians and insects (see Fisheries section), and may impair the quality of domestic water supplies.

Affected Environment

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

The BLM in cooperation with the Forest Service, DEQ, and the Environmental Protection Agency (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). 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 (OAR 2005; 340-041-0004) under any proposed actions. The BLM will continue to work with DEQ to implement the Applegate Subbasin Total Maximum Daily Load (TMDL) and Water Quality Management Plan (WQMP) completed in 2003 (ODEQ 2003b) and the Water Quality Restoration Plan (WQRP) for BLM and U. S. Forest Service-administered lands in the Applegate Subbasin (USDI and USDA 2005). Recovery goals focus on protecting areas where water quality meets standards and avoiding future impairments of these areas, and restoring areas that do not currently meet water quality standards. Necessary federal and state permits would be obtained for any proposed instream work.

The Applegate River is the only waterbody in the project area that is on the 2002 Oregon DEQ 303(d) water quality limited list. It is listed for summer stream temperature from the mouth to the Applegate Reservoir. A revised Oregon water quality temperature standard was approved by EPA on March 2, 2004. The seven-day-average maximum temperature of streams in the China Keeler project area may not exceed 64.4 degrees Fahrenheit (°F) (OAR 2005: 340-041-0028), whereas previously the maximum was 64°F.

Stream temperatures in smaller streams that are closer to their respective source areas are typically cooler than large rivers such as the Applegate River. BLM stream temperature monitoring indicates that the major tributaries (China Gulch, Chapman Creek, and Keeler Creek) on BLM-administered land in the China Keeler area meet the 64.4°F maximum criterion with the exception of a small portion of Keeler Creek. The BLM conducted temperature monitoring in 1998-2000 and 2003 on Keeler Creek at the lowest BLM boundary in section 25, approximately 0.25 mile above the confluence with the Applegate River. The 64.4°F criterion was exceeded in 1998, 2000, and 2003. Additional upstream data from 2000 and 2003 indicates that points in Keeler Creek above the 26/35 section line meet the 64.4°F criteria.

From aerial photo review, the higher Keeler Creek temperatures below the 26/35 section line appear to be the result of past road building and timber harvest within the riparian area on both private (section 26) and BLM-administered (section 25) lands. The WQRP implementation assures that under future actions, the stream will receive the maximum shade possible on federal lands.

Roads built in riparian areas can adversely affect both stream temperature and sediment. There are approximately eight road miles located within Riparian Reserves on BLM-administered lands (Table 3-25). Drainage areas AM0318 (Chapman Creek) and AM0324 (Keeler Creek) have the most road miles in Riparian Reserves, with 3.2 and 2.4 respectively.

Table 3-25. Road Miles within Riparian Reserves on BLM-Administered Lands

Drainage Area Number	Road Miles within Riparian Reserves
AM0303	0.7
AM0306	1.1
AM0309	0
AM0315	0.4
AM0318	3.2
AM0321	0
AM0324	2.4
AM0327	0.1
AM0330	0
Total	**7.9**

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 3-26). The three major tributaries in the analysis area show high slump potential ratings for 4-7% of the stream lengths. In general, channel stability is expected to improve as Riparian Reserves mature and additional structural material is added to the channel area.

Table 3-26. Slump Potential Ratings for Stream Reaches Surveyed by BLM.

Stream Name	Slump Potential Ratings		
	Low	Medium	High
Chapman Creek	52%	41%	7%
Keeler Creek	55%	39%	6%
China Gulch	36%	60%	4%

Roads on BLM-administered lands in the analysis area are stable with no failures present (see Soils section). Road sediment sources are primarily surface erosion from natural surfaced roads and road ditches that connect to streams. Road-stream crossings were observed during BLM stream surveys as a source of road-generated sediment, especially in the AM0318 (Chapman Creek) and AM0324 (Keeler Creek) drainage areas. Concerns with OHV trails were only observed in the AM0306 (China Gulch) and AM 0309 (between China Gulch and Long Gulch) drainage areas.

Past Actions

Past human-caused actions that have affected stream temperature in the project area include stream shade removal for: conversion to agricultural fields and home sites, mining activities, timber harvest, and road building; and water withdrawals for irrigation, mining, and domestic use (ODEQ 2003b). Large scale hydraulic mining conducted in the 1850s dramatically increased sediment in the Applegate River and some of its tributaries (USDI 1995b). Hydraulic mining is no longer allowed and placer mining requires the use of settling ponds. Agricultural and residential development in the valley bottoms have contributed to sedimentation through channel modification, grazing, and land clearing. Logging activities started in the late nineteenth and early twentieth centuries, but were limited in scale until the late 1940s (USDI 1995b). During the second half of the twentieth century, large scale timber harvest and road building resulted in increased sedimentation (USDI 1995b). Until the Oregon Forest Practices Act was passed in 1972, yarding was typically accomplished using tractors, even on steep slopes, with little regard for protecting stream crossings. Riparian areas received little protection and ground disturbing activities such as yarding resulted in sediment reaching the streams. Trees were harvested from streambanks leaving little vegetation to prevent the banks from eroding into the streams during high flows. Early forest roads were often poorly designed and located in unstable areas, and road failures provided a major source of sediment.

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

The advent of the Northwest Forest Plan in 1994 (USDA and USDI 1994) followed by the Medford District Record of Decision and Resource Management Plan in 1995 (USDI 1995a) resulted in major improvements for stream and watershed protection and restoration on federal lands. Riparian Reserves establish protection for all fish-bearing streams as well as nonfish-bearing perennial and intermittent streams, wetlands, lakes, ponds, and unstable areas. Riparian Reserves are adequate to maintain riparian conditions necessary to protect stream shade and restore water temperature over time (USDA and USDI 2004). Over the past 10 years, road construction has declined and road decommissioning and upgrading has increased. Implementation of best management practices during road and logging operations have reduced impacts on water quality. Water quality on federal lands is on an upward trend with reductions in summer stream temperatures and sediment input.

Past timber harvest on BLM-administered lands in the project area has been fairly minimal. The most recent BLM timber sale activity in the project area was a small, dispersed, helicopter salvage sale that occurred between 1989 and 1993 in drainage area AM0306 (China Gulch). In 1982 there was an individual tree harvest on approximately 68 acres using non-designated tractor skid roads in the China Gulch drainage. Around 1982, approximately 231 acres of partial cut and about 225 acres of overstory removal were harvested in drainage areas AM0315 (between Long Gulch and Chapman Creek), AM0318 (Chapman Creek), and AM0324 (Keeler Creek). The harvested areas are stable and have recovered from harvest-related disturbances.

Off Highway Vehicle (OHV) trails are a more recent development affecting water quality. Trails created through dispersed use on BLM-administered lands without the benefit of design or proper maintenance can produce serious erosion and adversely affect water quality. No inventory of OHV trails exists for the project area, however, field observations indicate that OHV use in non-designated areas is common in the northern portion of the China Keeler project area, particularly in the AM0303 (between Forest Creek and China Gulch), AM0306 (China Gulch), and AM0309 (between China Gulch and Long Gulch) drainage areas.

The interaction of roads with streams is considered an indicator of potential for sediment impacts to be conveyed to the stream. Road densities are high in all but one of the drainage areas analyzed and range from 2.4 to 10.6 mi./mi.^{2} (Table 3-10). Stream crossing densities are also high and for individual drainage areas they range from 5.7 to 27.4 crossings/mi.^{2} (Table 3-11). Based on the fact that 66% of the BLM stream crossings are dry draws, it is estimated that the majority of the roads on BLM-administered lands are located near or on the ridgetops.

Environmental Consequences

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

For purposes of analyzing environmental consequences of the no action and the proposed action on water resources, the project area is divided into drainage areas ranging in size from 845 to 2,714 acres (Table 3-7). Seven of the drainage areas are totally within the project area and three are partially outside the project area. This size of analysis watershed is large enough to assess the cumulative effect of actions that, taken individually (site scale) may not be significant, but when combined with effects from everything else going on in the drainage, may have a potential significant impact ("cumulative effect"). The drainage areas are small enough to avoid "drowning out" evidence of adverse effects. As the size of the analysis area increases, there is an increasing possibility of the analysis indicating that there is "no problem" when in fact individual drainages may have issues of concern.

Alternative A

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

Under Alternative A, there would be no change in existing water quality on BLM-administered lands. Streams in the analysis area would continue to meet the Oregon water temperature standard except for the lower portion of Keeler Creek and the Applegate River. Surface erosion from roads and OHV trails would be expected to remain a concern, and the risk of sediment inputs to streams would be expected to remain relatively constant. A minimum level of BLM road maintenance would occur to prevent major sediment input or repair drainage failures. There would be no action to decrease overall road densities or decrease road interactions with streams. There would be no action to correct OHV trail problems related to stream sedimentation until completion of the Timber Mountain/Johns Peak Off-highway Vehicle (OHV) Management Plan and Environmental Impact Statement (EIS). In the long term, it is likely that drainage on some OHV trails would be improved and the trails would be less likely to be a sediment source.

In the long term, with no vegetation treatments and the subsequent increase in stand densities and fuel loading, there is a high probability that a severe, stand-replacement fire could burn across the project area (see Fire section). A high severity fire could reduce or eliminate riparian vegetation, resulting in increased stream temperatures, and expose large areas of bare soil to the erosive forces of rainfall, potentially increasing soil erosion and sedimentation.

Effects from past and ongoing actions are summarized as follows. Stream temperatures are on an upward trend on BLM-administered land as previously harvested riparian vegetation recovers. However, roads built in riparian areas continue to contribute to temperature increases. On non-BLM lands, near-stream vegetation disturbance/removal and water withdrawals continue to adversely affect stream temperatures (ODEQ 2003b). Surface erosion from existing roads (see Soils section) contributes to low levels of sediment input primarily at road-stream crossings and where fill slopes closely parallel streams. In the northern portion of the project area, soil erosion caused by ongoing use and unauthorized expansion of OHV trails, particularly in Riparian Reserves, adds sediment to small tributary streams.

Reasonably foreseeable future actions planned for BLM-administered lands in the project area include the potential sale of approximately 9 acres along Keeler Creek. Sale of the parcel along Keeler Creek includes only 300’ of stream. If BLM sells this parcel, deed restrictions would protect the riparian area and streambanks so there would be no impact on water quality. There is no foreseeable road construction in the project area; most areas that could be harvested on private lands are accessible by existing roads. Future intensive timber harvests and fuel reduction treatments on non-BLM lands are possible in most drainage areas and potential changes in vegetation crown closure and compacted area are identified under the Alternative A discussion in the Water Quantity section. Private forest lands in the project area would be managed according to the Oregon Forest Practices Act and agricultural/rural residential lands would be managed according to county ordinances. Management of these lands is addressed in the Applegate River WQMP (ODEQ 2003b). Conforming to the WQMP should ensure achievement of the Applegate Subbasin TMDL.

In conclusion, past actions from the 1850s to the 1970s on both private and BLM-managed lands throughout the project area contributed to water quality degradation, specifically summer stream temperature and sediment increases. With the cessation of some activities, such as hydraulic mining, and the moderation of impacts from other activities, such as logging and road building, water quality conditions are improving. Present and reasonably foreseeable future actions would be required to adhere to the Applegate Subbasin TMDLs and WQMP and water quality in the tributary streams would be expected to continue to improve. Water temperatures in the Applegate River are not likely to noticeably improve since even at system potential it is not predicted to meet the temperature criteria during the hottest time of the year (ODEQ 2003b). The lack of vegetation management on BLM-administered

lands could lead to a high intensity fire that would likely set-back the shade recovery and expose large areas of bare soil, thus increasing stream temperatures and sedimentation.

Alternative B

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

Under Alternative B, no direct effects on sedimentation would occur because no work is planned in perennial streams and any work in or near intermittent streams would be done during the summer when no surface water is present. Road decommissioning, construction, and renovation proposed under Alternative B would have the greatest likelihood of having indirect effects on sedimentation to waterbodies in the China Keeler project area. The greatest potential for indirect effects on sedimentation would be from proposed work in intermittent channels. Although the work would be accomplished during the summer when no flow is present, any disturbed soil in the channel would likely be transported downstream during the following winter. Proposed in-channel work includes six culvert removals in drainage area AM0306 (China Gulch). Stream crossing density would decrease by 2.7 crossings/mi.^{2} in drainage AM0306 (Table 3-27 compared to Table 3-11).

Table 3-27. Total Number of Stream Crossings and Crossing Density with Alternative B[1] (shaded cells denote values different from Alternative A)

Drainage Area Number	# of Stream Crossings by Stream Type and Ownership								Total Crossings	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	3	8	5	4	37	12.5
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
Total	**22**	**24**	**3**	**59**	**23**	**54**	**104**	**59**	**348**	**15.9**

1/ Note: The data for Table 3-27 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.

The primary sediment source would be on-site soil disturbance caused by the removal of road stream crossings and the secondary source would be from surface erosion off cut and fill slopes and the road surface. The following Best Management Practices (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 when streams are dry.
- 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 new road grades less than 8-10%, roads would be outsloped, and on grades greater than 8-10%, roads would be insloped with ditchlines.
- For mechanical road decommissioning, 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. Fill material would be removed and stream side slopes would be reestablished to natural contours then seeded (with native or approved seed) and mulched. Excavated material would be removed from stream crossing areas and placed at stable locations. 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.
- Areas of disturbed ground on all decommissioned roads would be seeded with native or approved seed, fertilized, and mulched.

All of these BMPs would minimize the likelihood of displaced sediment reaching stream channels.

Approximately 1.1 road miles would be mechanically decommissioned in drainage area AM0306 (China Gulch), including 0.5 mile of road within the Riparian Reserve. Proposed road decommissioning would include the removal of six road crossings on short-duration intermittent streams and two on dry draws in the China Gulch drainage area (AM0306). Indirect effects would result if soil material entered streams as a result of proposed instream work and the sediment moved downstream from the culvert removal sites. The primary sediment delivery mechanism resulting from culvert removal at the short-duration intermittent stream crossings would be streambank erosion during bankfull flows following completion of instream work. Removing fill material, 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 culvert removal. The timing of any sediment pulse would coincide with normal high turbidity levels and the sediment from the proposed project would not be discernible above background levels. The proposed decommissioning would be in the headwaters of China Gulch which is over 2½ miles upstream from the confluence with the Applegate River. Any increase in sedimentation due to soil disturbance from the proposed decommissioning would be small with no discernible effect on the Applegate River.

Under Alternative B, there would be approximately 0.7 miles of new road construction in drainage areas AM0324 and AM0330. The proposed road construction would occur in stable locations, on or near ridges, thus minimizing the risk of sediment reaching streams. No streams or dry draws would be crossed by the proposed new road, and the closest dry draw would be over 150 feet below the road. The proposed new road would be out-sloped, thus avoiding road ditches. Soil that moves off the new road would likely be trapped by woody material below the fill slopes and not move into any dry draws or stream channels.

Proposed road renovation under Alternative B would include approximately nine miles of rock surfacing; rocking 3.5 miles of natural surfaced roads and adding rock to the existing base on 5.5 miles. The majority of the rock surfacing would occur on non-BLM lands in drainage areas AM0315 (between Long Gulch and Chapman Creek), AM0318 (Chapman Creek), and AM0324 (Keeler Creek). Approximately 1.6 miles of road

renovation would occur outside the project area boundary in two adjoining Forest Creek drainage areas (AM0203 and AM0209). Rock surfacing would reduce the amount of soil moving off the road surface, resulting in less sediment entering streams.

Road drainage improvements would occur on approximately two miles to further disperse road runoff and decrease the rapid, concentrated routing of water to streams during storm events. Approximately 1.5 miles of road drainage improvements would take place within the project area boundary (drainage areas AM0303, between Forest Creek and China Gulch, and AM0306, China Gulch) and the remainder would occur in two adjoining Forest Creek drainage areas (AM0215 and AM0221) outside the project area boundary. The rock surfacing and drainage improvements would help to minimize the sediment input from roads and is a restoration priority for the Middle Applegate River Watershed (USDI 1995b).

Proposed roadwork in and near streams would increase sedimentation rates slightly for up to three years, after which road drainage improvements to existing roads, upper slope locations (near ridgelines) for the new road construction, and decommissioning of problem roads and road stream crossings would result in a net reduction in sediment delivered to streams. Rock surfacing proposed for approximately nine miles of road would have a positive effect on stream sedimentation problems in the project area.

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

In addition to road related actions, management activities proposed under Alternative B that could have an indirect effect on sedimentation to streams in the China Keeler project area include commercial harvest, pre-commercial thinning, fuel reduction treatments, and helipad construction.

Proposed actions due to commercial harvest would include tree felling and log yarding. Of these actions, yarding would be most likely to lead to sedimentation due to ground disturbance. Alternative B proposes approximately 118 acres of tractor yarding, 371 acres of skyline cable yarding, and 826 acres of helicopter yarding (Table 3-28). Research has found that the amount of ground disturbance from yarding varies by logging system with 21 percent for tractor, 7 percent for skyline cable, and 2 percent for helicopter (see Soils section). Estimated area disturbed by yarding would be greatest in drainage areas AM0306 (China Gulch) and AM0315 (between Long Gulch and Chapman Creek) (Table 3-28). No increase in stream sedimentation would occur as a result of commercial harvest due to BMPs such as no harvest or yarding in Riparian Reserves and minimizing and waterbarring skid trails (see Soils section). Soil that moves on cable yarding corridors during storm events would be trapped by logging slash or by ground cover on undisturbed ground at the bottom of or adjacent to yarding corridors. On steeper slopes with higher erosion potential, waterbars would be constructed manually to direct water off the cable yarding trails. Waterbars on tractor skid trails would prevent water from concentrating on bare, compacted ground and move it to adjacent vegetated or slash covered slopes.

Table 3-28. Proposed logging systems under Alternative B and estimated acres disturbed.

Drainage Area	Tractor Yarding (Acres)	Cable Yarding (Acres)	Helicopter Yarding (Acres)	Total Yarding (Acres)	Total Estimated Acres Disturbed
AM0303	3	31	30	65	7
AM0306	62	90	300	453	29
AM0309			193	193	4
AM0315	38	155	98	291	37
AM0318	4	21	40	65	6
AM0321				0	0
AM0324	10	25	18	52	6
AM0327	1	12	46	59	4
AM0330		35	86	122	9
AM0336			16	16	0
Totals	**118**	**371**	**826**	**1315**	**103**

Under Alternative B, 86 acres of manual pre-commercial thinning (PCT) within Riparian Reserves would include approximately 28 acres in drainage area AM0306 (China Gulch), 37 acres in AM0315 (between Long Gulch and Chapman Creek), and 21 acres in AM0324 (Keeler Creek). The proposed Riparian Reserve PCT would occur along short-duration intermittent streams in drainage area AM0306, short- and long-duration intermittent streams in AM0315, and a perennial stream (Keeler Creek) in AM0324. Manual PCT would not involve any ground disturbance and therefore would not have any effect on erosion rates or sedimentation in the project area. Manual PCT would not occur: within 50 feet of the perennial stream; 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.

Under Alternative B, prescribed burning would be either broadcast (underburning) or handpile burning. Spring underburning would result in a low intensity burn with minimal duff consumption. Sediment increases from spring underburning would be very slight given the low intensity burn and BMPs that stipulate no ignition or fire lines in Riparian Reserves. Fall underburning would only be undertaken if "spring-like" conditions exist for soil and duff moisture levels. An area burned in the fall would not 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 1994:4-19).

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 outside of Riparian Reserves, mostly on stable ridges. Three proposed helipads would be located adjacent to Riparian Reserves along existing roads. 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.

Alternative B would have no direct or indirect effects on stream temperature and minimal effects on sedimentation because: 1) shade on perennial streams would be maintained with all vegetation treatments and proposed road work; 2) BMPs governing instream culvert removals would minimize the likelihood of sediments reaching downstream water sources; 3) all of the 0.7 miles of proposed road construction would occur in stable locations, on or near ridges, thus minimizing the risk of sediment reaching streams; 4) the net miles of existing roads would be decreased by 0.4 miles until the road proposed for natural decommissioning becomes fully

vegetated at which time there will be a net decrease of 1.4 miles; 5) the total road miles in Riparian Reserves would be reduced by 0.5 miles, decreasing sediment sources over the long term; 6) rock surfacing on nine miles of road and drainage improvements on two miles of road would decrease sediment delivery; 7) no sediment increases would occur as a result of commercial harvest due to BMPs, including Riparian Reserves; 8) 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; 9) sediment increases from underburning would be very slight given the low intensity burn and BMPs that stipulate no ignition or fire lines in Riparian Reserves; 10) BMPs would minimize the entry of sediment or ash into stream channels from pile burning; and 11) helipads would be constructed outside Riparian Reserves and BMPs would minimize any sediment moving off-site. No direct or indirect effect on water quality of the Applegate River would be anticipated under Alternative B.

"Minimal effects" means water quality will not be measurably degraded and not result in the listing of streams.

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

Existing sediment sources are primarily related to the road network and OHV trails created by past actions. Measurable changes in sedimentation resulting from Alternative B implementation and reasonably foreseeable actions (see Alternative A) would be minimal. Any soil that reaches the stream system due to road decommissioning and renovation under Alternative B would likely result in a local sediment pulse during storm events the first two fall/winters following road work. The timing of any sediment pulse would coincide with normal high turbidity levels and the sediment from the proposed project would not be discernible above background levels. Because the road construction proposed under Alternative B would be located on or near ridges, it is very unlikely that this work would result in any soil reaching streams. Therefore, the cumulative effects on sedimentation resulting from Alternative B would be slightly greater than Alternative A for all drainage areas.

G. FISH HABITAT

This section discloses impacts to the aquatic habitat, especially fisheries.

Issues/Concerns

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

Some are opposed to ground-disturbing activities because such activities may negatively affect aquatic habitat. Some are concerned that non-ground-disturbing activities like hand-thinning brush could negatively affect riparian habitat. NOAA Fisheries has concerns with any activity that could potentially negatively affect listed Southern Oregon/Northern California coho salmon (*Oncorhynchus kisutch*) or its habitat.

The types of activities proposed in the China Keeler project could impact fish habitat or habitat for other aquatic fauna in Chapman Creek, Keeler Creek, China Gulch and other streams in the project area. External and internal scoping determined that the habitat factors requiring special scrutiny included fine sediment loading, peak flows, large woody material, and road density and location. Other habitat factors for listed coho salmon were also analyzed as required by the interagency section 7 consultation process for the Endangered Species Act.

There are often concerns about commercial tree harvest and road construction, and for good reason. There is much literature documenting the adverse effects of these activities on aquatic systems. However, problems with commercial tree harvest are usually related to the amount of tree canopy removed, the type of logging system, or the extent of riparian harvest. Removing too much tree canopy in the Transient Snow Zone can change snow loading and lead to abnormal increases in peak flows. Too much tractor logging or poorly-designed cable yarding corridors can sometimes cause slope erosion and consequent sediment problems for streams – especially when riparian buffers are compromised. Riparian tree harvest sometimes targets the largest trees, effectively removing shade, reducing humidity and removing the source of future instream wood. Road construction usually causes problems when it is along streams or cutting across the middle of a steep slope ("mid-slope") – especially if soils are unstable. Typical problems include concentrating rainwater down road ditches and increasing peak flows in nearby streams, erosion of fine sediments into streams, or the triggering of landslides, usually due to plugged culverts or poor road drainage on badly-located mid-slope roads.

Affected Environment

Special Note: More detailed information can be found in a Fisheries Specialist Report prepared for the Biological Analysis. This report is available from the Medford BLM by request. The Applegate River flows through the middle of the project area; management activities are planned in the drainages on both sides of the river. Several native fishes spawn and rear in the Applegate: coho salmon, steelhead (*O. 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. Population records for all fish species are not available; however spawning surveys (USDI BLM, 1998/1999, unpublished), snorkel surveys (USDI BLM 2003, unpublished), and smolt trap data (ODFW 1999-2003) from nearby streams all indicate that coho numbers are low.

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. Currently, fish numbers in Chapman and Keeler Creeks are very low. Recent BLM surveys have found cutthroat in Chapman Creek and cutthroat and one rainbow/steelhead in lower Keeler Creek. (USDI BLM 1980, 1997, 1999, 2003, unpublished) Fish have been essentially extirpated from China Gulch. ODFW shocking surveys (2002, unpublished) found one steelhead in the lower 1/3 mile; however, the rest of China Gulch appears to be fishless.

On June 18, 1997, 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, coho may also have used the lower gradient reaches of Chapman, Keeler, and China Gulch, where each stream meets the Applegate River's floodplain. Two hundred years ago, the rivers' floodplain was probably full of side channels and wetlands, especially at tributary junctions. Currently, the mouths of Chapman and Keeler Creeks drop steeply into the Applegate River, making access difficult for fish, especially coho. These steep gradients could be due to river channelization, gold and gravel mining and/or the Applegate Dam. It is also possible that Chapman and Keeler Creeks have always been small and steep and never provided coho habitat. Nevertheless, for the purposes of the China Keeler Project, BLM estimates that coho historically used the lower 1 – 1½ miles of Keeler Creek, the lower 2 miles of Chapman Creek, and the lower ½ mile of China Gulch. 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 the lower portions of China Gulch, Chapman and Keeler Creeks are considered *unoccupied* Critical Habitat. The same stream and river sections are also considered Essential Fish Habitat for coho, as

defined by the Magnuson-Stevens Act. The Applegate River is considered Essential Fish Habitat for chinook salmon.

Special Notes: The stream and riparian information that follows has been compiled from the following sources, except where otherwise noted: 1997 ODFW fish habitat survey data from Chapman Creek and Keeler Creek (ODFW 1997a and 1997b); 1997 BLM Hydrology riparian survey data from Chapman Creek, Keeler Creek, China Gulch, and surrounding fishless streams (USDI BLM 1997); and site visits by BLM fisheries personnel (1980 – 2002).

The Applegate River has a long history of gold mining, agricultural and residential development, beaver trapping, water withdrawals, dam construction, water diversion, road development, logging, fires, and fire fighting. It is 303(d) listed for temperature (ODEQ, http:///www.deq.state.or.us/wq/standards/WQStdsTemp.htm). The riparian area has been confined to a narrow river-side strip of large trees. The river has been straightened, channelized, and isolated from its floodplain, with the consequent effects to fish habitat: fewer pools, a wider channel, little refugia from floods or predators, fewer spawning areas, and decreased food supply. Only enormous public desire or large floods could restore some of the river's function. For detailed information on river condition, please see the Middle Applegate Watershed Analysis (USDI BLM 1995) or the Applegate Aquatic Health Assessment (USDA FS and USDI BLM, 1995).

The slopes draining to the Applegate River show a marked difference between north- and south-facing. South-facing slopes are dry and hot, covered with oceans of ceanothus/manzanita chaparral and small-statured Oregon white oak woodlands. Stringers of black oaks, pines and firs run up some of the riparian areas. Otherwise, riparian areas are open and dry; Oregon grape and poison oak are common riparian understory plants. Along intermittent channels, riparian areas are often only 25' wide on each side of the channel.

North-facing slopes are dramatically moister. They support mixed conifer forests of Douglas-fir, Ponderosa pine, cedar, and madrone. Oak woodlands cloak the lower elevations. Riparian areas are vegetatively diverse, supporting all the usual southern Oregon riparian species: big leaf maple, yew, cedar, ninebark, willow, dogwood, black oak, etc.—and very healthy poison oak.

Chapman Creek sports some of the best fish habitat in the Middle Applegate Watershed. In 1997, 50% of the surveyed stream miles on federal land were rated Properly Functioning (PFC) or Functioning-At-Risk with an Upward trend (FARU); only 20% Functioning-At-Risk with a Downward trend (FARD) or Not Properly Functioning (NPF).

Chapman Creek's riparian areas (on BLM) are the healthiest in the Middle Applegate Watershed. Alder, bigleaf maple, canyon live oaks, incense cedar, and Pacific yew add diversity to a mixed conifer overstory. A diverse mix of shrub and forb species add canopy layers for shading and nutrient supply. Shading and a cool riparian microclimate are the norm in the Chapman drainage, despite a history of clearcut logging near stream channels (on both private and federal lands). The stream was probably protected from the north-facing aspect and narrow canyon of Chapman Creek. Now, decades later, shrubs protect the stream channels in these locations.

Chapman Creek is also fortunate in that there are reaches on BLM with an adequate amount of instream wood. Over two miles of stream have >25 pieces of large-diameter wood (>24"dbh)/mile in and adjacent to the stream, the standard for Proper Functioning Condition in the Klamath-Siskiyou (east) Matrix of Pathways and Indicators. Over four miles of stream have 10-25 pieces/mile (functioning, although "at risk.").

Unlike many other nearby streams, the substrate in Chapman Creek stores few fine sediments. In 1997, the stream bottom was primarily boulder and cobble with small pocket pools. There were no active mass wasting sites.

Chapman Creek also has more perennial (year-round) sections of stream than nearby Keeler or China Gulch. The fan-shape of the drainage, geology, and aspect all contribute to water storage capacity. There are 20 springs in the drainage, another indication of water storage.

The most pressing problem for aquatic habitat in Chapman Creek is the location and design of particular roads and culverts. One perched culvert on mainstem Chapman Creek blocks the upstream passage of fish and amphibians and the downstream movement of spawning gravels and wood. There is also an active gold dredging operation on Chapman Creek.

Keeler Creek is located next to Chapman Creek. Like Chapman Creek, the forested reaches of Keeler Creek maintain cool temperatures (USDI BLM, unpublished thermograph data, 2002), despite the fact that in many places, riparian buffers are recovering from past logging. Fines are limited; the stream bottom is primarily composed of cobbles and boulders, providing an excellent substrate for aquatic insect production and many small pocket pools for amphibians. The channel has appropriate width-to-depth ratios. Large wood is in poor supply, however one reach on BLM has enough large-diameter wood to be rated Properly Functioning. Despite the cool temperatures upstream, the lower mile does not meet ODEQ's temperature criteria of 64.4°F (USDI BLM, unpublished water temperature data, 2000). More information can be found in the "Water Resources" section of this document. Keeler Creek was historically mined for gold, which always raises the spectre of mercury stored in sediment.

Road densities in the Keeler Creek drainage are high. See the "Water Resources" section for more information. Roads paralleling Keeler Creek limit the recovery of riparian areas. There is a perched culvert at river mile 0.7 that appears to be blocking upstream fish passage. There are also other problem culverts in the drainage.

China Gulch is a narrow, steep, south-facing drainage. Soils are shallow and the upland plant community dominated by chaparral. The west-slopes do support mixed conifer forests, but many of the more mesic conifers are dying. Off-Highway Vehicles (OHVs) have created a network of roads and trails throughout the east side of the drainage, causing erosion problems and limiting riparian recovery. The drainage was heavily mined for gold. Tailings and glory holes are still scattered throughout. Due to its proximity to the town of Ruch, many houses have been built along the lower and east-side slopes.

The streams in the China Gulch drainage are generally in poor shape. Forty percent are Not Properly Functioning, or are Functioning-At-Risk-with-a-Downward Trend. Silts and clay dominate the mainstem, severely reducing habitat for aquatic insects, and amphibians. (Interestingly, many tributaries have low amounts of fine sediment – it is quite possible that fines were scoured out in the 1997 flood and deposited in the main stem). Mainstem China Gulch is severely incised. Road densities are very high (6.6 miles/sq mile), increasing the risk of experiencing changes in peak flow during storm events. See the "Water Resources" section of this document for more information.

In general, the unnamed frontal streams in the project area reflect the same channel and habitat patterns as Chapman, Keeler, and China Gulch, just on a smaller scale. The north-facing drainages are cooler, moister, with healthier, more diverse riparian areas. The south-facing drainages are warmer, drier, with very narrow riparian areas. Many of the south-facing streams flow through chaparral or oak woodlands.

Past Actions

The effects of past actions are manifested in the current condition described above. Actions and events that have shaped the existing condition include, but are not limited to: logging and road building, wildfires, fire suppression, gold and gravel mining, water diversion, and the development of private lands for both agricultural

and personal uses. See the Middle Applegate Watershed Analysis (USDI BLM 1995) and other sections of this document for more detail on past actions.

Environmental Consequences

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

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

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 and chinook. The Southwest (SW) Oregon Level 1 Team has reviewed an earlier version of the China Keeler project, which included more harvest, more road construction, more road decommissioning in Riparian Reserves, more fuels work, and culvert removal and replacement in fish-bearing streams. This earlier project was determined to be "May Affect, Not Likely to Adversely Affect (NLAA)." The SW Oregon Level 1 Team concurred with the NLAA determination. Medford BLM received a Letter of Concurrence from NOAA Fisheries August 27, 2005 for the China Keeler Project as described in the May, 20004 EA. This Letter of Concurrence is sufficient for this "reduced version" of the China Keeler Project. 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 [see Federal Regulation 50CFR§402.16(b)].

Alternative A

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.

Indirect effects would also include effects on riparian vegetation. In riparian areas with overly-dense stands of Douglas-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 would remain high (see Fuels section). A severe wildfire could indirectly affect aquatic ecosystems.

The current scientific "fire" 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 (Benda et al. 2003; J. Rossa, personal observation). 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.

There 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 "Water Resources" 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 in the "Water Resources" section, 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 in Quartz Gulch after the 2001 Quartz Gulch fire (D. Squyres and J. Rossa, personal observation).

Cumulative effects for Alternative A include past, present, and reasonably foreseeable future actions, and the direct and indirect effects of the proposed project. The effects of past and present actions are summarized in the current condition of fish habitat in the project area. The current condition also serves as the "baseline" for the Endangered Species Act section 7 consultation. There are no proposed activities for Alternative A, other than "status quo" management. The direct and indirect effects on fish and aquatic habitat are described as above.

Reasonably foreseeable future federal actions include the potential sale of approximately 9 acres of BLM land along Keeler Creek. Sale of this parcel along Keeler Creek includes only 300' of stream. If BLM sells this parcel, deed restrictions would protect the riparian area and streambanks.

Under Alternative A, the future action (the land sale) is neutral to fish, aquatic biota, and stream habitat. The indirect effects of Alternative A could have positive, negative, or neutral effects, depending on the occurrence, intensity, and behavior of a wildfire. Therefore, it is impossible to predict the cumulative effects of Alternative A on fish and aquatic systems.

Alternative B

Under Alternative B, there are no **direct effects** to stream habitat. No instream work is proposed for the China Keeler Project.

Under Alternative B, road decommissioning, 86 acres of non-commercial riparian thinning, and haul road renovation would have **indirect effects** to aquatic systems, some negative and some beneficial.

In China Gulch, one of the roads to be decommissioned runs in and out of the riparian area along an intermittent stream. Where it parallels the adjacent stream, this road is separated from the stream by healthy riparian vegetation, thick duff layers and downed wood. Where it crosses the stream, the riparian area is also lush and healthy. This adjacent stream is in moderately fair condition, with some fine sediment storage capability. The

other road runs along the edge of a weedy meadow and densely-stocked madrone/Doug-fir stands. The upstream end of this road runs up an intermittent stream channel in extremely poor condition. All streams near road decommissioning are dry in the summer, when road work would take place. Although some fine sediments would be produced from the road work, in the stream with healthy riparian vegetation, the sediment would be routed downstream and stored naturally in the channel, having little biological effect. For example, sediment-sensitive macroinvertebrates (if present) would move to more favorable locations, then quickly recolonize as the fine sediment sorted downstream. In the poor quality stream, the amount of fine sediment in the channel from decommissioning would be less than that entering the channels year after year from poorly-constructed roads (see "Water Resources" section). In both cases, 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). All decommissioning is at least 2½ - 3 miles from fish-bearing sections and coho Critical Habitat. The long-term benefit of the decommissioning would improve aquatic habitat by improving natural stream function, reducing fine sediment input. Indirect beneficial effects also include reduced risk of culvert failure, reduced road-related fine sediment input, and improved tree growth as vegetation reestablishes on decommissioned roads.

Approximately 86 acres of the non-commercial understory thinning is planned within Riparian Reserves of China Gulch, Keeler Creek, and the small, unnamed stream east of Chapman Creek[1] (see Chapter 2 for details). This work may have a beneficial effect to individual large-diameter riparian trees (both conifer and hardwood) by reducing competition for water at the site scale. One of the objectives of the riparian understory thinning is to protect these large-diameter trees and thereby to protect a vitally important component of future aquatic and riparian habitat health. Protecting these larger trees indirectly benefits aquatic systems by maintaining the source of large woody material for sediment control, habitat creation, humidity retention, and microsite creation for riparian diversity. There would be no negative indirect effects from riparian thinning because "no treatment" buffers would be maintained along every stream, protecting banks and streamside vegetation from accidental thinning or burnpiles. The "no treatment" buffers would also protect the streams from any overland fine sediment movement towards streams (if any) after handpile burning. No temperature problems would be caused by this riparian thinning because the riparian overstory would be maintained.

The non-commercial riparian thinning includes dropping thinned trees across the "no treatment" buffer of adjacent streams in order to improve the downed woody component in the riparian area. The diameter of the trees is so small (usually less than 6" dbh), and the distance across the "no treatment" buffers large enough, that the usual benefits of large wood (moisture retention, habitat creation and stream channel structure) would not be realized. However, these small logs would add nutrients to the forest floor and even though only the tree tops might make it to the channel, these tops may help to trap fine sediment. The benefits would be so minor that they would not be noticeable downstream in fish-bearing stretches of China Gulch, and the Applegate River.

Road renovation in the China-Keeler project primarily consists of rocking roads. Rocking roads will help ensure roadbed stability during haul, thereby eliminating road-related drainage and sedimentation problems the winter following haul. Roacking stream crossings would help prevent dust and fine sediment movement off the road bed and into streams. Overall, road renovation would benefit streams in the China Keeler project area.

In the China-Keeler project, commercial tree harvest retains enough canopy in the Transient Snow Zone that there are no concerns about increased peak flows (see "Water Resources" report, this document). Strict PDFs protect soil from compaction due to logging systems and would control soil erosion—especially because full Riparian Reserve buffers would be maintained on all streams. All helipads are on ridges or knolls outside of Riparian Reserves and well away from intermittent or perennial headwater streams. There is no commercial tree harvest in Riparian Reserves; therefore, shade, humidity, and instream wood sources would be maintained. 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. Finally, harvest units

[1] This stream is located at 38s3w31sene and 38s3w32swsw.

along the Applegate River are separated from the river by roads, irrigation ditches, flat agricultural land, the river's Riparian Reserve, or all of the above. There are no risks of negative biological impacts from harvesting because harvest units are not hydrologically connected to stream channels and stream channels are protected by complete Riparian Reserve buffer widths. And there would be no chance of sediment from these harvest units compromising coho Critical Habitat in the river.

There is only one road proposed for construction, and this road would be along a ridge in stable soils without any hydrologic connection to streams. Therefore, there is no risk of the road channeling water or fine sediments into streams, and no risk of this road causing slope failure or landslides. The road is also located away from slide areas. Stringent PDFs and BMPs offer extra insurance against road failure. There would be no effect from this road to aquatic systems or coho Critical Habitat.

The effects to coho and coho Critical Habitat were analyzed in a Biological Analysis for a larger and more complicated version of China Keeler. NOAA Fisheries concurred with the BLM that the determination of effects for that larger project was **May Effect, Not Likely to Adversely Affect.** BLM will reinitiate consultation if the China Keeler project has more or different effects than those analyzed. As described and analyzed in this document, it does not. For clarity, the effects of the China Keeler project as described in this document are summarized in the table below.

Table 3-29: Summary of Effects to Southern Oregon/Northern California Coho ESU Critical Habitat Factors, from the Analytical Process for Section 7 Consultation[1].

SONC Coho Habitat Factor	Summary of Effect to SONC Coho Habitat Factors
Sediment[2]	**Negative but insignificant**, because the only expected sediment source is from road decommissioning, the points of possible sediment entry into coho Critical Habitat are few, and strict PDFs on roadwork and haul would significantly limit the amount of fine sediment entering streams. Although there is a risk of some fine sediment entering stream channels, the amount is expected to be very small, and be indistinguishable from background levels within a short distance from road crossings. Finally, the baseline sediment condition in Chapman and Keeler Creeks (the most significant, although unoccupied, coho Critical Habitat within the project area) is very good: fines are low in both streams; therefore, very small amounts of additional fines would not cause a negative biological effect to coho (sensu Waters, 1995).
Temperature[2]	**Neutral** because Riparian overstory maintained everywhere.
Large Woody Material[2]	**Beneficial but insignificant** because site improvements from the few acres of non-commercial riparian thinning and road decommissioning would be too slight to be noticed in Keeler Creek and China Gulch baseline conditions too poor for improvement in the small section of coho Critical Habitat.
Change in Peak/Base Flows [2]	**Neutral** because Transient Snow Zone canopy would be maintained, so peak flows would not be affected; and remaining trees would absorb extra water, so low chance that base flows improved within coho Critical Habitat.
Width:Depth Ratio[2]	**Beneficial** at immediate location of culvert removals, but insignificant because China Gulch baseline conditions too poor. **Neutral** throughout rest of project area because peak flows not affected, fine sediments controlled, and without any instream work, there would be no other mechanisms to change width:depth ratios.
Hazardous Materials[2]	**Neutral** because strict PDFs and little instream activity mean that the

	risk of hazardous material entry to coho Critical Habitat is negligible.
Off-Channel Habitat[2]	**Neutral** because this type of habitat not naturally present in streams within the project area, only the Applegate River, and because none of the activities would be in the channel or affect peak flows, width:depth ratio, LWM, or streambanks, so there is no mechanism for off-channel habitat change.
Pool Character and Quality[2]	**Neutral,** because no improvement or impacts to large wood and sediment within coho Critical Habitat due to PDFs on road decommissioning and protection of full Riparian Reserve buffers.
Physical Barriers[2]	**Neutral** because although culverts on small streams in upper China Gulch would be removed, the culverts are far upstream of coho Critical Habitat.
Streambank Condition[2]	**Beneficial** at road decommissioning sites in China Gulch where culverts would be removed. However, for coho Critical Habitat, this improvement is **insignificant** because the work is far from coho Critical Habitat and the improvement is so small that benefits will not be noticed at the HUC-7 spatial scale. Within coho Critical Habitat, the proposed work has a **neutral** effect because no instream work is proposed that could damage banks and there are no expected changes in peak flow that could scour banks.
Floodplain Connectivity [2]	**Beneficial** at one road decommissioning site in China Gulch where the road currently obliterates part of an intermittent stream's floodplain. However, for coho Critical Habitat, this improvement is **insignificant** because the improvement is so small that benefits will not be noticed at the HUC-7 spatial scale.
Road Density and Location[3]	**Beneficial**, because two Riparian Reserve roads will be decommissioned in China Gulch but the only new road will be high on a ridge across stable soils. However, the proposed work is **insignificant** to this habitat factor because the changes are so small that there is no improvement noticeable at the large spatial scale of the Middle Applegate watershed.
Riparian Reserves[3]	**Beneficial,** because two Riparian Reserve roads will be decommissioned in China Gulch, and non-commercial thinning will improve the health of individual large-diameter trees in 86 Riparian Reserve acres along China Gulch, Keeler Creek, and an unnamed stream east of Chapman Creek. However, the proposed work is **insignificant** to this habitat factor because the changes are so small that there is no improvement noticeable at the large spatial scale of the Middle Applegate watershed.
Human Disturbance History [3]	From the perspective of coho Critical Habitat, the activities proposed in the China Keeler project would not create additional disturbance that could adversely affect streams or coho Critical Habitat. However, the proposed work is insignificant to this habitat factor because the baseline condition of the Middle Applegate Watershed is so degraded from past disturbance (e.g. gold mining, road construction, floodplain development) and the proposed changes are so small that no improvement would be noticeable at the large spatial scale of the Middle Applegate Watershed. Therefore, the proposed work has a **Neutral** effect on this habitat factor.
Landslide and Erosion Rates[3]	Neutral, because unstable soils would be avoided and the only new road construction is on a ridge in stable soils, so there are no landslide triggers. Road improvement would decrease erosion rates.

	However, the proposed work is insignificant to this habitat factor because the changes are so small that there is no improvement noticeable at the large spatial scale of the Middle Applegate watershed. Therefore, the proposed work has a **Neutral** effect on this habitat factor.

1/ Note that the effects listed in this table are different than those in the Biological Analysis (BA). That is because the BA analyzed the May, 2004 proposed action version of the China Keeler project. The current proposal is a subset of the previous proposal with reduced treatment acres and roading.
2/ Analyzed at the drainage scale, i.e. HUC-7. The primary drainages analyzed are Chapman Creek, Keeler Creek, and China Gulch.
3/ Analyzed at the watershed scale, i.e. HUC-5, or Middle Applegate Watershed.

Cumulative effects for Alternative B include past, present, and reasonably foreseeable future actions, and the direct and indirect effects of the proposed project. The effects of past and present actions are summarized in the current condition of fish habitat in the project area. The current condition also serves as the "baseline" for the Endangered Species Act section 7 consultation. The direct and indirect effects of the proposed project elements on fish and aquatic habitat are described as above.

Reasonably foreseeable future federal actions include the potential sale of approximately 9 acres of BLM land along Keeler Creek. Sale of this parcel along Keeler Creek includes only 300' of stream. If BLM sells this parcel, deed restrictions would protect the riparian area and streambanks.

Under Alternative A, the future action (the land sale) is neutral to fish, aquatic biota, and stream habitat. The current conditions are very poor in the Applegate River and China Gulch, but are moderately good in Chapman and Keeler Creeks. The direct and indirect effects of Alternative B are occasionally beneficial at the small, site-specific scale (e.g. culvert removal on a fishless, intermittent stream in China Gulch). However, most of the effects of this project are insignificant or neutral due to the extensive PDFs and BMPs, the careful placement of new road, the amount of tree canopy remaining in harvested units, and rentention of Riparian Reserve buffers and overstory. Therefore, Alternative B does not cause additional strain on the aquatic ecosystem in the Middle Applegate watershed, or in Chapman, Keeler, China and other unnamed streams in the China Keeler project area.

H. WILDLIFE HABITAT

This section discusses terrestrial wildlife habitats and connectivity. Fragmentation, as it relates to biological integrity, is discussed in the Biological Diversity section.

Issues/Concerns

Scoping (external and internal) generated the following issues/concerns and anticipated effects related to implementing the Proposed Action. These effects may or may not occur as a result of the proposed action but were of concern to members of the public or ID team specialists.
Some oppose logging and road construction actions because of perceived negative effects to wildlife--native wildlife populations and/or species may decline in number as a result of habitat loss, fragmentation, and disturbance due to forest openings resulting from roads, logging and/or fire management activities, and from disturbance activities such as OHV use.

Some are opposed to cutting any large trees because doing so will impact recruitment of snags and large woody material.

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

Vegetation manipulations, regardless of the vegetation type (trees, brush, grasslands) affect wildlife primarily by modifying habitat. The proposed action focuses on the removal of trees in forested stands, and nearly all effects would be to forested habitat.

All prescribed treatments would reduce canopy closure, snags, and understory vegetation. It is inherent with forest disturbance, whether natural or human-caused, that some species of wildlife are winners and others are losers. The habitat components described above (canopy closure, vertical structure, and snags) are important to a variety of wildlife species associated with the conifer stands proposed for treatment. The proposed harvest would adversely affect species preferring a high degree of canopy closure, snag-dependent species, and species preferring shaded understory shrub habitat (e.g., northern spotted owl, pileated woodpecker, and Swainson's thrush, respectively). Conversely, the treatments would benefit species preferring or adaptable to more open canopies and/or early seral conditions, e.g., American robin and black-tailed deer.

Roads result in direct and indirect habitat loss. The road prism itself alters existing habitat to essentially compacted bare ground, a habitat type typically not utilized by most wildlife species in the project area. Other ways roads affect wildlife in addition to habitat removal include: vehicular noise disturbance which affects behavior patterns; increased potential for poaching; microclimatic changes to the habitat adjacent to roads; and physical barriers to movement. Hamann et al 1999 observed that for birds there is a continuum of responses to roads ranging from habituation to abandonment of adjacent habitat. This scenario likely holds true for all species in the project area.

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

Affected Environment

Wildlife species may have specific preferences with forests of particular age class and structure, which are best described by seral stages (RMP EIS, 3-19). The current distribution of seral stages in upland plant communities (those in which conifers are present) is presented in table/graph 3-30.

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 3-30 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 (Early Seral)	409	solitary vireo, deer mouse, black-tailed deer
Poles (Mid-Seral)	516	Golden-crowned kinglet, porcupine,
Mid-Seral	2,790	Pacific giant salamander, western tananger,
Mature	2,212	northern spotted owl, northern flying squirrel

Portions of the proposed project area have been designated as an Oregon Important Bird Area due to the presence of bird species that reach their northern breeding limits in southwest Oregon. These species are associated with the shrubland/oak-woodland habitat complex. Species specifically mentioned in the designation include blue-gray gnatcatcher, California towhee and oak titmouse. Treatments in the preferred habitat of these species is not part of the Proposed Action.

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 per acre.

Past Actions

In terms of optimized habitats for wildlife, a complete absence of humans would be ideal. Because there is no historical data for animal populations and diversity, and because both habitat changes and human population increases, along with alteration of key carnivore predator-prey relationships, it is difficult to establish a baseline to which to anchor past actions that have affected wildlife. In the more recent past, however, the removal of habitat through development of private lands and logging, along with fragmentation of habitat via road construction have been key disturbances to wildlife.

The least available habitats are unfragmented stands of old growth. In that context, stands of old growth were substantially altered by the 1980's (see Fire and Fuels Management and Vegetation sections). In addition, the majority of roads had been constructed by the 1980's as a result of private land development and timber management.

Until implementation of the NWFP began in 1994, timber harvest on both BLM and private land in the analysis area (which is the Middle Applegate 5th Field Watershed) 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 cumulative effects 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 broader Middle Applegate 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.

Environmental Consequences

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

An overview of the effects of timber management on wildlife/wildlife habitat is provided in Chapter 4, pages 51-83, of the BLM Medford District Resource Management Plan (RMP). To provide for habitat needs and maintaining a diversity of habitats, the RMP provides for a range of seral stages of forested vegetation. This provision is across the entire Medford BLM District lands, and would not be appropriately measured at the project level.

However, 5th field watersheds are large enough that such a scale would be representative to measure the range of seral stages to determine large scale cumulative effects. 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.

Alternative A

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 alternative is designed to improve. Restoration of these habitat elements, therefore, would not take place. Specifically, under the action alternative, 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. Also thinning would reduce the potential for a high intensity wildfire which is likely to occur in these stands under current high density stem conditions. This work will not happen under Alternative A, No Action.

Foreseeable actions which incrementally contribute to habitat loss, fragmentation and disturbance include road and trail construction and vegetative treatments which alter habitat types. Projects considered for cumulative effects within the project area are: road construction and land clearing on private lands, timber harvesting on private industrial lands, and fuels reduction treatments on private land.

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 might be treated or could be under contract for treatment on BLM managed land. This estimate is based on the amount of commercial timber stands in the proposed projects and the percentage of commercial timber stands that have been treated in similar projects. It is not known how this harvest will be distributed among the various stand conditions. Also, for the purpose of this analysis, all conifer stands with late-successional characteristics on private land are expected to be harvested by 2008.

Alternative B

In order to accomplish the timber management objectives in the proposed project area, existing habitat conditions would be modified on approximately 1,315 acres of commercial conifer forest stands. Currently there are approximately 5,518 acres of commercial conifer stands within the boundary of the proposed project, and approximately 27,000 acres within the cumulative effects analysis area.

Due to the variety of stand conditions in the proposed project area, numerous prescriptions/marking guidelines have been developed. With the exception of the 12 acres of 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 not benefit these species since nesting and foraging habitat would be removed, 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.

There are 0.7 miles of new roads being built. There are 1.8 miles of roads being closed/obliterated, the net change being 1.1 miles fewer roads. Roads being closed are mostly within Riparian Reserves.

The single proposed road traverses a variety of habitat types, and would eliminate approximately 4.5 acres of habitat. In relation to the size of the proposed project, the loss of this small amount of habitat 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 closure and/or obliteration of 1.8 miles of roads decreases the loss of habitat and disturbance, but mostly for larger animal species like black bear, who would use the abandoned roadside habitat more frequently than open roads (Brody and Pelton 1989). For amphibians road surfaces represent adverse habitat conditions (compacted, bare, dry ground). Because new roads are being constructed away from riparian habitats and from known locations of sensitive salamanders, the impact to amphibians is expected to be very slight.

While new road construction will have impacts to some wildlife that are sensitive to new roads, these impacts are determined to be minor. This conclusion is based on the following reasons. Studies (presented by the Natural Resource Defense Council in their compendium on the effects of roads and logging to wildlife) have shown roads affect individuals, but could not conclude effects on populations. The landscape is already fairly fragmented, both naturally by the diversity of vegetation as well as by existing roads. Because of the existing fragmentation, new roads have little additional effect. In fact, there is a net decrease in the miles of open roads. The net decrease of open road is 1.1 miles.

Adjacent to the China-Keeler project is the John's Peak OHV area, a place designated in the Medford District Resource Management Plan for OHV's. Though the area is dedicated to OHV use, a management plan does not exist. An analysis of managing the OHV area is currently underway. The extent of management is unknown at this time, but the objective is to reduce current impacts, including the creation of additional "wildcat" trails that may lead into the China-Keeler project area. It is also unknown how users of the John's Peak area will respond to being managed, and if users who participate in creating new trails will migrate to other areas not under strict management. It is also unknown what management actions are contemplated in John's Peak to keep migration of OHV activity from occurring. Therefore, an estimate of potential future OHV affecting China-Keeler based on actions at John's Peak is not possible.

In summary, as a result of implementing the China Keeler Project, 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. The direct and indirect effects of the actions proposed under Alternative B will not have a substantial effect on wildlife because 1) while there will be population shifts as habitats created benefit some and do not benefit others, populations will not trend toward a need for listing as sensitive, threatened or endangered; 2) habitats lost by road construction are minimal and are virtually nil because there is a net decrease in road miles; 3) new roads have little additional effects to fragmentation; 4) while some increases from OHV activity is likely, the increased access is mostly on ground already impacted by OHVs; and 5) timber harvests target predominantly small trees which are not needed for snags and large downed wood, while removing only minor amounts of larger wood.

I. WILDLIFE - SPECIAL STATUS SPECIES

This section discloses the impacts to threatened, endangered and special status wildlife species.

Issues/Concerns

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

Degrading habitats for special status species may result in further population declines and/or trends away from recovery of the species.

Logging may degrade suitable habitat for northern spotted owls resulting in perceived adverse effects.

Harvesting large trees is perceived to subject northern spotted owls to increased displacement from barred owls.

Affected Environment

Special Status Species are those species that are federally listed as threatened or endangered, proposed or candidates for federal listing as threatened or endangered, or are BLM designated sensitive or assessment species. In addition, prior to April, 2004, the Survey and Manage species program was in place and provided protection measures similar to the current BLM sensitive species program.

The northern spotted owl (Strix occidentalis caurina) is a federally listed threatened species. There is one known spotted owl site 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 1,400 acres of suitable spotted owl habitat and 870 acres of dispersal-only habitat on BLM administered land within the proposed planning 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.

A major scientific review of the status of the northern spotted owl concluded that the rate of habitat loss for the northern spotted owl on all federal lands has been less than anticipated at the time of listing (Courtney and others 2004). This less than anticipated rate of habitat loss is due to timber harvest levels being lower than anticipated; changes in harvesting that have left greater amounts of stand complexity (emphasis on removing smaller trees); the harvest of old growth was less than anticipated; lower levels and less intense harvest has resulted in less loss of existing late-successional forest; and the area in riparian management zones (set aside from general timber management) was significantly underestimated.

The study notes a general population decline across the range of the owl of about 2.5-4%, but notes that averages across all study areas should be viewed cautiously because that would be ignoring regional variation. Population in SW Oregon is generally stable. The study also noted that currently the Barred owl and wildfire presented a greater threat to the northern spotted owl than timber harvesting. Barred owls have been positively correlated to northern spotted owl populations in Washington and British Columbia, but not elsewhere, but the effects of Barred owl competition are essentially unknown.

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.

Table 3-31: Special Status Species

CHINA-KEELER SPECIAL STATUS SPECIES		
Common Name	**Scientific Name**	**Status**
Northern Spotted Owl	Strix occidentalis	FT
Northern Goshawk	Accipiter gentilis	BS
Siskiyou Mountains Salamander	Plethodon stormi	BS
Townsend's Big-Eared Bat	Corynorhinus townsendii	BS
Fringed Myotis	Myotis thysanodes	BA

(FT= Federal Threatened, BS = Bureau Sensitive; BA = Bureau Assessment)

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.

Several Siskiyou Mountains salamander sites were found during surveys in the planning area. Approximately 20 acres of occupied habitat have been delineated and would be protected. This protection would ensure that the habitat substrate would remain intact, and that microclimatic conditions would not be altered. No treatment would occur in any known occupied salamander sites.

Townsend's big-eared bats are present in 2 mine adits within the proposed planning area. Two other adits are located within the planning area. These adits have not been surveyed for bat use; however it is assumed they are occupied and consequently will receive protection.

Fringed myotis are associated with a variety of habitats including conifer forests and oak-woodlands. They roost in mines, caves, abandoned buildings, and crevices and cavities in large trees.

Prior to April, 2003 the Northwest Forest Plan provided extra protection for some species through Survey and Manage (S&M) standards and guidelines (S&Gs). The S&Gs generally required that surveys be conducted for certain species and that located sites be protected. The S&Gs were applicable to ground-disturbing activities/projects. To comply with the S&Gs, the proposed project area was surveyed for the following S&M animal species; Siskiyou mountains salamander, great gray owls (Strix nebulous), red tree voles (Arborous longicaudus), and terrestrial mollusks The results of the surveys follow:

- Siskiyou Mountains Salamander – Several sites were found in the portion of the proposed planning area south of the Applegate River; none were found north of the river.
- Great gray owl – One nest site was located in the proposed planning area.
- Red tree vole – No red tree vole sites were found in the planning area.
- Mollusks: No target mollusk species were found.

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.

Past Actions

Past actions that are manifested in the current condition of the China-Keeler area which have resulted in the need to list species for special attention are events and actions that have rendered habitats unsuitable. Primarily, those actions have been the development of private lands, the destruction of stream habitats via mining operations, logging and road building. These events have been described in numerous other sections of this assessment.

Environmental Consequences

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

Alternative A

Because no projects are planned under this alternative, the effects to wildlife that are discussed in the action alternatives would not immediately occur. However, habitat conditions in the proposed project area are dynamic and various natural processes will continue to change the character of the habitat over time. For example, drought and overstocking have stressed many of the large remnant trees in the project area, particularly pine, and these trees will continue to be lost. As snags these trees would continue to benefit wildlife, but data indicate that snags are present in adequate numbers across the landscape to meet wildlife needs – there are up to 54 snags per acre in some areas (BLM 2004). The larger live trees add an element of diversity to the landscape and provide adequate tree size for nesting, roosting, foraging, and denning by some of the large wildlife species in the planning area, e.g.; red-tailed hawk, porcupine, and black bear.

Wildfire is a major threat in the China-Keeler planning area and could greatly influence the abundance and distribution of the various habitat condition classes in the planning area. This in turn would modify the distribution and abundance of wildlife. Other natural disturbance events such as insect epidemics, floods, and climate change could also impact wildlife populations in the planning area. However, it is very speculative in the short term to try to determine the location and scale of such events.

Alternative B

There are 3,295 acres of suitable and 1,630 acres of dispersal-only northern spotted owl habitat in the planning area. Alternative B would modify approximately 860 acres of suitable spotted owl habitat (i.e., nesting/roosting/foraging habitat) by changing 745 acres of suitable habitat to dispersal habitat and 115 acres of suitable habitat to a condition that is not useable by owls. Additionally, approximately 100 acres of dispersal-only habitat would be changed to a condition not useable by owls. 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 745 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. The net result of the proposed harvest is a 27% decrease in the amount of suitable habitat, and a 40% increase in dispersal-only habitat.

Table 3-32 – Spotted Owl Habitat in China Keeler Planning area

Spotted Owl Habitat Within the Planning area			
Pre-Project		Post-Project	
Suitable (acres)	Dispersal-only (acres)	Suitable (acres)	Dispersal-only (acres)
3,295	1630	2,435	2,275

The habitat modification described above would occur within portions of the median home range radius of 4 northern spotted owl sites. Two sites are known to have been occupied within the last 5 years (2000–2004). One of these sites has 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.

One of these sites is within the boundary of the China Keeler planning area, and the activity center/core is protected with a 100 acre buffer.

The identified site-specific effects are best interpreted in a regional context. Because the northern 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 (which considered the impacts from anticipated projects in context of the regional conservation of the owl) concluded that the programs consulted on (including the China-Keeler project) 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).

Several reports have been published recently concerning the status of the northern spotted owl – Courtney et al. (2004); Anthony et al. (2004); USFWS, November 2004; and Lint, Technical Coordinator, (2005). Anthony et al. (2004) found greater than expected adult owl population declines in Washington and northern Oregon, but also found the populations in southern Oregon and northern California to be more stable. The reasons for both the population decline in one portion of the range of the owl and the good demographic performance in another portion are unknown. Courtney et al. (2004) noted that current habitat loss didn't appear to be a factor since areas with good demographic performance had the highest level of timber harvest, and the areas with greatest declines had the lowest rates of harvest. This would indicate that there are likely a number of interacting factors at play in the declines. Courtney et al (2004) also pointed out that there could be lag effects of previous timber harvest, and that habitat loss from wildfires, and competition from barred owls are current threats. USFWS (November 2004) found that even though the spotted owl population was declining in some areas and there were some additional threats the scientific data did not support changing the spotted owl status from threatened to endangered. USFWS (November 2004) also did not identify the need to change the existing conservation strategy, i.e., NWFP.

Five other special status animal species are known to currently be present in the proposed planning area or have been detected in the planning area in the past. These species are northern spotted owl (addressed above),

northern goshawk, Siskiyou Mountains salamander (addressed below in Survey and Manage species), Townsend's big-eared bat, and fringed myotis. ,

The proposed action will modify approximately 860 acres of habitat considered to be suitable for the northern goshawk. The modification of this habitat would likely adversely affect goshawks within the planning area if any are present. However, 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 bats are present in 2 mine adits within the proposed planning 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 planning 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 and given appropriate seasonal restrictions..

Fringed myotis are associated with a variety of habitats including conifer forests and oak-woodlands. They roost in mines, caves, abandoned buildings, and crevices and cavities in large trees. Within the proposed planning area the known mine adits would be protected (see Townsend's big-eared bat above). Some trees to be harvested could be used as roost sites. However, riparian and other reserves and the snag retention guidelines would mitigate this potential impact (USDI 1994).

Protocol Survey and Manage surveys for great gray owls, mollusks, red tree voles and Siskiyou Mountains salamanders were conducted in the proposed planning area prior to the Survey and Manage Standard and Guideline being eliminated. The previous S&M species found in the proposed planning area during surveys are the great gray owl, and Siskiyou Mountains salamander.

One great gray owl nest site is located within the proposed planning 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.

Several Siskiyou Mountain salamander sites were found during surveys in the proposed planning area. Occupied habitat has been delineated and would be protected in accordance with the NWFP Standards and Guidelines and Management Recommendations. Approximately 20 acres of occupied habitat were identified in the proposed project area.

J. BOTANY

This section discloses the impacts to threatened, endangered, special status and invasive plant (including fungi) species.

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

Issues

Degrading habitat for threatened, endangered, sensitive or other special status species may result in further population declines and/or trends away from recovery of the species.

Invasive plant species may become established or more widespread as a result of habitat manipulation.

Habitat alteration including reduced canopy cover and soil compaction associated with harvest activities degrades habitat for native plant (including special status plant and fungi species) populations.

Ground disturbance associated with harvest activities may impact stems and propagules of native plant species (including special status plant and fungi) species.

Ground disturbance and road building provide vectors for expansion of invasive plant populations.

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

Affected Environment

All of the proposed treatment areas were surveyed for vascular and nonvascular (lichens and bryophytes) plants on the Medford District Special Status Plant list and Medford District Noxious Weed list (Appendices x and x). Surveys were conducted over a time period extending from 1998 through 2003 by professional botanists using an intuitive controlled survey method. Those areas supporting high potential habitat for target species were surveyed more intensively.

Ten species of fungi were recently listed as Bureau Sensitive. These species were formerly managed under the Survey and Manage program. As Survey and Manage species, surveys were determined to be impractical. Continued direction from the Oregon State Office indicates that field units are not required to conduct pre-project surveys for these fungi species that now fall within the special status species program (OSO IB-OR-2004-145 Attachment 5).

Bureau Special Status Species

The surveys documented 129 occurrences of 24 Bureau Special Status plant species within the project area including 4 occurrences of the Federally endangered species *Fritillaria gentneri* (Table 3-33). No other occurrences of Federally listed or proposed plant species are present within the project area.

Table 3-33 Bureau Special Status Species

Lifeform	Species name (followed by number of occurrences in proposed treatments)	Common Name	Bureau Status	Occurrences in project area
Vascular	***Callitriche marginata* (1)**	winged water-starwort	BTO	1
Vascular	*Camissonia graciliflora*	hill suncup	BAO	1
Vascular	***Clarkia heterandra* (8)**	mountain clarkia	BAO	8
Moss	***Crumia latifolia* (4)**	wideleaf crumia moss	BAO	11
Vascular	*Cryptantha milo-bakeri*	Milo Baker's cryptantha	BAO	1
Vascular	***Cypripedium fasciculatum* (5)**	Clustered lady's-slipper	BSO	25
Vascular	*Cypripedium montanum*	Mountain lady's-slipper	BTO	5
Vascular	*Enemion stipitatum*	Siskiyou false rue anemone	BTO	1
Moss	*Fabronia pusilla*	Fabronia moss	BTO	1
Vascular	*Festuca elmeri*	Elmer's fescue	BAO	5
Moss	*Fissidens grandifrons*	large-leaf fissiden moss	BTO	4
Vascular	***Fritillaria gentneri* (2)**	Gentner's fritillary	FE	4
Moss	*Hedwigia stellata*	starry hedwigia moss	BTO	1
Vascular	***Hieracium greenei* (1)**	Greene's hawkweed	BTO	2
Vascular	***Lithophragma heterophyllum* (26)**	hillside woodland-star	BTO	31
Vascular	*Mimulus bolanderi*	Bolander's monkey-flower	BAO	7
Vascular	*Mimulus congdonii* (1)	Congdon's monkey-flower	BAO	4
Vascular	*Mimulus douglasii* (1)	Purple mouse-ears	BTO	4
Vascular	*Pellaea mucronata* ssp *mucronata*	birdfoot cliffbrake	BAO	1
Vascular	*Sedum oblanceolatum*	oblongleaf stonecrop	BSO	3
Vascular	***Smilax californica* (1)**	California greenbrier	BTO	1
Vascular	*Solanum parishii*	Parish's nightshade	BAO	1
Moss	*Tripterocladium leucocladulum*	tripterocladium moss	BAO	4
Vascular	*Zigadenus exaltatus*	giant deathcamas	BAO	4

Status definitions: FE=Federal endangered, **BSO**=Bureau Sensitive Oregon, **BAO**=Bureau Assessment Oregon, **BTO**=Bureau Tracking Oregon. Species listed in **bold** are present within areas proposed for treatment. Number of occurrences in proposed treatment areas are in parenthesis.

Callitriche marginata: Winged water-starwort is a floating leaved aquatic species. The single occurrence in the project area in 38S3W31 is on the edge of a unit proposed for treatment.

Camissonia graciliflora: Slender-flowered evening-primrose grows on shrubby hillsides and open oak woodlands in clay soils at elevations of less than 2500 ft. There is one known occurrence within the project area (38S3W15) that is outside proposed treatment areas.

Clarkia heterandera: Small-fruit clarkia occurs in shady sites in foothill woodland, yellow pine forest, and chaparral communities ranging in elevation from 1500-5100 ft. There are eight known occurrences within the project area in 38S3W31.

Crumia latifolia: Wideleaf crumia moss usually grows on deposits of calcium carbonate (i.e. tufa deposits) in seeps and streams. Populations are known from 38S3W16 (4 sites), 38S3W20 (3 sites), 38S3W21 (2 sites), and 38S4W25 (2 sites).

Cryptantha milobakeri: Milo Baker's cryptantha is a southwestern Oregon and northern California endemic that occurs in dry meadows, conifer-hardwood forests, and white oak woodlands. There is one known occurrence in 38S4W35 that is outside proposed treatment areas.

Cypripedium fasciculatum: Clustered lady's slipper occurs in a variety of habitats all of which seem to have a filtered light condition in common and most frequently occurs on moderately steep slopes at mid elevations. It is most often associated with Douglas fir and is usually tucked under some type of hardwood tree or senescent shrub such as manzanita, in areas with relatively little competition from other understory plants. There are twenty-five known occurrences of this species within the project area five of which are in areas proposed for treatment; 38S3W31 (2 sites), 38S4W25 (1 site), 38S4W26 (1 site), 39S3W5 (1 site), 39S3W6 (9 sites), 39S4W1 (7 sites), 39S4W12 (1), and 39S4W3 (3 sites).

Cypripedium montanum: Mountain lady's-slipper is found in filtered to shaded Douglas fir stands and mixed evergreen stands. Five occurrences are known from 38S4W35 (1 site), 39S4W1 (2 sites), and 39S4W12 (2 sites).

Enemion stipitatum: Siskiyou false rue anenome is endemic to Oregon and California. This species occurs on the edges and within brushy and wooded slopes. In southwestern Oregon it usually occurs in Oregon white oak and black oak woodlands with a filtered light regime. The single occurrence in the project area is in 38S4W22.

Fabronia pusilla: Fabronia moss occurs on the exposed and unexposed surfaces of rock outcrops within stands of Oregon white oak and Douglas Fir. A single occurrence of this moss species is present in 39S3W19.

Festuca elmeri: Elmer's fescue occurs in partially shaded grassy openings within Oregon white oak woodland, chaparral, and conifer/hardwood forest habitat. Populations are present in 39S4W1 (4 sites) and 39S4W12 (1 site).

Fissidens grandifrons: Large-leaf fissidens moss is an aquatic species that occurs on rocky streambeds within stands of Douglas fir. Occurrences of this species are in 39S3W6 (1 site) and 39S4W1 (3 sites).

Fritillaria gentneri: Gentner's fritillary is endemic to southwestern Oregon and adjacent northern California. It is found in white oak woodland, mixed evergreen forest, and mixed white oak / rosaceous chaparral. There are four known occurrences within the following sections; 38S3W16 (1 site), 38S3W20 (1 site), 38S3W21 (1 site) and 38S3W22 (1 site).

Hedwigia stellata: Starry hedwigia is a moss species with a widespread distribution that occurs on rock outcrops in Douglas fir forests. The single occurrence of this species is in 39S3W19.

Hieracium greenei: Greene's hawkweed is found in dry conifer stands with an open to filtered light regime. Occurrences are known from 38S3W31 (1 site) and 39S4W1 (1 site).

Lithophragma heterophyllum: Hillside woodland-star is a regional endemic. This species is present in filtered to shaded Douglas fir forest. Thirty-one occurrences of this Bureau Tracking species are present in the following sections: 38S3W22 (1 site), 38S3W29 (3 sites), 38S3W31 (8 sites), 38S3W32 (4 sites), 38S4W22 (3 sites), 38S4W26 (4 sites), 38S4W27 (3 sites), and 38S4W35 (5 sites).

Mimulus bolanderi: Bolander's monkey-flower is known to occur in gravelly soil under wedgeleaf ceanothus chaparral. There are 7 known occurrence in 38S3W20 (5 sites) and 38S3W22 (2 sites).

Mimulus congdonii: Congdon's monkey-flower is an annual herb that has a distribution limited to southern Oregon and California. This species occurs in white oak woodlands and wedgleaf ceanothus chaparral. Occurrences are known in 38S3W16 (3 sites) and 38S3W22 (1 site).

Mimulus douglasii: Purple mouse ears is an annual species that occurs in openings within conifer and shrub stands. Four populations are known in 38S3W16 (2 sites), 38S3W17 (1 site) and 38S3W22 (1 site).

Pellaea mucronata* var *mucronata: Bird's-foot fern occurs in California, Nevada, and Oregon. There are only four known sites in Oregon and all of these are located on the Medford District. The one known occurrence in the project area is in 39S4W1.

Sedum oblanceolatum: Applegate stonecrop is a local southwestern Oregon, northern California endemic that grows in vertical cracks and on the ledges of rock outcrops. This species is present in 39S4W11 (1 site) and 39S4W12 (2 sites).

Smilax californica: California greenbrier is a vine that usually occurs in riparian habitat. The single occurrence of this species is present in 38S3W29.

Solanum parishii: Parish's nightshade is a small shrub with a restricted distribution in western North America. It is found on south facing slopes in grasslands and grassy openings within chaparral and woodland habitat. Evidence of a frequent fire regime is often apparent. The single occurrence of this species is in 38S3W21.

Tripterocladium leucocladulum: Tripterocladium moss 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. Four occurrences in the project area are present in 39S3W5 (1 site), 39S3W6 (1 site), 39S3W7 (1 site) and 39S4W12 (1 site).

Zigadenus exaltatus: Small-flowered death-camas is known from western California and southwestern Oregon. There are taxonomic questions related to the plants in the Applegate Valley of southern Oregon and they may represent a new species to science. In the project area this species occurs in a wide variety of habitats on south facing slopes. Habitats include meadow, chaparral, Oregon white oak, Douglas fir and mixed hardwood-conifer stands. Soils are often cobbly to gravelly loams. Known sites in the project area are in 39S3W6 (1 site), 39S3W7 (1 site), 39S4W10 (1site) and 39S4W2 (1 site).

Bureau Special Status Fungi

Ten former Survey and Manage fungi species, now managed as Bureau Sensitive species, have suspected or documented occurrence on lands administered by Medford District BLM (Table 3-34). Known occurrences of these Bureau Sensitive fungi species are present in southwestern Oregon in the Klamath Mountains and Cascade Range (Table 3-34). For actions authorized or approved by the BLM, pre-project clearances must be completed for special status species to ensure that actions authorized do not contribute to the need to list special status species (Oregon-Washington Special Status Species policy). The Bureau Sensitive fungi species would best be detected during fall surveys. Surveys for special status fungi species have not been

completed for proposed treatment areas within the project area. Above-ground fruiting structures (sporocarps) are short-lived, seasonal in occurrence, and annually variable making surveys difficult (USDA and USDI 2004). According to BLM Information Bulletin No. OR-2004-145, pre-disturbance surveys in proposed project areas for these fungi are not practical to conduct and are not expected; protection of known sites along with large-scale inventory work will provide the measures and means to meet agency policy.

Four species occur on the Medford District and four species occur within the Medford District boundary but on other lands (US Forest Service, State of Oregon, and private). Because these species were considered impractical to survey for, much of the surveys and species information came from the Regional Ecosystem Office and the Regional Mycologist's staff. Survey areas and methods were not designed to meet the objectives of site specific, pre-disturbance surveys. Survey methods used in selected areas were line transects, plotless transects, and randomized plots. Of the four species found on the Medford District, three were discovered by BLM or contract botanists performing pre-disturbance surveys for other species.

Table 3-34. Special status fungi species documented or suspected on lands administered by Medford District BLM. Local ecoregions and administrative units where species is documented present are also listed.

Species name	Status	Local Habitat, Local Ecoregions, and Administrative Units	Known Medford BLM?	Potential for occurrence*	
				Habitat	Proximate
Boletus pulcherrimus	BSO	Late successional white fir communities; Western Cascades Ecoregion, **Ashland R.A.**	**Documented**	-	-
Dermocybe humboltensis	BSO	Stable coastal sand dunes with *Pinus* spp. and *Vaccinium* spp.; Klamath Ecoregion; Roseburg BLM, Arcata Field Office	Suspected	-	-
Gastroboletus vividus	BSO	High elevation Shasta red fir; Klamath/ Western Cascades Ecoregions; Applegate RD.	Suspected	-	-
Phaeocollybia californica	BSO	Associated with oaks in mature to late successional mixed evergreen forests; Western Cascade/Klamath Ecoregions; Arcata Field Office, Coos Bay/Eugene/Roseburg District BLM.	Suspected	+	-
Phaeocollybia olivacea	BSO	Associated with white oak and tan oak in later successional mixed evergreen forests; Western Cascades/Klamath Ecoregion; **Grants Pass R.A.**, Rogue River/Siuslaw/Six Rivers National Forests, Coos Bay/Eugene/Roseburg/Salem Districts BLM	**Documented**	+	-

Phaeocollybia oregonensis	BSO	Moist late successional Hemlock communities with white fir; Western Cascades Ecoregion; Siuslaw, Mt. Hood National Forests, Coos Bay/Eugene/Salem Districts BLM, - probably only in western Glendale	Suspected	-	-
Ramaria spinulosa var. *dimunitiva*	BSO	Late successional PSME stand, 1200 feet; Klamath Mountains; Roseburg District BLM	Suspected	+	-
Rhizopogon chamaleontninus	BSO	3300 foot PSME forest - Klamath Ecoregion; unknown location	Suspected	U	-
Rhizopopgon ellipsosporus	BSO	In mixed evergreen forest in Kane Creek drainage; Klamath Mountains; **Ashland R.A.**	**Documented**	+	+
Rhizopogon exiguus	BSO	Low elevation PSME forest; Klamath Ecoregion; Siuslaw National Forest	Suspected	+	-
Potential for occurrence: "-" = Low, **"+"**=High, and **"U"**=Unknown potential for occurrence based on similar habitat in project area and proximity to known populations.					

Most of the known occurrences of special status fungi are outside the Applegate watershed and habitat conditions for 4 of the 10 species are not present in the project area (Table 3-34). Two known sites of sensitive fungi are known from the Applegate watershed. *Gastroboletus vividus* is present on the Applegate Ranger District in high elevation Shasta red fir stands near Jackson Gap. One species, *Rhizopogon ellipsosporus,* is known from mixed conifer forest stands in the Kane Creek drainage (Applegate watershed).

An analysis of forest habitat in the project area, known site proximity to the project area, species distribution patterns and range, species ecological requirements, past surveys, and habitat fragmentation results in the following species *Rhizopogon ellipsosporus, Gastroboletus vividus, Phaeocollybia olivacea, Boletus pulcherrimus, Rhizopogon exiguus, Phaeocollybia californica, Rhizopogon chamaleontinus, Ramaria spinulosa var. diminutiva, Dermocybe humboldtensis* and *Phaeocollybia oregonensis* having low to moderate likelihood of occurrence in the project area.

Noxious Weeds

All of the proposed treatment areas were surveyed for noxious weeds by qualified botany contractors over a time period extending from 1998 through 2002. Surveys documented 35 occurrences for four species (Table 3-35).

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 3-35 – 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	*Centaurea 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. Weed expansion probability was estimated 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. Weed expansion probability is summarized for yellow star thistle and the other three species of noxious weeds known to occur within the project area (Table 3-36).

Table 3-36. 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%

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 38S3W9 and occupies approximately 0.1 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 0.2 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 probability for the spread of yellow star thistle, and 507 acres of the land have a high probability for the spread of bull thistle.

Environmental Consequences

Alternative A

Under the No Action Alternative there would be no direct effects to any special status plant or fungi species within the boundaries of the project area. Habitat associated with Bureau Special Status Species, including canopy cover and humidity, would remain unchanged for the short term. Noxious weed and invasive plant species present in the project area would continue to persist. Under the No Action Alternative special projects would be required to treat noxious weeds in the project area.

Prior to current standards for the protection of special status species, past actions resulted in cumulative impacts. Because special status species now have survey and protection requirements, any species found within the China-Keeler project area or within the range of the species, which overlaps into China-Keeler, is afforded protection in ongoing projects. Therefore, human-induced effects from ongoing projects are very limited.

Alternative B

Bureau Special Status Species-Plants

Fifty occurrences of 10 Bureau special status plant species are present within units proposed for treatment under the Action alternatives. Twenty-nine of these occurrences are species that are Bureau Tracking species which do not require mitigation or management. The remaining 21 occurrences include populations of *Fritillaria gentneri* (FE), *Cypripedium fasciculatum* (BSO), *Clarkia heterandra* (BAO), *Crumia latifolia* and, *Mimulus congdonii* (BAO).

Two occurrences of *Fritillaria gentneri* are present on the edges of units within the following sections: 38S3W20 (1 site) and 38S3W22 (1 site).The sites 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 two sites in question or within its currently known range.

Occurrences of the Bureau Special Status vascular plants *Clarkia heterandera*, *Cypripedium fasciculatum,* and *Mimulus congdonii* within proposed treatment units will be buffered with a 150 ft radius buffer. Occurrences of the Bureau Special Status nonvascular plant *Crumia latifolia* within proposed treatment units will be buffered with a 100 foot radius buffer. This buffering provides protection from physical disturbance and microclimate alterations associated with timber harvest activities. Under Alternative B, there would be no direct effect to any Bureau Special Status plant species.

Table 3-37. Proposed mitigation for Bureau Special Status Species in the China Keeler project area.

Species name	Bureau Status	Occurrences in project area	NT	RR	OUT	None
Callitriche marginata (1)	BTO	1				●
Camissonia graciliflora	BAO	1			●	
Clarkia heterandra (8)	BAO	8	●			
Crumia latifolia (4)	BAO	11	●	●		
Cryptantha milo-bakeri	BAO	1			●	
Cypripedium fasciculatum (5)	BSO	25	●		●	
Cypripedium montanum	BTO	5			●	
Enemion stipitatum	BTO	1			●	
Fabronia pusilla	BTO	1				
Festuca elmeri	BAO	5			●	
Fissidens grandifrons	BTO	4		●		
Fritillaria gentneri (2)	FE	4	●		●	
Hedwigia stellata	BTO	1			●	
Hieracium greenei (1)	BTO	2			●	●
Lithophragma heterophyllum (26)	BTO	31			●	●
Mimulus bolanderi	BAO	7			●	
Mimulus congdonii (1)	BAO	4			●	
Mimulus douglasii (1)	BTO	4				●
Pellaea mucronata ssp. *mucronata*	BAO	1			●	
Sedum oblanceolatum	BSO	3			●	
Smilax californica (1)	BTO	1				●
Solanum parishii	BAO	1			●	
Tripterocladium leucocladulum	BAO	4			●	
Zigadenus exaltatus	BAO	4			●	

None of the Bureau Special Status plant 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. Proposed road construction may lead to an increase in noxious weeds which can out-compete the native plant species for water, nutrients, and space. Project design features are in place to reduce existing weed populations and minimize spread to unoccupied sites.

Bureau Special Status Species-Fungi

There is potential for special status fungi species to occur in the project area**.** Predicting the likelihood of occurrence is difficult as habitat requirements for many of the suspected species is broad or poorly understood. For the 10 fungi species known or suspected to occur on Medford District BLM, specific information on connectivity and habitat requirements, range (including occurrences within the project area), and disturbance effects is lacking (USDA and USDI 2004 p. 108). The site-specific environmental consequences for the China Keeler Project are based on information regarding habitat component requirements, proposed treatments, and similar species or species groups' response to such disturbance.

The 2004 SEIS *To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines (*USDA and USDI 2004) analysis determined one of the following outcomes for each of the former Survey and Manage species:

1. Habitat (including known sites) is sufficient to support stable populations in the Northwest Forest Plan area.
2. Habitat (including known sites) is sufficient to support stable populations range-wide in the Northwest Forest Plan area.
3. Habitat (including known sites) is insufficient to support stable populations in the Northwest Forest Plan area.
4. There is insufficient information to determine an outcome.

Outcomes were determined by analyzing factors including habitat, life history, range, distribution, number and location of known sites, and the extent of the reserve system. This information was then used along with projected conditions to determine the species future population and stability patterns (USDA and USDI 2000, USDA and USDI 2004).

The 2004 FSEIS has determined that for eight of the 10 species (*Boletus pulcherrimus, Gastroboletus vividus, Dermocybe humboldtensis, Phaeocollybia californica, Ramaria spinulosa* var. *diminutiva, Rhizopogon chamaleontinus, Rhizopogon ellipsosporus,* and *Rhizopogon exiguus*) that habitat (including known sites) is not sufficient to support stable populations in the Northwest Forest Plan area. For seven of the eight species, this outcome is not due to federal actions but other factors such as: (1) limited potential habitat and few populations on federally managed lands; (2) potential for stochastic events; (3) low number of individuals; (4) limited distribution; and, (5) narrow ecological amplitude. Therefore, none of the China Keeler alternatives would change the species viability condition for (*Boletus pulcherrimus, Gastroboletus vividus, Dermocybe humboldtensis, Ramaria spinulosa* var. *diminutiva, Rhizopogon chamaleontinus, Rhizopogon ellipsosporus,* and *Rhizopogon exiguus*) based on habitat availability.

For one of the ten fungi species (*Phaeocollybia californica*), the 2004 FSEIS determined the outcome of insufficient habitat is due to land management activities. Known sites of *Phaeocollybia californica* are not substantially protected by reserves and are susceptible to adverse impacts from soil disturbance and/or a significant loss of host species. Although Matrix Standards and Guidelines of the Northwest Forest Plan provide for minimizing soil and litter disturbance, there is lack of knowledge about how much disturbance can be tolerated by these species. Loss of even a few known sites could adversely impact this species

persistence within the Northwest Forest Plan area (USDA and USDI 2000, p. 154). Management activities proposed under the China Keeler project are consistent with those activities anticipated under the Northwest Forest Plan 1994 FSEIS and 2004 FSEIS to Remove Survey and Manage Mitigation Measure Standards and Guidelines. Currently, there are no known sites within the China Keeler project area. Any sites discovered would be protected and the site maintained. If unknown sites of *Phaeocollybia californica* are present in the project area, this project could adversely impact this species as described above and in the 2004 FSEIS.

Two of the 10 BSS fungi species (*Phaeocollybia olivacea, Phaeocollybia oregonensis*) were determined to have habitat (including known sites) sufficient to support stable populations in the Northwest Forest Plan area. These species would stabilize in a pattern similar to or different from their reference distribution because a substantial number of known sites are located in reserves or managed under the Agencies' Special Status Species Programs (USDA and USDI 2004, p. 152).

Table 3-38. Species outcomes for Survey and Manage Fungi in 2004 SEIS. Number of occurrences and number of occurrences in reserves in the Northwest Forest Planning area.

Scientific Name	Number Sites in NFP[1]	Number Sites in Reserves[2]	% in Reserves
Habitat Not Sufficient – not due to federal action			
Boletus pulcherrimus	36	5	13.9
Dermocybe humboldtensis	4	1	25.0
Gastroboletus vividus	4	2	50.0
Ramaria spinulosa var. diminutiva	1	0	0
Rhizopogon chamaleontinus	1	0	0
Rhizopogon ellipsosporus	3	0	0
Rhizopogon exiguus	5	3	60.0
Habitat Not Sufficient – due to management			
Phaeocollybia californica	30	5	16.7
Habitat Sufficient			
Phaeocollybia olivacea	93	19	20.4
Phaeocollybia oregonensis	11	5	45.5

[1] Source: ISMS database 11-20-04, Handbook to Strategy 1 Fungal Species in the NWFP, Handbook to Additional Fungal Species of Special Concern in the NWFP, Medford District data.

[2] Reserves = Land Use Allocations Late Successional Reserve and Congressionally Reserved.

The 10 Bureau Sensitive fungi known or suspected to occur on Medford District BLM are species that form mycorrhizae or mutually beneficial relationships with the rootlets of host plants that are typically conifers. The mycorrhizae form an underground mycelial network that can be considered the vegetative body of the fungi. Sporocarps, the fruiting bodies or "mushrooms", may develop above or below the ground surface depending on the species. Spores produced by the fruiting bodies are then transported by animals or wind. Late successional characteristics, including moderate to high canopy cover, high incidence of large trees, snags, and accumulation of coarse woody debris (including logs), in forested stands are important habitat components for fungi (USDA and USDI 2004 p. 148).

An estimated 24% of the commercial forest land in the China Keeler project area would be treated. Commercial harvest activities could have varying degrees of adverse impacts depending on the level of tree removal and ground disturbance including reduction of canopy cover, ground disturbance, and removal of organic matter or coarse woody debris. Adverse effects to fungi include changes in microsite conditions (including temperature, humidity, light intensity, and wind) from reduction of canopy cover, edge effects, changes in soil moisture regimes, fragmentation of the mycelial network, reduction in availability of host trees, reduction of root and root tip availability, decrease in organic soil layer, soil compaction/bulk density increase, and a decrease in the amount of coarse woody debris that may serve as a source of moisture in the dry months. These effects may reduce or eliminate sporocarp reproduction, change fungal species composition and species diversity, and decrease fungal biomass.

All of the Bureau Sensitive fungi are associated with forested environments and though specific information is unavailable they are thought to be associated with late successional/old growth forests. In the project area 2212 acres are classified as mature/late successional forest, of this 391 acres are proposed for treatment. The remaining untreated mature habitat in the project area and in the watershed will continue to provide habitat for fungi, including those listed as Bureau Sensitive if they are present. "Small forest fragments can function as refugia where fungi may persist until suitable habitat conditions become available in adjacent stands." (USDA and USDI 2004 p. 148).

Management methods that retain living trees and shrubs provide host trees and substrates to maintain mycorrhizal networks (Amaranthus and Perry 1994). A study by Luoma et al. (2004) examined the effects of varying levels and patterns of green-tree retention on ectomycorrhizal sporocarp production; levels tested were 15, 40, 75 and 100% existing live tree basal area for aggregated and dispersed patterns of green tree retention. Complete elimination and reduction of sporocarp production was observed in the 15% aggregated and 15% dispersed treatments respectively. Aggregate patterns at 40% retention also showed decrease in sporocarp production. No effect was observed in stands with 40% green tree retention in dispersed patterns. Total fall mushroom biomass decreased significantly in the 40% aggregate and the 15% dispersed and aggregate treatments compared to the 75% aggregate, 40% dispersed, and the control (100 %). Prescriptions for the China Keeler commercial forest units result in: Poles 56-61% retained, Mid-mature 51-72% retained, Mature 43-69% retained. Retention patterns will range from dispersed to small openings. Bureau Sensitive fungi, that were not surveyed for but could be present, may survive subsequent habitat conditions due to the design of commercial harvest treatments.

Habitat components important to fungi include dead, downed wood; standing dead trees; and live old-growth trees; as well as a diversity of host species(including trees and underbrush) and microhabitats"(USDA and USDA 2004 p. 148) Proposed project actions and design features including treatments retaining 40% or greater live tree basal area, retention of coarse woody debris and surrounding vegetation, retaining old growth trees and associated trees, riparian reserves, special status plant reserves, and logging systems that minimize or create only localized ground disturbance will support fungi viability.

Increases in soil bulk density from ground disturbing activities limit available soil moisture and inhibit root growth of host species for fungi. Road building, tractor yarding, and cable yarding can have intense effects at

a localized level on soils. An estimated 0.7 miles of new roads are proposed under the action alternatives for the China Keeler project. For new road construction it is estimated that the road prism occupies a width of 40 feet (4 acres per mile). Approximately 119 acres are proposed for tractor harvest, including 18 acres in mature forest stands. Tractor yarding utilizes tractors to drag trees to landing locations along narrow skid trails (about 9 to 12 feet wide) that are located approximately 150 feet apart. An estimated 402 acres of commercial units are proposed for cable yarding, including 126 acres in mature stands. Parallel skyline corridors 9 to 15 feet wide and placed 200 feet through the treatment unit are used to pull trees upslope to landing areas. Dahlberg and Stenlid (1995) found that mycelial networks may range in size from 1.5 – 27 meters. If special status fungi are present in the project area ground disturbing impacts may fragment the hyphal network reducing or eliminating populations.

Organic soils and coarse woody debris protect mineral soil from compaction, reduce erosion, maintain soil nutrition and maintain long term soil moisture. Mycorrhizal fungi prefer moist sites and rotten wood for colonization. Organic soils and abundance of coarse woody debris may be impacted by tree harvest and prescribed burning. Project design features are in place in the China Keeler project area such that coarse woody debris remaining after logging would be maintained at or above current levels in order to protect the surface soil and maintain productivity.

The impacts of prescribed burning for removal of slash and site preparation depends on fire intensity. High intensity burns that get into mineral soils may eliminate mycorrhizal fungi and create habitat that is colonized by non-mycorrhizal plant species including weeds. In the China Keeler project area, all prescribed underburns are to be performed when moisture conditions are high enough and prescription windows are at a level so that no more than 50% of the mound depth/duff layer around pine trees is consumed during burning. A recent study by Smith, et al. (2002) examined short-term effects of seasonal prescribed burning on ectomycorrhizal fungi. Results showed that fall underburning (in dry ponderosa pine stands of eastern Oregon) significantly reduced duff depth, live root biomass, and ectomycorrhizae species richness compared to spring underburning, for at least two years. Also, the probability of residual tree mortality was greater for fall burning. The data suggests that spring burning should be favored over fall burning if the objective is to maintain ectomycorrhizae species diversity

High intensity burns, such as pile burning to remove slash, that enter mineral soils would create a localized disturbance including death of fungi down into mineral soil (the more diverse portion of the soil), incineration of the organic soil layer, loss of available nutrients, reduction of soil moisture, a decrease in fungal biomass, a decrease in fungal species diversity, fungal species composition change, degradation of soil physical structure, and increase non-mycorrhizal species' (many that are weedy) ability to become established at the site.

This analysis was completed in compliance with BLM State Office direction on management of fungi under the Special Status Species program to meet the requirements of the Oregon-Washington BLM Special Status Species policy. If sites supporting Bureau Sensitive fungi were discovered in the China Keeler project area they would be managed to maintain the species at an occupied site to prevent contributing to the need to list that species as threatened or endangered under the Endangered Species Act. Reduction of canopy cover and removal of host trees proposed in silviculture prescriptions would not likely adversely affect Bureau Sensitive fungi species since retention of host trees and coarse woody debris would continue to provide habitat components favored by these species. Localized disturbance such as roads, skid trails, or slash piles may adversely impact Bureau Sensitive fungi populations, if they are present in the disturbed area.

For seven of the 10 BSS fungi species it has already been determined in the 2004 FSEIS that habitat is insufficient to support stable populations in the Northwest Forest Plan area; therefore, the species viability condition (based on habitat) for *Boletus pulcherrimus, Gastroboletus vividus, Dermocybe humboldtensis,*

Ramaria spinulosa var. *diminutiva, Rhizopogon chamaleontinus, Rhizopogon ellipsosporus,* and *Rhizopogon exiguus* would not change under any of the alternatives including the no action alternative.

In the 2004 FSEIS, *Phaeocollybia californica* was determined to have insufficient habitat due to land management activities. Known sites of *Phaeocollybia californica* are not substantially protected by reserves and are susceptible to adverse impacts from soil disturbance and/or a significant loss of host species. Loss of even a few known sites could adversely impact this species persistence within the Northwest Forest Plan area (USDA, USDI 2000, p. 154). The potential for actions proposed in the China Keeler project to affect populations of this species are low due to both a low probability of occurrence and a low probability of direct impacts.

For two of the 10 BSS fungi, (*Phaeocollybia olivacea, Phaeocollybia oregonensis*) it was determined in the FSEIS that habitat is sufficient to support stable populations in the Northwest Forest Plan area. Species viability condition for these fungi species (based on habitat) would not change under any of the alternatives including the no action alternative.

Noxious weeds

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 sites including roads and landings. These same areas serve as dispersal corridors. Newly disturbed sites such as skid trails, roads, and landings may provide suitable habitat for the establishment of noxious plant species. 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.

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.

In the project area pre-treatment of noxious weed populations prior to proposed Actions will reduce existing populations. Project design features including washing equipment along with seeding decommissioned roads, fill slopes or new roads, and landings will minimize colonization of new sites. Potential effects will also be minimized by the stipulation that all new road construction will be closed to public access including off road vehicle use.

Additional documents pertinent to Botanical Resources are available upon request:

OSO IB-OR-2004-145 *Project Evaluations for Former S&M Species in which Surveys are Not Feasible*, Medford District Special Status Plant List and Medford District Noxious Weed List.

K. OHV, VISUAL RESOURCES, CULTURAL RESOURCES, NOISE AND TRAFFIC

Since the China-Keeler project does not propose any changes to management of existing off highway vehicle (OHV) use, this section discloses simply whether and how much (OHV) use patterns might change as a result of changes to the project's vegetation and road network. The impact of change is the basis for determining effects to other resources. This section also discloses the social implications of those changes. Direct OHV impacts to wildlife are found in the "Wildlife" section; impacts to wildfire are found in the

"Fire/Fuels Management" section; impacts on soils and water quality/quantity are discussed in the "Soils" and "Hydrology" sections, respectively; impacts to vegetation are disclosed in the "Vegetation" section; impacts to air quality are disclosed in the "Air Quality" section. This section also discusses Visual Resource Management, Cultural Resources and Noise and Traffic concerns.

Issues/Concerns

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

There is opposition to new road construction because construction of new roads may increase OHV activity, which may impact the environment and local residents.

There is opposition to thinning timber stands because opening these stands may lead to OHV users pioneering new trails.

There is a concern that timber harvest or other management may change the visual quality of the area.

OHV's can impact wildlife, water quality, vegetation, air quality, and result in recreational conflicts and quality of life impacts (noise, trespass, litter and waste) to local residents. New roads may result in increased access for OHV. Such access may also result in increased areas subject to human caused wildfires and the spread of noxious weeds.

The reduction of vegetation and forest debris, especially near or on the forest floor, could subject the more open forest conditions to OHV use.

Timber harvest changes the look and character of the hillsides and the views that local residents and tourists have of the forest.

Noise from helicopter logging or other activities associated with the project could be irritating to local residents.

Traffic could be increased as a result of the proposed action and be annoying to local residents.

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

Affected Environment

OHV activity has been increasing in the project area, partly because of increasing public interest in the sport/recreation activity, and partly because of the increasing popularity of BLM's adjacent John's Peak designated OHV area.

The project area is currently open to OHV use except for riparian areas. The area receives substantial use in limited areas mostly motorcycles and ATV's. All the existing roads in the project area are open and available to OHVs as well as an unknown number of informal user created trails. OHV activity up to the present time has resulted in one degraded meadow and some complaints from local residents mostly regarding noise and trespassing.

OHV's impact local residents with noise. Because of the checkerboard patterns of land ownership and inclusions of private lands among BLM lands, boundaries are often confusing and/or ignored. Consequently, trespassing is a common complaint among local residents. Dirt bikes meet county noise standards/ordinances simply by having mufflers.

Past Actions

OHV use (principally motorcycles) has grown in popularity in the China-Keeler area. Part of this is due to the increasing sales and availability of small off road motorcycles and ATVs. The existing roads in many areas of China-Keeler facilitate the dispersal of OHV use in the planning area. The adjacent John's Peak area has been visited and used by OHV enthusiasts for decades. The area became well developed with trails and in 1996 was designated by the Medford District Resource Management Plan as an officially designated OHV area. The lesson from past actions is that roads facilitate the development of OHV trails, especially because the area has no restrictions against riding off roads and trails. This is the standard policy for BLM lands. BLM lands are open for OHV, walking, cycling and horseback riding unless expressly closed to those activities.

Environmental Consequences

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

Alternative A

Actions which incrementally contribute to ongoing OHV activity or increased OHV activity include establish of new residences on private land adjacent or near the China Keeler project area, road construction within the project area on private lands, road construction in adjacent watersheds that would connect or closely connect to road systems in the project area, designated/developed OHV use on adjacent areas (Johns Peak), development of privately owned/operated OHV "parks", and the continued BLM policy of unrestricted OHV use unless designated closed.

Except for some localized development of private land, there are no reasonably foreseeable road construction projects. OHV activity will continue at least at the current pace with the associated effects to people and the environment. Depending on OHV users' reaction to restrictions in the John's Peak area (currently subject of an EIS for OHV Management), and future decisions by the BLM on restricting and/or closing OHV activity in the China-Keeler area (though none planned at this time), OHV use may increase, in which case the current impacts will be increased. These impacts are mostly associated with OHV use off of forest roads.

No timber would be removed and no contracts created for the local workforce. No timber would be sold or provided. No helicopter noise or road traffic increases would occur.

Alternative B

This alternative has a net decrease in the miles of roads within the planning area. More miles are proposed to be closed or decommissioned than constructed new. While some roads are being closed to highway vehicles, Off Highway Vehicles could still access some of the roads. Considering the road closures and the location of the small amount of new road construction there should be little potential increase in use by OHVs. The new road construction is in an area far from current OHV use. The China Gulch area which now has the highest

rate of use will have some roads closed which. Even if some of the closed roads continue to be used as OHV trails, it is unlikely that this project proposal will contribute to more OHV use. There are currently abundant OHV trails in the China Gulch area and this project proposal does not create conditions that would contribute to more use.

Based on the reduced miles of roads and the location of new roads, new road construction will/will not measurably increase OHV activity, therefore limiting any additional impacts to the environment and local residences.

Because of the general trend in outdoor recreation and OHV machines being sold, there is an increasing chance that some residents will be subjected to noise more frequently. Because of the small area that is impacted by new roads and because of the distance from residents where new access is provided by new roads, only a few individuals are subjected to a potential for more frequent noise. However, judging by the paucity of comments received during the public comment period regarding impacts by OHVs, such impacts are deemed to be minor and very localized.

Because the direct and indirect effects are very minor, the cumulative impact of OHV effects of Alternative B related to increased access, when added to past and ongoing actions (which contribute the vast majority of the net effect of OHVs), is relatively unchanged. In addition, the end result of the Johns Peak Management Plan EIS is managed use of OHVs, thus further reducing opportunities for newly created user trails within the China Keeler project area.

Visual Resource Management

The entire project area is designated as either visual resource management class III or IV. The management objective for class III lands is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer.

Class IV lands are even less restrictive. The level of change to the characteristic landscape can be high and these activities may dominate the view and be the major focus of viewer attention.

It is important to note, that the system is based on observations of a causal observer and not local residents who are very sensitive to minor changes that may take place in the local neighborhood.

The proposed activity is to manage commercial timber stands with a variety of treatments including thinning, density management, and a small regeneration cut (12 acres). One short segment of road will also be constructed.

The planning area was evaluated for visual contrasts from major travel routes and all proposed activities within the China Keeler Planning area will meet visual resource management objectives. The activities proposed are predominately thinning and density management which leaves the largest tress and removes the smaller trees. This type of harvest has a low visual impact because the forest canopy is not altered much. The road proposed for construction is far from the valley and away from local residents. The overall visual impact of the project is low.

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.

Noise and traffic

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 and 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.

CRITICAL ELEMENTS

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

Critical Elements

Critical Element	Affected Yes	Affected No	Critical Element	Affected Yes	Affected No
Air Quality		X **	T & E Species		X **
ACECs		X	Wastes, Hazardous/Solid		X
Cultural Resources		X	Water Quality		X **
Farmlands, Prime/Unique		X	Wetlands/Riparian Zones		X **
Floodplains		X	Wild & Scenic Rivers		X
Nat. Amer. Rel. Concerns		X	Wilderness		X
Invasive, Nonnative Species		X	Energy Resources (EO 13212)		X
			Environmental Justice		X

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

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China Keeler Landscape Project
Appendix A

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 B

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 C

Acronyms and Glossary

Appendix C
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 D

Springs and Associated Water Rights/Rights of Way

China Keeler – Water Rights and Springs

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

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

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:

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.

CHINA KEELER PROPOSED ACTION